2017

Ethical Relationships to Soil in the Anthropocene

Anne Therese O'Brien

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Ethical Relationships to Soil in the Anthropocene

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Bachelor of Science (Honours) and Bachelor of Arts

A thesis in fulfilment of the requirements for the degree of Doctor of Philosophy

Institute for Social Justice
Faculty of Education and Arts
Australian Catholic University.

2017
Figure 1: Peter Andrews examines soil texture with a young farmer. Source: Anne O’Brien, 14 April 2014.
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Abstract:

While soil is central to human life and the flourishing of countless nonhumans, its importance is rarely acknowledged. Soil is often represented as lifeless, invisible or a substrate: part of the background to more important things. Its value is only publicly expressed when its functions break down, and even then, this rarely prompts an adequate response. Now as life on earth faces the climate crisis and the other anthropogenic planetary and localised perturbations, there is growing recognition that healthy soil ecosystems may help wider ecosystems cope. How can modern humans better care for and regenerate soil? What relationships can be disclosed, cultivated and strengthened in order to do this?

The Anthropocene, as far as the soil is concerned, is a product of particular land use practices, ideologies, and protagonists, with some damaging soil far more than others. Some indigenous societies have cared for soils for millennia, while a growing number of regenerative practitioners are likewise developing responsive, skilful and caring working relationships with soil organisms.

In this thesis, I examine contemporary practices of regenerative land stewardship that help build soil ecological integrity, using an interdisciplinary approach of interview and site based fieldwork, combined with theoretical reflection. Articulating principles of care for soil, I hope to contribute to the work of enabling transformative social change at the level of norms. The fieldwork examples ground the analysis in everyday realities.
of land stewards, who bear witness to both environmental devastation and ecologically robust relationships.

After considering the meaning, science and practice of regenerative land stewardship, I use critical theory to consider how mechanistic science, instrumental reason, and technicity have contributed to the exploitation of soil. I consider the ways in which dominant management techniques and technologies have been naturalised, presupposing the ideal of control. I contrast this with more provisional, responsive approaches of pursuing plural ends such as Wendell Berry’s concept of kindly use. Using field work case studies, I examine how practitioners learn to care for soil, involving new ways of seeing, recognition, and receptivity, monitoring signs of soil health such as soil aggregate texture, and attempting to do justice to new matters of concern as they arise. Such work builds ecological relationship in the course of everyday work, rendering soil ecosystems not only means, but also ends in themselves, and also making for a less alienated form of work.
Statement of Authorship

This thesis contains no material that has been extracted in whole or in part from a thesis that I have submitted towards the award of any other degree or diploma in any other tertiary institution.

No other person’s work has been used without due acknowledgment in the main text of the thesis.

All research procedures reported in the thesis received the approval of the relevant Ethics/Safety Committees (where required).
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Acknowledgements

This thesis was written on the lands of the Burramattagal people of the Dharug Nation, as well on Cammaraygal Country, of the Ku-ring-gai Nation. I acknowledge their sovereignty, recognising that the work of addressing wrongs involves negotiating long overdue treaties, rekindling old ways and learning new ways of caring for Country that are in keeping with Aboriginal duties of responsibility towards the land.

This project draws from the knowledge developed by practitioners and organisms whose cooperation on the land reveals and affirms new and inadequately recognised dimensions of our joint biological capabilities. In my opinion their work is crucial at this time in human history. The multiple forms of abundance that such practitioners produce, grounded in ecological integrity, could help deliver the world from the terrifying “Mad Max” “fight or flight” scenarios that become more likely in an increasingly hostile warming world of militarised capitalism. I hope my work adequately comprehended and fairly represented their efforts.

I have benefited greatly from being part of several academic communities. The Institute for Social Justice has provided a receptive and stimulating academic community, providing feedback to my working drafts, particularly fellow doctoral students. I am grateful for all the help I have received. Special thanks to my supervisor Nikolas Kompridis, and my panel member Romand Coles, for their ethical and political imaginations and their insightful feedback. Also thanks to Magdalena Zolkos and Allison Weir for their support and ideas.

The former Centre for Citizenship and Public Policy at Western Sydney University was an environment in which several of these ideas germinated in fertile soil. The first year coursework was particularly useful for me, in establishing the direction in which this thesis would go. My thanks to Katherine Gibson and Ethan Miller for their engagement with my project over this period, the members of the Community Economies Research Network, and the Flying Fox Collective House, for their adventurous learning and fun.
During the research and fieldwork, I benefited from the hospitality and assistance of several people. Marco Cuevas-Hewitt and his partner Ana hosted me, helped me out with practicalities of my fieldwork in Western Australia and lent me their car when my car hire fell through. Christine Jones put me in contact with the farmers the WA Wheat belt. Agness Knapik and her partner hosted me during my visit to Mudgee Microscope Group, showing me their wonderful garden using green manure techniques. Walter Jehne and Cindy Eiritz, formerly my fellow members of Climate Action Canberra, originally stimulated my interest in this topic. They also each provided hospitality, encouraged me and explained many aspects of soil physiology and climate policy to me.

I’m grateful to Sydney Trains, for providing the work environment that few offices provide, helping me concentrate and find a writing flow over many journeys. I could almost have written my PhD about Sydney’s need for better public transport, but we will save that energy for some other project.

Thank you to my parents, Geoff and Cathy, who have been enthusiastic supporters, helping me out when I was working late at the university, and encouraging my curiosity and journey of learning. Thanks also to my mum’s cousin Terry Fish for the photograph of the Fish Mouldboard plough and some explanation of the context behind the invention. Thanks also to Victoria Grieves for encouraging me to think more about my family connections to farming and to incorporate this into my work.

I have journeyed through this long and difficult PhD with Simon Dougherty, my partner, who has also been writing a PhD thesis. Simon’s kind attentiveness assisted me greatly when poor health made it hard to keep going. Simon has an unwavering commitment to justice, unmatched integrity, a clear mind, and a big heart. The countless discussions we had about philosophy and politics certainly informed this thesis, and I am very grateful.
Introduction

The most creative and necessary work that humans do is to work with the soil as co-producers with nature. Human effort and knowledge based on care for the soil prevents and reverses desertification, the root of collapse of so many historical civilizations. Vandana Shiva.

In December 1990, Ivan Illich and several of his friends wrote a Declaration on Soil. Departing from usual subject matters critiquing technologies of domination and controlling education systems, they wrote: “Soil – its cultivation and our bondage to it – is remarkably absent from those things clarified by philosophy in our western tradition.” In the declaration they argued for philosophy’s role in clarifying the virtues needed to sustain soil, as well as the relationship between soil and the good.

In the modern era, soil ecosystems, which support many forms of complex life on Earth, are under immense stress. Human induced degradation affects “nearly 40% of the earth’s arable land as a result of soil erosion, atmospheric pollution, extensive soil cultivation, over-grazing, land clearing, salinization, and desertification.” Over the past century, the intensification of industrial farming has increased the rate of soil erosion

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sixtyfold,\(^4\) with at least several tonnes for each person on the planet eroded each year.\(^5\)

When “the whole world, at all scales, is a ‘contact zone,’”\(^6\) modern humans face the challenge of developing skills and virtues to transform our relations with other species such that we heal rather than harm ecosystems, assisting with the expression of their numerous beneficial capabilities and emergent properties. I am interested in the opportunities that humans have to work with ecosystems more cooperatively, moving from the Anthropocene to the Symbiocene, as Glenn Albrecht puts it.\(^7\) Soil is a prime site for proliferating symbiotic relations for three reasons. Firstly, soil is a habitat for numerous organisms. Secondly healthy soil performs numerous functions, including regulating water and nutrient flows, reducing erosion and imparting nutrition to plants, impacting upon the health of other trophic levels of life. Producing 12 of the 17 so-called “ecosystem services,”\(^8\) soil is a form of “ecological infrastructure” as it provides amenities for humans and numerous other species.\(^9\) Thirdly, soil persists


\(^8\) According to B.E. Clothier, S.R. Green and M. Deurer, “Preferential flow and transport in soil: progress and prognosis,” *European Journal of Soil Science* 59, (2008): 8. While “ecosystem services” can highlight the capabilities of ecosystems in an easy to understand way, playing a valuable educational role, I use the term cautiously as it usually assumes humans as the only (or the main) beneficiary of benefits, also flattening value into a capitalocentric framework.

\(^9\) Keith L. Bristow, Steve M. Marchant, Markus Deurer and Brent E. Clothier, “Enhancing the ecological infrastructure of soils,” Presentation to the 19th World Congress of Soil Science, *Soil Solutions for a*
underneath and amid the stuff of everyday life, despite the strenuous efforts that are often made to pave over, build above, clean away and replace it (e.g. with hydroponic growing mediums). In such proximity there is real potential to modify routines of engagement to become sensitised to soil, and to work with rather than against processes of soil production or pedogenesis. I’m not alone in seeing political potential in practices of attentiveness to the materials of everyday life: David Schlosberg and Romand Coles, as well as others have written of this potential.

Potential “allies” in soil are abundant (along with long-sworn enemies), though most can only be seen with the aid of a microscope, or their presence inferred with a visual or chemical proxy. Developing sensitivity to signs of life beyond the immediately evident is an important capability in the skill-set of regenerative agriculture. The condition of soil and the wellbeing of soil life could become public concerns, if these issues are articulated in powerful and culturally relevant ways.

While the everyday closeness of humans –in-general to soil is an interest of mine, my research focuses upon those practitioners who encounter soil in the course of their daily work, relying economically on soil functioning, as farmers, green keepers, or gardeners. Such people –often unknowingly – share some common interests with species that live in soil, especially when their vulnerability to agricultural pollution and soil degradation becomes a problem. From such ‘shadow places,’ victims of

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environmental degradation may emerge, Lorax-like, in distress. Like the character arc of the “Once-ler” in Dr. Seuss’s picture book, those who witness ecological destruction on a daily basis through their work can become passionate and troubled ecological advocates. I have books on my shelf that are part-practical manual, part personal narrative of people who were transformed by their direct encounter with substances or organisms at work, whether it’s Paul Stamets, a former forester, and the fungi that he came to know, or Raymond Rogers, a former fisherman who experienced the collapse of the North Atlantic fishing industry. Likewise, the dissident staff of SeaWorld, San Diego in the 2013 documentary Blackfish stood up to their management against the captivity of orcas, showing how such workers are well-placed to become public advocates using their practical expertise for the purposes of critique, collective action and testimonial advocacy. These examples demonstrate the understanding and responsibility that everyday practices of labouring with other species have the potential to generate. It is my view that the modern Western environmental movement has not adequately recognised the rich resource of knowledge and concern held by such practitioners.

In 2008 I spent one day on the island of Bohol in the Philippines with a family of fisher folk who worked on a traditional boat casting out nets and waiting, drumming the boat sides to scare the fish into the nets. They only caught a small number of fingerlings for around two hour’s work. We did not share a common language, however there was

15 Blackfish, Directed by Gabriela Cowperthwaite, (San Diego, USA Manny O Productions, 2013). DVD.
one relevant English word they knew, and they repeated it over and over to me: *Crisis!* *Crisis! Crisis!* It was a troubling and urgent call, which still haunts me. In their case, it was both commercial overfishing as well as the clearing of mangroves that reduced fish populations. This condemned local fisher folk to a very tough life, with younger generations leaving to find work in the city as soon as they could. One hopeful sign was the work of local environmental organisations bringing people together to learn about, protect and replant the mangrove forests – a campaign which clearly drew links between human and ecological wellbeing. Such livelihood issues comprise what Martínez-Alier calls *The Environmentalism of the Poor*.16 The condition of soil is a major concern of many small farmers, but also peasants, who feed 70% of the world’s human population,17 and who often grow food on so-called “marginal” land, without having the luxury of being able to buy new land when old land becomes degraded.

**My connection to soil**

As an inhabitant of the driest continent on Earth (apart from Antarctica), and a gardener, I am perhaps more predisposed than most people to care about soil. I entered adulthood during the Millennium Drought, a period of crisis throughout Eastern Australia lasting nine years, which was particularly devastating for rural people, and for ecosystems. The image of a farmer tending to skeletal sheep, staring out towards a desolate horizon was a common motif on television and in newspapers. Agriculture became very tenuous amid the dry. As a vegetable gardener, I also struggled to grow plants that were originally from other parts of the world, using

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techniques that also were from elsewhere: plants that became shriveled husks. Sports fields became dusty, compacted expanses of ground; bushfires intensified and water restrictions regulated garden water use to twice a week, outside sunlit hours. The worst that I and most other city dwellers had to put up with was the water restrictions, while many farmers went bankrupt, abandoning their crops and leaving farming altogether, with the number of people working in farming in Australia declining 15% in only 12 months during 2002-3.18

My interest in soil grew as an undergraduate at the University of Sydney, where I undertook an independent research project on mycorrhizal fungi with Dr. Peter McGee in 2001. Through this research I learned about the extraordinary capacities of such fungi to redistribute the products of photosynthesis between trees, allocating sugars to young trees that struggle to access adequate sunlight while growing beneath a rainforest canopy. Then over the three years while working as a public servant in Canberra, from 2008-10, I co-convened a community group, Climate Action Canberra, which campaigned for an adequate national and local policy response to the global climate emergency. One of the members of our group was a retired ecologist, Walter Jehne, who works with farmers to improve soil biodiversity, and speaks in a most engaging way about soil and microbes. Walter convinced me that regenerative agriculture potentially has a major part to play in both mitigating and adapting to climate change. When I commenced a PhD in 2011 at Western Sydney University, my initial focus was on climate policy, but reading texts from Bruno Latour and Jane

Bennett reminded me of soil. This prompted me to change my topic to focus upon our relations with soil.

The suburb of Sydney where I live, Parramatta, has an estuarine aquatic environment where the salt waters of Sydney Harbour mix with the fresh waters of Parramatta River. This is a place once rich with food, including the long finned eel, the namesake of the *Parramatta Eels* football team, which was cared for and possibly farmed by the local Aboriginal Burramattagal People. It was also where the settlers first successfully established European crops along the riverbanks after nine months of crop failures and famine in Sydney Cove (plaques in Parramatta Park triumphantly attest to this). The days of agriculture are now long gone, and glassy apartment blocks now rise from the riverfront.

Settlers were often frustrated by the difference between Australian and European soils: they saw the soils as *poor*, and few learned how to adaptively work *with* the land, or to grow and harvest foods that the land was more capable of supporting.

Australian soils are old, relative to soils on other continents, as volcanic processes have not occurred on the continent for more than 4900 years. They are lower in phosphorus and some trace elements, to which the native vegetation is well adapted. The language of “poor” and “rich” soils assumes universality, but is historically rooted.

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19 These texts were Bruno Latour, *Politics of Nature: How to bring the Sciences into Democracy*, (Hyderabad, India, Orient Longman, 2007) and Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham, NC, USA, Duke University Press, 2010).


in European understandings of desirable conditions for favoured food crops. Today, the dominant Australian palate carries these influences.

**Soil’s cultural significance**

Soil evokes a wealth of imagery, owing to its central role in human subsistence practices throughout the ages. The word *Earth* both means our planet and the soil, while the word *human* comes from *humus*. The first human according to the Abrahamic religions was *Adama*, meaning ‘soil’ in the original Hebrew. Daniel Hillel explains this connection beautifully in the documentary *Symphony of the Soil*: “Adam literally means *earthling*, and described in the second chapter of Genesis, is fashioned by God out of *Adama*- out of the earth, translated as the dust of the earth, but is really the *afar*, the soil, the material of the soil. And now ... Adam’s mate - *Hava*- in English rendered - Eve- means *life giver*. “22 This creation story carries the insight that humans have an elemental composition greatly derived from the land: we depend on soil relations for our mineral nutrition. It also shows the ways in which the cultures of early Judaism both identified with and revered soil. That the union between Adam and Eve is analogous to that between soil and life has resonance with many different cultural understandings of concepts such as *fertility*. On the Wikipedia ‘List of fertility deities’, 47 of the 160 gods listed from cultures around the world, are responsible not only for abundance of children but also soil fertility and agricultural productivity.23 Thus soil shares with human fertility an association with life and generativity. According to

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22 In *Symphony of the Soil*, directed by Deborah Koons. (Mill Valley, California: Lily Films, 2012). DVD.
William Albrecht, “The soil is the ‘creative material’ of most of the basic needs of life. Creation starts with a handful of dust.” Soil has aroused interest and inquiry for millennia, spurred by its practical relevance to the tasks of everyday provisioning.

Montgomery writes,

> For most of recorded history, soil occupied a central place in human cultures. Some of the earliest books were agricultural manuals that passed on knowledge of soils and farming methods. The first of Aristotle’s fundamental elements of earth, air, fire, and water, soil is the root of our existence, essential to life on earth…. In our accelerated modern lives it is easy to forget that fertile soil still provides the foundation for supporting large concentrations of people on our planet.

Soil is immensely useful to humans and nonhumans, as a surface for movement, interface of exchange, substrate for growth, crucible for biochemical transformation, building material, microbial inoculant and a habitat. Soil mediates traffic between living and dead, organic and inorganic, at the nexus of the lithosphere, the biosphere, the hydrosphere and the atmosphere. I could playfully say that soil is the ground for all grounds: the foundation of human and other terrestrial existences.

Soil is imbued with certain qualities and aesthetics that inform judgement of people and things. An “earthy” person is wholesome, level-headed and attuned to practical matters: widely regarded as a virtue. Yet “soil” and “dirt” are also referents for our language of contamination and moral corruption. For examples, a ‘dirt file’ contains humiliating information that may compromise the reputation of a public figure. When something is degraded or made unfit for public presence, it is ‘dirty’ or has been

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'soiled,' and thus must be cleaned, redeemed or quarantined from appearance in public, or confined to particular spaces. The Anthropologist Mary Douglas states at the beginning of her classic book *Purity and Danger*, that “Our idea of dirt is compounded of two things: care for hygiene and respect for conventions.”

Ecologically, soil is a common good bequeathed by past generations of life, providing means of life and other affordances for many different organisms. Soil made possible the diversity of organisms that live today on earth. This is not to say that a similar diversity could not have evolved in other circumstances, but given the Earth as it has evolved thus far, the vast majority of extant species depend upon a set of biogeochemical conditions, including the existence and flourishing of soil ecosystems. In a similar manner to the role of complex relations of life in making and moderating the qualities of a habitable planet in James Lovelock’s *Gaia theory*, self-organising life, differentiating in function as it takes different forms, progresses towards highly structured interdependent communities in soil, which collectively produce new emergent properties that can enlarge the capabilities of future generations.

Like the degradation of the human gut microbiome, soil ecosystems are being degraded, their needs and value misrecognised through thoughtless and misinformed practices that marginalize soil life. In Australia, a total of 4.4 billion tonnes of soil have been lost to erosion from 325 000 kilometres of gullies since European settlement at

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an average erosion rate of 4.4 tonnes per hectare annually.\textsuperscript{29} Globally, 10 million tonnes of Phosphorus, 121 million tonnes of Nitrogen and 36 billion tonnes of Carbon are emitted annually from soils, causing pressures in many fragile ecosystems.\textsuperscript{30} Many forms of industrial agriculture devastate biodiversity, not just on the land itself but also in waterways and particularly at the mouths of rivers, causing ‘dead zones’ due to the elimination of oxygen from the waters through the overgrowth of blue green algae, and increasing the fragility of coral reefs affected by agricultural runoff. If current trends continue,

$10^9$ hectares of natural ecosystems would be converted to agriculture by 2050. This would be accompanied by 2.4- to 2.7-fold increases in nitrogen- and phosphorus-driven eutrophication of terrestrial, freshwater, and near-shore marine ecosystems, and comparable increases in pesticide use. This eutrophication and habitat destruction would cause unprecedented ecosystem simplification, loss of ecosystem services, and species extinctions.\textsuperscript{31}

At this particular time of unprecedented exploitation of the planet, soil and soil organisms are some of humans’ and complex life in general’s most important allies in helping mitigate and adapt to the increased environmental instability of the Anthropocene. To overcome widespread indifference, we need to tell more stories about soil and its role in supporting many forms of life on earth.


\textsuperscript{30} Julian Cribb, \textit{Poisoned Planet: How constant exposure to man-made chemicals is putting your life at risk}, (Sydney, Allen and Unwin, 2014).

The work of this thesis

How are land stewards learning to recognise and care for soil organisms, and what forms of knowledge and ethics enable and sustain such practices? These are key research questions that animate this study.

A major challenge facing humans today is to transform our everyday practices to attend to the needs of the organisms whose lives our livelihoods are entwined with. As we reconceive human livelihoods as dependent upon the flourishing of nonhuman livelihoods, we make such nonhuman existences emerge into the foreground of our ethical concern. One major domain of practice where such recognitions are becoming commonplace is land stewardship.

The popular rhetoric of environmental crisis, particularly the story of human population growth, pits human sustenance against environmental integrity. Yet it is not a given that human land use necessarily destroys ecological wellbeing: numerous Indigenous and peasant land practices demonstrate this. While on the whole, the impact of modern agriculture on soil in Australia has been devastating, not all modern agricultures are equally to blame. A minority current of soil-attentive practices has been steadily growing for over a century amid Western modernity and limited extension support.  

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33 Pëtr Kropotkin describes very insightfully a form of ecologically-responsive agriculture that he believed was new at the turn of the 20th Century, in his Fields, Factories, and Workshops, or, industry
One objective of this thesis is to retrieve a concept of use that can contribute to a more ecologically sensitive language of work. Indigenous practices and philosophies of use and Wendell Berry’s concept of *kindly use* point us in the right direction, involving respect for the land as both means and end, and a more provisional orientation to goals, pursuing plural ends that are revised iteratively and responsively.

I examine practices of regenerative land stewardship that pursue soil ecological integrity, using an interdisciplinary approach of interview and site based fieldwork combined with theoretical reflection. The fieldwork examples ground the analysis in everyday realities of land stewards, who bear witness to both environmental degradation and the potentialities of ecologically robust relationships. By learning regenerative practices, practitioners build less alienated worlds of ecological relationship, attending to the needs of species they in turn depend upon. This is a skilful craft of learning new ways of seeing, recognition, and receptivity, monitoring signs of soil health such as soil aggregate texture, and responding to matters of concern as they arise. Articulating principles of care for soil, the thesis contributes to the work of enabling transformative social change at the level of norms.

The case studies I have focused upon may seem unremarkable on the surface: one might easily pass them by without recognising their difference to the average park, golf course or sheep farm. None of them are certified organic; they do not gain benefits for marketing purposes for the practices of soil care that they prioritise. Several of them are large-scale broad acre operations. Mostly they conform to the

combined with agriculture and brain work with manual work, (New York, G.P. Putnam and Sons, 1901), 60.
conventional appearance and the outputs of modern agriculture and modern land stewardship, and yet depart from them when it comes to chemical inputs in particular. A table summarising the interviews that I undertook and used in this thesis can be found in Appendix 1.

The farmers and other practitioners I interviewed tend to use combinations of modified language, modified and supplementary tools, changed habits and public educational advocacy to acknowledge and achieve greater acknowledgement for soil and its needs as a living entity. Through these efforts, soil emerges into the foreground of concern, prompting changes in everyday practices. In such circumstances, the goals of use are broadened to include care: an exclusively instrumental orientation becomes a more receptive and reciprocal *kindly use*. Not only are farmers responsive to the growth patterns of plants and animals, but they also become responsive to the growth patterns of soil. Fertility is understood as contingent and interdependent with the functioning of broader ecological interactions on (and off) the land. This can empower a more relational interpretation of land degradation, recognising the soil food web as an ethically and functionally-significant entity, disclosing potentialities for multi-scalar relationships that build ecological integrity.

My ethical orientation in this thesis endorses a commitment towards pursuing ends of flourishing and liberation that are proper to each diverse organism or human, in part through identifying and overcoming impediments to the free development of relationships. We can find sources for this in both Martha Nussbaum’s application of
the Capabilities Approach to the nonhuman realm,\textsuperscript{34} and in Herbert Marcuse’s and Andrew Feenberg’s efforts to theorise the \textit{Liberation of Nature}.\textsuperscript{35} Methodologically, such an ethical stance in my view requires both critique of ideologies\textsuperscript{36} and a commitment to understanding the world in ways that are non-reductionist. Thus I undertake both qualitative empirical research pursuing “thick description”\textsuperscript{37} and philosophical analysis of the ethical commitments of land-based practices and the social understandings that justify them. I engage not only with the material world but also with the meanings and logics evoked by material practices and discourses, including the phenomenological manifestation of key objects such as soil in everyday perception, using photography to illustrate certain aspects of soil perception.

My interpretive approach in participant observation is influenced by ethnography, particularly the classic work of Clifford Geertz. While I did not immerse myself in “the field” over extended time periods as anthropologists do, the technical workshops and field days I attended and the interviews I carried out inform my understanding of my everyday surroundings, providing stimulus for recursive cycles of reflection and social action, as well as contacts to follow up for interviews (snowball sampling)\textsuperscript{38}. At each site I observed and talked informally with practitioners, learning about their work and gathering “rich data.”\textsuperscript{39} In doing so I was seeking to understand in some small way

\textsuperscript{35} See Andrew Feenberg, “The Liberation of Nature?” \textit{Western Humanities Review} 1 (Fall 2004) 85-96, in which he also discusses the work of Marcuse.
their *worlds*, vastly different as they are from mine, as a city-dwelling researcher.

Geertz emphasises the importance of meticulous observation: “Behaviour must be attended to, and with some exactness, because it is through the flow of behaviour - or, more precisely, social action- that cultural forms find articulation.” He also encourages a discernment of conceptual structures and social 'givens':

> our double task is to uncover the conceptual structures that inform our subjects' acts, the "said" of social discourse, and to construct a system of analysis in whose terms what is generic to those structures, what belongs to them because they are what they are, will stand out against the other determinants of human behaviour.

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Semi-structured interviews were recorded on a tape recorder and listened to at a later date. Notes were taken upon listening, including some transcribing of key quotes.

I also practiced autoethnography, reflecting on the ways in which my own histories and concerns are bound up in my interpretation of events. As I wrote, and interpreted fieldwork situations, I realised the significance of details I had previously overlooked, and how they echoed themes that spoke to my research. Thus the writing and rewriting process was a crucial element of my research. I did not enter “the field” with hard and fast research questions; nor was the field limited in space and time: rather, I approached my research carrying a set of concerns and being attuned to anything in my surroundings that spoke to those concerns, and it was only through writing and rewriting that more specific questions and a more coherent thematic organisation of fieldwork research emerged. Thus my research was more emergent and inductive than deductive.

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40 Geertz, 17.
41 Ibid., 27.
Bruno Latour encourages us to “follow the things themselves,” to open up black boxes and enter realms of epistemic uncertainty about the objects of inquiry, rather than adhering to predetermined and solid distinctions between context and content.\(^{42}\) John Law describes the difficulty that often arises in research that attempts to tame a messy situation into neat conceptual frameworks (arising from what he calls the “realist paradigm”). He prefers the aspiration to be true to the complexity of the world, to “know that mess.”\(^{43}\) Law recounts frustration while researching the social-medical problems of alcoholism and cirrhosis of the liver:

Why couldn’t we get a properly focussed set of interviews? Were we asking the wrong questions? Misleading the interviewees? Why did the interviewees want to talk about the wrong things? We certainly quite often felt that we were failing and weren’t up to scratch. As time went on, however, we started to be kinder to ourselves. This is because it started to dawn on us that the object we were studying might be a shape-shifting reality. Textbooks are able to distinguish nicely between (say) cirrhosis of the liver caused by alcohol, and alcoholism ‘in general’ which includes a whole range of other symptoms (but by the way, those who abuse alcohol do not necessarily suffer from cirrhosis). It is in theory – and sometimes in practice – possible to make distinctions between the various relevant entities, and then to relate them together. But maybe, we slowly came to believe, it wasn’t actually like that in reality. Maybe we were dealing with a slippery phenomenon, one that changed its shape, and was fuzzy around the edges.\(^{44}\)

Similar kinds of fuzziness and shape shifting are evident when examining problems of soil degradation, which are at once social and ecological; ideological and material; problems of history and of current practices. When people talk about the problems of


\(^{44}\) Ibid., 5.
soil, they invoke many interconnected objects at once. In the course of my research I was interested in the broader contexts in which soils become an object of concern, so my research questions evolved as I adjusted to each context and came to understand it better.

**Chapter structure**

In chapter one I discuss soil in Australia, where production agriculture has been the dominant mode by which land surfaces have been remodelled for the purposes of growing annual plants or grazing stock for meat, wool and dairy production. Reflecting on family history and the broader history of the plough in Australia, I discuss human responsibility, vulnerability and power in this era some geologists have named *The Anthropocene*. I will also discuss how human interactions with soil have been influenced by understandings of hygiene, serving as a regulatory regime for human relations with soil, particularly soil microbes. Understanding of microbes was most dramatically altered with the growing acceptance of the Hygiene Hypothesis and with interest in the cultivation of beneficial microbes enabling a more cooperative relationship between humans and microbes.

Chapter Two focuses on the barriers to a relationship of care with the soil, particularly in the epistemologies and regimes of control that are prevalent in science and in agricultural practice. I analyse the Frankfurt School critique of instrumental reason, as well as Heidegger and Illich’s writings on what it might mean to have a free relationship to technology. I also turn to the work of Wendell Berry, in considering more integrated epistemologies and ontologies with the land.
Chapter three examines regenerative land stewardship, involving analysis of my case studies. I begin by discussing definitions of regenerative land stewardship and considering regenerative agriculture’s global roots. I consider the ecosystem-wide benefits created by healthy soil particularly focusing on the role of fungi. Some of this discussion will be quite scientific and physiological in nature. I will then go on to discussing two case studies: one, a golf course, and two, a sheep and wheat farm. Then I will reflect on the way that my learning with regard to agriculture has led to new connections to parkland in Sydney, moving me to learn about a local artist’s efforts in bush regeneration and some short-lived experiments in questioning suburban norms of grass lawns.

Chapter four elaborates on a practical philosophy of “kindly use,” drawing from Berry’s concept, as well as the pragmatist tradition, and the work of Hannah Arendt and Richard Sennett to think about the ways in which material consciousness can inform respect for the land. I consider philosophies of respectful use held by many indigenous cultures, made possible through long-term skilful and knowledgeable relationships with specific terrains. I end the chapter by thinking about just and reciprocal understandings of use.

The final chapter, Chapter Five considers what kind of relationship with soil we need in order to adequately respect it. I discuss how we come to “see” soil in ways that give significance to ecologically important features, drawing upon theories of political recognition, reification, Emmanuel Levinas’ relational ethics and feminist care ethics, including the work of Donna Haraway on co-domestication. I consider the role of
acknowledgement and responsiveness in the ethics of receptivity, thinking about how we perceive and respond to a suffering nature.
Chapter 1: Human power and vulnerability

In this chapter I discuss soil degradation in Australia as a neglected aspect of The Anthropocene that reveals both modern human power and our vulnerability. I consider how modern humans, establishing settler colonial land relations and, later, scientifically justified regimes of hygiene and control, impacted the biodiversity of soil flora. Drawing upon a wide range of sources including 20th Century literature, family history as well as recent ecological humanities scholarship, I discuss the broader modern human responsibility towards soil at a time that has been proclaimed The Anthropocene by geologists. I consider whether our current scientific paradigms serve us well in developing a responsible attitude towards soil. When climate change and earth alienation are becoming worse, can modern humans, who have thus far exerted their dominance, also become more aware of their vulnerability, and develop a more cooperative orientation to soil ecologies?

1.1 The plough and soil degradation in Australia.

On the 22nd September 2009, at the end of the longest drought period since official records began, the residents of Sydney woke to a dust storm that enveloped the city in a surreal orange light. Social media and online news outlets were ablaze with images of the “apocalyptic” dawn. Geologists quoted in broadsheet newspapers interpreted the event as “natural,” claiming that it was unlikely to be related to global warming, nor land degradation. One expert briefly mentioned farmers' land management
practices, adding that they had improved markedly since the regular dust storms of seventy years ago, as if to pre-emptively shield farmers from blame.\textsuperscript{45} The origin of the dust was said to be the Lake Eyre Basin, a region of desert and semi-desert spanning the Northern Territory, Queensland, New South Wales and South Australia that has been arid for thousands of years. Three years later, a study in the journal \textit{Environmental Chemistry} traced the origin of the dust to “agricultural land as well as desert”: the high organic matter content “reflected that the dust also contained top soil from the inland of NSW,”\textsuperscript{46} an area greatly affected by drought and agricultural land degradation. A further and unrelated study stated that this dust storm was the largest of its kind recorded by Western science, with “almost 2.5 million tonnes of soil ... lost off the Australian coastline in the 3000km long dust plume... the largest off-continent loss of soil ever reported.”\textsuperscript{47} As the dust settled, the “freak weather” interpretation prevailed, with no ethical content being incorporated into the public narrative or popular understanding of the event.

In literature, dust storms are used as tropes portending social breakdown. In the ancient Greek play \textit{Antigone}, written by Sophocles around 441 BCE, a storm is depicted as a sign from the gods, of society gone awry. It forms not only the backdrop to the human turmoil but also a parallel drama of the play in its own right:

\begin{quote}
\textbf{SENTRY:} Suddenly, a whirlwind!

Twisting a great dust storm up from the earth,
\end{quote}


\textsuperscript{46} Rupak Aryal, Dheeraj Kandel, Durga Acharya, Meng Nan Chong and Simon Beecham, "Unusual Sydney dust storm and its mineralogical and organic characteristics," \textit{Environmental Chemistry} 9, No. 6 (2012): 537–46

a black plague of the heavens, filling the plain,
ripping the leaves off every tree in sight,
choking the air and sky. We squinted hard
and took our whipping from the gods.48

This storm is seen not only as physical phenomenon, but also a moral phenomenon. It is a punishment for wrongdoing, and in Antigone, associated with this wrongdoing is the use of the plough, which Morton points to as the ultimate image of the Anthropocene. It “grinds the unastonishable earth with horse and shatter,”49 leading to elemental chaos. The human “unastonishable” indifference to environmental consequences is rendered vivid by pathetic fallacy, as in Morton’s words, agriculture “turn[s] reality into domination-ready chunks of parcelled-out space waiting to be filled and ploughed by humans.”50

John Steinbeck’s 1939 novel The Grapes of Wrath powerfully dramatises the negative impact of modern farm machinery on rural communities. As the tractor efficiently carves up the land, the soil loses its binding qualities to the landscape and becomes “an emulsion of dust and air.” For the farming communities portrayed, “the dawn came, but no day.”51 The erosion prefigures the exodus of the people from the land as the “dust bowl” conditions and economic restructuring force farmers to migrate to California to become landless labourers at the beginning of the Great Depression. As the tractors advance as key technologies in farming communities, there is a corresponding loss of loyalty and care given by people to the land. The tractor

50 Timothy Morton, “The Oedipal Logic of Ecological Awareness,” Environmental Humanities 1, (2012), 16.
demolishes carefully built homes and fills in water wells in pursuit of the straight furrow of progress. Seven years later, Judith Wright’s 1946 poem, *Dust*, likewise connects sickness, misfortune, ploughing and dust, amid the aftermath of war in rural Australia:

This sick dust, spiralling with the wind,  
is harsh as grief’s taste in our mouths  
and has eclipsed the small sun.  
The remnant earth turns evil,  
the steel-shocked earth has turned against the plough  
and runs with wind all day, and all night  
sighs in our sleep against the windowpane.52

The soil rises up in illness and anguish, turning against the plough and eroding in the wind. Later in the poem, Wright urges us to act differently towards the land, to “make a new choice,” that is, to go on in a new way. While for Sophocles, the earth is “unastonishable,” for Wright the earth is “steel-shocked.” Both imply the question: is the earth expressing a discernible reaction that we should heed? If so, are we capable of recognising it?

The mechanical plough has altered landscapes perhaps more than any other machine in Australia. In her recent essay, *The Plough as Settler Colonial Cultural Icon*, historian Victoria Grieves shows how the plough was a central tool in the expansion of colonial frontiers, both materially and ideologically. She argues that “deep within western culture is the idea of the innocuousness of the plough, of the harmless and even beneficial outcomes of so many centuries of turning the soil and a tendency to

celebrate the ploughman as...the foundational player in the development of settler colonial societies in the new world.” Yet in semi-arid landscapes in Australia and the New World, the plough’s impact was far from innocuous, upending the crops of traditional owners, destroying soil structure and causing dust storms. Grieves provides an inventory of several types of plough that were used by settlers in Australia. One, the Stump-Jump Plough, was specifically invented to bypass the ubiquitous stumps on the rapidly expanding frontier.

My maternal grandmother’s first job in the 1920s-30s was as a bookkeeper at G. Fish and Sons, the agricultural implements and engineering company of her soon-to-be brother in law’s family in Bathurst. Fred Fish was the son of George Fish, a blacksmith, inventor and manufacturer of the Fish Mouldboard Plough, designed in the 1890s and built left-handed to suit Chinese market gardeners.\(^{53}\) The plough became a mainstay of most farms in the Central West of NSW. Today the business stands in Lambert Street, Bathurst, no longer a manufacturer, but now a retail agricultural supply company.\(^ {54}\)

\(^{53}\) This was before the White Australia policy, which resulted in many people of Chinese ancestry, even those born in Australia, being sent back to China.

\(^{54}\) Like many Australians whose families have been here for more than a century, my family on both sides has benefited in concrete ways from the riches of this land and the unjust land relations of colonialism. I only learned about the family connection to ploughs when I read an early version of Victoria Grieves’ paper on ploughs, in which she mentions the Fish Mouldboard Plough and its invention by George Fish of Bathurst, which I recognised as a family name and location. Ironically Grieves had already given me feedback on an earlier version of my paper on kindly use (now chapter 4), and she encouraged me to situate myself, tell my story and incorporate more family history, as is the practice particularly with indigenous methodologies. Thus I contacted my mum’s first cousin Robyn and her husband Terry Fish, to learn more.
My mostly Irish ancestors immigrated to Australia in the 1840-90s, before and after the Potato Famine. They established their lives in the rural towns of Brewarrina, Wellington, Araluen, Pambula, Bathurst, Maitland and coastal Queensland. Agriculture then employed more people than it does today, in part because it was less capital intensive, and in part because the land was less degraded. The agricultural workforce has been restructured over the years with increasing mechanisation and consolidation of farms, leading to very large tracts of land being managed by single farmers, or families, using seasonal hired workers. Today my entire immediate family and all apart from one of my seventeen first cousins live in the major cities of Sydney and Melbourne.

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55 Source: personal communication, Terry Fish, 27 November 2016.
My mum’s childhood holidays were spent with her cousins in either Bathurst or Hay. Bathurst is around three hours West of Sydney by car, and The Hay Plain is around ten hours South West of Bathurst. Both towns are within the Murray Darling Basin, Australia’s food bowl, and both are in Wiradjuri country. Before mum was born, my grandfather spent several summers with his brother in law cutting down trees on the Hay Plain. Later, he described the tree stumps to her as extending as far as the eye could see on the dry soil surface. Many of these stumps were then laboriously removed, to allow for a more uniform soil profile. The loss of tree cover throughout many semiarid areas, combined with intensive plough use, predominantly annual cropping and overgrazing changed the hydrology of these regions, increasing sunlight intensity, degrading the soil particularly by reducing levels of organic matter, and increasing salinity. Lower organic matter decreased resilience to drought, eliminating the ‘soil sponge’ and amplifying the dryness of the climate, a situation only alleviated superficially in some areas by irrigation.

At the time of settlement, Australian soils were far richer in organic matter to their condition today. Eric Rolls writes, “When Europeans came to Australia, the soil had a mulch of thousands of years.” Early diaries of explorers reveal a vastly different soil consistency to today’s desiccated textures. In 1817, John Oxley described the land West of the Great Dividing Range thus: “The soil, in the immediate neighbourhood of Bathurst, is for the first six inches of a light, black, vegetable mould, lying on a stratum of sand, about eighteen inches deep, but of a poor description, and mixed with small

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stones, under which is a strong clay."^57 Bill Gammage quotes James Cotton, a pioneer in rural New South Wales, who in 1901 recounted dramatic changes to the landscape with the onset of grazing:

Before this district was stocked... [it] was covered with a heavy growth of natural grasses... The ground was soft, spongy and very absorbent. One inch of rain then, in spring or autumn, produced a luxurious growth of fresh green grass ... a gradual deterioration of the country caused by stock... has transformed the land from its original soft, spongy, absorbent nature to a hard clayey, smooth surface (more specially on the ridges), which instead of absorbing the rain runs it off in a sheet as fast as it falls.\(^58\)

The work of Gammage as well as Bruce Pascoe have made clear that the “natural grasses” that were abundant at the time of settlement were carefully cultivated by Aboriginal people, who burned land to stimulate soft new grass growth for kangaroos and wallabies. In some regions Aboriginal people planted crops such as Kangaroo Grass and Native Millet for bread.\(^59\) Pascoe argues that the traditional methods Aboriginal people used to cultivate plants and work the soil should be understood as agriculture and as tilling, thus challenging the European categorisation of Aboriginal societies as pre-agricultural. He uses evidence from Lieutenant George Grey's diary, *A Journal of Two Expeditions In North-West and Western Australia, 1837-39*:

> We now crossed the dry bed of a stream, and from that emerged upon a tract of light fertile soil quite overrun with *warran* [original emphasis] plants [a species of yam plant - Dioscorea hastifolia], the root of which is a favourite article of food with the natives. This was the first time we had seen this plant on our journey, and now for three and a half consecutive miles [5.6

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kms] traversed a piece of land, literally perforated with holes the natives made to dig this root, indeed we could with difficulty walk across it on that account whilst the tract extended east and west as far as we could see. It is now evident that we had entered the most thickly-populated district of Australia that I had yet observed, and ... more had been done to secure a provision from the ground by hard manual labour than I could believe it in the power of uncivilised man to accomplish.\textsuperscript{60}

It is likely that the use of digging sticks would have caused more minimal disturbance to the soil profile than the mechanical plough, even at a broad acre scale. The tilling described is only enough to plant and harvest the yams, rather than the wholesale upturning of soil that ensues from mechanical ploughing. Pascoe interprets this passage as demonstrating that Aboriginal societies practiced tilling. Yet I wonder why Pascoe is so determined to show this, when the environmental credentials of tilling are becoming increasingly shaky. It is true that there is continuing cultural currency of tilling in the popular imagination. This can be seen in the grand claims that are made about the role of ploughs in human history: “It was the plough that kick-started our civilisation in the first place; that ultimately made our modern economy possible,” Tim Harford argues in his BBC radio series \textit{50 Things that made the Modern Economy}.\textsuperscript{61} Another reason why Pascoe might seek to claim the mantle of tilling for Aboriginal peoples is that John Locke justified colonial land theft and the establishment of private property relations (primitive accumulation) through invoking the image of tilling the soil as a synecdoche for productive labour that would earn ownership of the land. This is discussed in more detail in Chapter four.


1.2 The Anthropocene and soil

The failure to read the East Coast dust storm as a sign of environmental distress may be symptomatic of a tendency of scientists and the broader public to understate the impact of agricultural practices on processes of soil formation and degradation. There is a widely-held belief that humans are only minimally implicated in geological processes. This view shares some commonality with climate change denial. Naomi Oreskes writes:

For centuries, scientists thought that earth processes were so large and powerful that nothing we could do could change them. This was a basic tenet of geological science: that human chronologies were insignificant compared with the vastness of geological time; that human activities were insignificant compared with the force of geological processes. And once they were. But no more. There are now so many of us cutting down trees and burning so many billions of tons of fossil fuels that we have indeed become geological agents.62

The proposal to designate the current era as The Anthropocene is thus a significant move by geologists. In this era, traces of human agency are imprinted on geological time. Jan Zalasiewicz and others argue that humans, our machinery, and our patterns of extraction and disposal are geological forces in our own right: not only is climate change creating a new geological era, but the skyscrapers we build are also canyons; cities and garbage dumps now constitute geological strata full of synthetic substances such as plastics and metal combinations not found in nature.63 Modern agriculture has

also fundamentally changed nitrogen fluxes, as well as phosphorus flows, causing
‘dead zones’ of anoxic water at the alluvial fans where rivers meet the sea, as well as
similarly lifeless rivers poisoned by algal blooms. We can think about both human
transformation of the soil through agriculture and human transformation of fossil
carbon reserves as both events of mass oxidation of carbon, in which carbon that had
been tightly bound through biological processes, held in ways that were relatively
geologically stable, were suddenly disturbed and released into the atmosphere.
Poetically we could call this a dangerous unearthing.  

One aspect of The Anthropocene debate focuses on the changes to the Earth’s surface
and atmosphere caused by agriculture, the Early Anthropocene Hypothesis.  
The Neolithic Revolution involved the “clearance of forest for cultivation and pastureland
[which] is the largest transformation of Earth’s surface that has occurred to
date.” Early signs of major geological impact by humans on the biosphere through
agriculture can be traced at least from around 8000 years ago, when large tracts of
forest were cleared for crops, Carbon Dioxide levels in the atmosphere increased, and
farming and grazing practices caused erosion.

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64 Carbon dioxide is different to other “dangerous unearthings.” Localised toxic compounds such as
uranium ore or acid sulphate soils are known by indigenous societies to be substances that can cause
illness or death. Carbon dioxide and its equivalents are necessarily mediated by vast techno-social
assemblages which render the global atmosphere as a domain of technical knowledge measurable by
scientific instruments, with responsibility determined through state-based governmental documents
articulated in the jargon of both science and law.
66 Ruddiman, “An Emerging View on Early Land Use,” Guest article on Real Climate: Climate Science from
emerging-view-on-early-land-use/
For me, the term *Anthropocene* evokes the scale of global environmental change induced by modern humans: mainly global warming, but also the disruption of nutrient cycles and other consequences of industrialised capitalism over the past 300 years.

During this time period, the changes from the Industrial revolution spread from Europe to the New World, before reaching other parts of the earth, at different paces according to differential investment patterns. During this time, colonialism rendered major parts of the world as extractive frontiers for minerals, wood and plantation agriculture. This process was extremely militarised and violent, cementing many power relationships that remain today, but in different forms, maintained by implicit threats by investors and international financial institutions. These power dynamics mean that the responsibility for environmental degradation and the resultant changes in earth system dynamics overwhelmingly rest in the hands of privileged white men, particularly those who run Western governments, those who run multinational corporations, and those who run international financial institutions.

In this light, the term *Anthropocene* obscures political responsibility for environmental degradation, pointing at humanity-in-general rather than particular humans. Yet I agree with Daniel Chernilo when he says “it is wrong to contend that a global or indeed universalistic concept is intrinsically unable to [elaborate on the highly unequal distribution of burdens and benefits that marks the rise of most modern institutions].” All universalistic concepts obscure some things and reveal others. This does not automatically discount their usefulness. That said, I am not strongly attached to the concept, suffice to say that it can be useful to frame the environmental

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challenges facing the modern human, with agriculture prime among them, as partly ontological and ethical questions about who we are as modern humans and who we should become. I could equally use the terms Modernity or Capitalocene,\textsuperscript{69} or even era of technicity,\textsuperscript{70} to convey similar concerns: the specific nuances of the term Anthropocene are not my focus. Whatever term we use for this era of global change, it should be understood as descriptive, non-pejorative, and open-ended, to allow for the possibility of a changed trajectory, or “good Anthropocene,”\textsuperscript{71} if modern humans are able to transform to support the flourishing of diverse forms of life on Planet Earth.

The term Anthropocene holds together a paradox of control and vulnerability: on the one hand modern human technological fingerprints are ubiquitous, shaping the conditions in which all life on earth must now live. On the other hand, humans are not in control, despite unprecedented governmental attempts to manage nature. As Aidan Davidson writes:

\begin{quote}
Many contemporary Earth dynamics may be inherently human in origin, but they are not thereby exclusively human, nor does human implication equate to the possibility of control. The tangling of human actions and earthly flux takes the form of ‘collective experiments’ in which ‘no one is in charge’ and for which there is ‘no protocol’ (Latour 2011,3). Within nonlinear circuits of causality, human intentions are inflected, fused, and provoked so as to be always at least partly uncomprehended by human actors.\textsuperscript{72}
\end{quote}

Thus, even though we know ourselves to be a species endowed with self-consciousness, and even though control has been elevated to a central value of

\begin{itemize}
\item Hubert Dreyfus and Charles Spinoza, “Further reflections on Heidegger, technology and the everyday,” In N. Kompridis (Ed.), Philosophical Romanticism, (Abingdon, UK: Routledge, 2006): 265-81
\end{itemize}
modern societies, the complexity of the global situation has made it very difficult to adequately anticipate and address the big issues of global warming and soil degradation. It would seem that these two inclinations have worked against each other, as the hubristic desires to be seen to “have it all under control,” and to control limited private domains to the neglect of the public sphere, have foreclosed the kinds of serious honest public conversations that can lead us to recognise our collective responsibilities toward a rapidly changing Earth.

In a 2014 speech, Donna Haraway critiques the concept of *The Anthropocene*, pointing to its grounding in reductive forms of mathematized biological knowledge. She argues that these domains of knowledge have considerable blind spots towards microbiology and symbiosis, forms of life that are less amenable to control than others:

> [These] sciences of the modern synthesis work with genes, cells, organisms, populations, species: [they] put them into relationships with each other well described by the mathematics of competition, equations described by thermodynamics, that are profoundly mathematised...but they could not do and did not do has have any grip on microbiology- partly because microbiology works in such a weird way...they could not and did not deal with symbiosis- many biological processes that have come to be shown as general for life on earth were ungraspable within the sciences of the modern synthesis, they really were minority sciences- anything to do with lichens and coral reefs disappeared from leading sciences until recently, they could not deal with developmental phenomena, with change through time.  

Microbiology and symbiosis are realms in which the highly complex associative dynamics of the nonhuman world are evident, requiring humans to accept some

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73 Donna Haraway, “Anthropocene, Capitalocene, Chthulucene: Staying with the Trouble” Lecture to Arts of Living on a Damaged Planet Conference, University of California, Santa Cruz, 5 September 2014. Available at: https://vimeo.com/97663518
degree of unknowing in efforts to understand and work with them.\(^7^4\) In their resistance to being codified and instrumentalised, these forms of life help to point us towards more humble and cooperative potentials of science and reason, frustrating reductive inclinations to find ready objects, neatly bounded entities or clear processes of causality, confronting us with uncertainty as to how to go on. Recognition of complex relations may challenge humans’ and scientists’ hubris, our desires to control and to know all. From symbiosis we quickly learn that humans are not at the centre of all relations, and that seeking to reorder them in ways that are favourable to us alone is unwise and pointing to possibilities for our own greater cooperation with other species.

Symbiosis, the mutually beneficial cooperation of organisms, has been the condition that has enabled evolution and the development of complex life forms. Lynn Margulis’s now widely accepted theory of the endosymbiotic origins of the mitochondria and the chloroplast: bacteria that became embedded in our evolutionary ancestors’ cells, shows the ability of life to relationally innovate means of life for the future. These organelles enabled respiration and photosynthesis, becoming essential parts of the metabolic processes of cells that perform these functions, and creating ‘new normals’ of oxygen productive and oxygen dependent life. Myra Hird writes, “bacteria evolved the Earth’s production economy,”\(^7^5\) in her interpretation of Margulis’ work:

- phototrophs convert solar energy; chemotrophs convert chemical energy; lithotrophs gain electrons from inorganic compounds (such as hydrogen and sulfur) or simple organic

\(^{7^4}\) Donna Haraway suggests the liberatory potential of closer relationships with other species in her \textit{Companion Species Manifesto: Dogs, People, and Significant Otherness}, (Chicago, Prickly Paradigm Press, 2008).

\(^{7^5}\) Hird, \textit{The Origins of Sociable Life}: 127.
compounds (such as water and hydrogen sulfide); organotrophs convert complex organic substances (such as proteins in dead biomass and carbohydrates in grasses and grains) and so on.\textsuperscript{76}

This capability to transform energy creatively expanded the repertoire of what life could become, and the basis upon which future life could proceed.\textsuperscript{77} As James Lovelock says, “Natural selection then tended to favour the improvers.”\textsuperscript{78} Lovelock claims that “the biosphere actively maintains...[the atmosphere] to provide an optimum environment for terrestrial life.”\textsuperscript{79} With each new development, life experiences a quantum leap and is able to proceed in a new way.

### 1.3 The Aliveness of soil

Recognition of the \textit{aliveness} of soil seems to be a constant refrain for many regenerative farmers and soil ecology experts. The famous soil scientist Hans Jenny in a 1984 interview, entitled “My Friend the Soil,” insisted that soil is \textit{not} an abiotic environment:

Many ecologists glibly designate soil as the abiotic environment of plants, a phrase that gives me the creeps. Is the bark of a tree the abiotic environment of the tree? And what about the bacteria-rich rhizosphere? Looking at the root-soil boundary under the powerful electron microscope, an observer cannot tell where the biotic part ends and the abiotic part begins.

Soils contain over one thousand different species of lower animals: the earthworms, pill bugs, nematodes, millipedes, termites, ants, springtails, and amoebas, not to mention the millions of moulds and bacteria.... When I add up the live weights, exclusive of roots, estimated by soil biologists, I find more living biomass below ground than above it, amounting to the equivalent

\textsuperscript{76} Ibid., 127-8.
\textsuperscript{79} Lovelock, \textit{Gaia}, 69.
of 12 horses per acre.80

The fact that soil is alive makes it responsive to its environment; with needs that it satisfies in interaction with that environment: it is both vulnerable to and impacts upon its surroundings. Human behaviour thus has greater consequences for living soil than it would have for non-living soil. Even phenomena that might seem injurious to nonliving soil such as erosion can also be read as consequences of a long process of declining ecological integrity of soil. There is a distinct ethical difference between actions undertaken to affect a nonliving thing versus action that impacts upon a living thing.

If we can acknowledge active powers of the Earth, we can perhaps make space for them, which means refraining from activities that inhibit them. Rather than seeking to control, regenerative practitioners instead make room, calling a collective into being and building its capabilities, relying on mediator organisms to solubilize nutrients and perform other ecosystem functions. Rather than a mechanistic approach, creative and disclosive practices of iterative experimental praxis with soil microbes are pursued. Rather than imposing order, stewards are alert to support the forms of order that emerge and develop in the relations of life that build on one another through succession.

Engaging with life means making decisions regarding which relations we are most attuned to in our concernful actions in our shared environments. Instead of celebrating all objects even those that are chemically inert, or celebrating all agentive

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qualities even those that poison and maim, I prefer to ask “what kind of agency” and “with what effects on ecological integrity?” while giving any organism the benefit of the doubt, and finding uses for most organisms that proliferate, as Peter Andrews has done with weeds. Haraway points out this in her work examining the work of Deborah Bird Rose and the artist Patricia Piccinini:

The crucial question has to be not ‘are they original and pure (natural in that sense)?’ but rather ‘what do they contribute to the flourishing and health of the land and its critters (naturalcultural in that sense)?’ That question does not invite a disengaged ‘liberal’ ethics or politics, but requires examined lives that take risks to nurture some ways of getting on together flourish and not others. With their generally positive attitudes to animals Europeans have disparagingly called feral, Australian Aboriginal peoples have tended to evaluate what westerners call ‘species assemblages’, new and old, in terms of what sustains the human/non-human, storied, changing and lived world that in English is called country. As feminist science studies scholar Karen Barad put it for ears tuned to western philosophy and science: ‘Embodiment is a matter not of being specifically situated in the world, but rather of being in the world in its dynamic specificity. ... Ethics is therefore not about right response to a radically exterior/ised other, but about responsibility and accountability for the lively relationalities of becoming of which we are a part.’

In other words, we are always already making choices about which organisms to ally ourselves with, which organisms to encourage, to feed or to discourage or eliminate. The criteria that regenerative farmers use in deciding to support certain soil species above others is plural, both production goals and ecological robustness are considered.

A more robust, ecologically complex system which generates emergent properties such as greater water holding capacity can serve ecosystems beyond the soil ecosystem, as I have discussed in chapter two. I like to think of this ecological goal as “serving complex life.”

1.4 Soil as dirty: Hygiene and “the pathogen matrix.”

The hygiene conventions of Western cultures have long deemed soil a risky object that should be avoided, or tamed if at all possible. The rank smell of decomposing matter warns of danger: the stinking food in our fridge, the smell of decomposing flesh, the sour odour of sewerage all indicate that a possible hazard and vector of illness is in our midst. Wetlands have particularly suffered from this association: the hydrogen sulfide smell, from anaerobic decomposition, is very powerful and can be perceived from afar, thus wetlands were devalued and destroyed, or “reclaimed” for public health reasons. These discourses are ironically dramatised in the following comic:

Figure 3: Eco fear comic. Source: Sean T Collins and Julia Gerorer, “Why We Fear the Ocean,” 2014

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82 Sean T Collins and Julia Gerorer, “Why We Fear the Ocean” Symbolia Magazine/ The Nib (Medium.com) 27 October 2014. https://medium.com/the-nib/why-we-fear-the-ocean-27998318a313#.t8t2ch83o
The following quote shows how the discourse of the dangerous swamp was applied both to dense scrub and rotting soil matter, during the expansion of the colonial frontier in the state of Victoria in 1855, justifying the ploughing of the land:

The immense quantity of vegetable matter rotting on the surface of the earth, and still more of that rotting in the waters, which the new visitants must drink, cannot be very healthy. The choked up valleys, dense with scrub and rank grass and weeds and the equally rank vegetation of swamps, cannot tend to health. All these evils, the axe and the plough and the fire of settlers, will gradually and eventually remove; and when that is done here, I do not believe there will be a more healthy country on the globe.\footnote{William Howitt, \textit{Land, Labour and Gold: Or Two Years in Victoria}. (London, Longman, Brown, Green and Longmans, 1855) Vol 1231. Quoted by Andrew Wear, “The Prospective Colonist and Strange Environments: Advice on Health and Prosperity,” in \textit{Cultivating the Colonies: Colonial States and Their Environmental Legacies}, edited by Christina Folke Ax, (Athens, Ohio, Ohio University Press, 2011), 38.}

This quote reflects both settler triumphalism and the prevailing scientific belief at the time, \textit{Miasmatism}, of the origins of contagious illness, prior to the acceptance of Koch’s Postulates in the 1880s: that vapours, particularly smells from decaying organic matter cause disease.\footnote{Natalie Angiermay, “Century-Old Death Records Provide a Glimpse Into Medicine’s History,” May 25, 2004, http://www.nytimes.com/2004/05/25/health/century-old-death-records-provide-a-glimpse-into-medicine-s-history.html?_r=0 There is an element of truth to Miasmatism insofar as pathogenic fungal spores are mobilised in damp conditions, particularly in the climates of England and Ireland. See also Janis McLarren Caldwell, “Physical health,” in \textit{The Brontës in Context}, edited by Marianne Thormählen, (Cambridge, UK, Cambridge University Press, 2012), 340.} Paradoxically, we as humans heavily rely upon soil organic matter for \textit{cleaning} hazardous biological matter: Daniel Hillel argues that “[soil] is the fount of all cleanliness…. Think of all the many generations of people who have died of all manner of diseases, and somehow the soil cleanses them all and recycles their bodies into the materials of life.”\footnote{Hillel, \textit{Symphony of the Soil}.} Yet this cleansing process is not always reliable: the dangers of shallow graves are thought to have contributed to the premature deaths of several members of the Brontë family,\footnote{Nick Holland, “The Haworth Graveyard and Martha Brown” \textit{Anne Brontë Blog}, 1 November 2015. http://www.annebronte.org/the-haworth-graveyard-and-martha-brown/} as well as soldiers on numerous battlefields.
We now understand that soil contains multitudes of microorganisms: in a single teaspoon, there are more microbes than humans on the planet. Only some of these microorganisms are plant and animal pathogens. The fact that soil microbes can cause disease is used as justification for a policy of elimination, with a lopsided focus on disease dubbed “the Pathogen Matrix” by Myra Hird. This view ignores the multitudes of beneficial bacteria, fungi and other microbes that form symbioses with each other, producing benefits for entire ecosystems, including agro-ecosystems. In many plant nursery operations, soil is sterilised with chemicals such as methyl bromide to eliminate potential vectors of disease, with negative consequences for soil biodiversity and for worker health. The bias against microbes is also evident in the syllabi of our educational institutions: the only microbiology education for agriculture students undertaking a four-year degree with a highly regarded Australian university concerns plant and animal disease, a fact noted in frustration by Sam, one of my interview subjects, with whom I studied microscopy and compost making for three days at the Soil Food Web Institute on the New South Wales North Coast.

The dominant quarantine-based and “defense through attack” frames of the pathogen matrix have guided the human relationship with microbes ever since Dr. John Snow identified a water pump in London as a source of Cholera. Snow’s germ theory of disease gave rise to strict regimes and infrastructures of hygiene that have saved many lives.

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89 The Soil Food Web Institute is on the grounds of Southern Cross University, Lismore, Australia.
lives but are causing problems in the long term for our health and the health of the land. While the decline of cholera and the near-eradication of polio from the face of the Earth are major achievements to celebrate, the success of the discipline of pathology has crowded out other more accommodating sciences that inform our attempts to enhance microbiological symbiosis, with resources poured into these domains of knowledge that have given definitive results through identification and elimination. Potential relationships with companion species as well as potential life-giving and begetting efficiencies (such as the use of nutrients in sewerage) have been foreclosed in the isolation between zones of human habitation, zones of plant cultivation and zones of nutrient accumulation from sewerage and other waste streams. There are exceptions to this trend, where treated sewerage has been used to irrigate tree plantations, such as in Wagga Wagga, NSW, and near the town of Ismailia, Egypt, a strategy that is helping to combat desertification.90

1.5 A more open stance towards soil life

While the science of hygiene and the aesthetics of the abject are used to demarcate places, people and organism assemblages of decomposition as unsuitable for appearance in public, these designations and separations are historically contingent. We can see from history that widespread aesthetic preferences shift, sometimes prompted by public argument, or by more affectively-mediated processes. In recent decades, compost has slowly matured in its human relationship, from something made in backyards by avid gardeners, far enough away from houses to minimize their ugliness and smell, to something that can be made on balconies and even inside.

houses- or at the opposite end of the scale, in large industrial farming operations. The backyard compost heap has diversified into the worm farm, the compost tumbler, the bokashi bucket, and the black soldier fly farm.

There is also a powerful counter-narrative against the *pathogen* matrix that is centred on the biological needs that humans have for regular contact with a diversity of microorganisms. The *Hygiene Hypothesis*, formally proposed by David Strachan in 1989,\(^91\) was the first to suggest that declining regularity of contact by humans with good bacteria [and their regular eradication with antibiotics and biocides in everyday human life] is to blame for overactive immune systems and the growth of digestive dysfunction. Medical experts now accept this theory as the best explanation for a wide range of health problems mediated by the immune system and the microbiome such as allergies and hay fever. Research into human autoimmune conditions has revealed that they are at least in part caused by disrupted gut ecosystems, with incidence of such conditions overwhelmingly associated with urban lifestyles: with people regularly interacting with farm animals less susceptible.\(^92\) The symbiotic microbes present in the human gut in particular are becoming more widely recognized by the medical establishment as boosting human health, leading the United States Food and Drug Administration to ban antibacterial hand washes for domestic use.\(^93\) These antibacterials such as triclosan and nano silver are part of everyday life in Australia,

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inserted in numerous products including toothpaste, body wash, deodorant and other personal health products. The overuse of antibiotics and other biocides both in domestic and agricultural settings has altered natural selection processes at a faster rate than new antibiotics are able to be commercialized, leading to the rise of resistant pathogens, (and herbicide resistant weeds) thus exposing weaknesses in the chemical artillery that modern humans have built up towards pathogenic microbes and other unwanted species.94

More nuanced understandings of appropriate contact with microbes have been growing for the last few decades. In her book Allies and Enemies, Anne Maczulak writes, "Few pathogenic bacteria exist that cannot be stopped by simply washing hands, preparing food properly, and steering clear of others who are obviously sick.... For safety’s sake, thinking of bacteria as occasional enemies as well as constant allies helps maintain your health."95 Instead of attempting to build impervious walls to keep microbes out, Maczulak encourages us to embrace and cultivate strong diverse communities within our bodies, not just for their defensive properties, but also for their life-enhancing, health-giving properties, knowing that our hospitality may occasionally be taken advantage of, but that most of the time, we will be able to deal with the difficulty of such occasions and that the risk of them occurring should not outweigh the danger of who we would become if we were to close ourselves off to the mutualistic gift-giving of multitudinous and pluralistic biological exchange. Viewing microorganisms as “constant allies” enables us to see the maintenance of health as a

collective and multispecies enterprise: assemblages of humans and nonhumans extending from farm soils to human intestines, which function far less effectively when diversity and ecological integrity of any one of these parts are reduced.

The regenerative farmer Joel Salatin is one of those public figures at the forefront of promoting a more hospitable attitude towards microbes in agriculture, recognising their role in land stewardship. Salatin utilizes the buffering and cleansing properties of robust microbial ecosystems to mitigate disease, arguing that disease is as much a property of an unhealthy terrain as it is a consequence of a pathogenic invasion.96 Joanne Dodds writes, “This ‘terrain theory’ leaves the responsibility in the hands of the farmer to create conditions that are unfavourable for disease to develop.... Whilst there is the occasional ‘unwell’ animal on [Salatin’s farm] Polyface there have only been three disease ‘outbreaks’ in the 50-year history of the farm.”97 Antoine Béchamp, a contemporary and rival of Louis Pasteur, developed the “host theory” that Salatin and Dodds paraphrases.98 This approach invokes a more relational concept of health than the pathogen-focused model, seeing it as produced by a heterogeneous assemblage of living and nonliving relations and practices rather than through control through the elimination of threats with chemicals.99 Vigorous plants can also be understood to constitute “terrains” that resist both disease and mass herbivory by

96 Joel Salatin mentioned the Terrain theory of disease in a talk he gave at the “Real Food Forum” at the Sydney Town Hall on 16 February 2013.
insects. One of my interview subjects, Peter, explains this:

We had sorghum out there one year... we had a heap of midge flying around, but they weren’t landing on the crop- the crop was healthy enough that they didn’t land. Midge is a tiny mosquito-like insect, it eats the flour in the grain head, it chews them out you get no grain, but if you have a healthy plant it puts off a feel that these insects don’t like, and know, you grow a healthy plant, you don’t get insect attacks... I had neighbours flying around in the planes putting out chemicals- they say “you’ve gotta spray.” - I say “why?” The neighbours sprayed three times.

Eliot Coleman calls this a “plant positive” rather than “pest negative” philosophy, “focused on growing vigorous, healthy plants and animals imbued with all their natural powers of resistance.”

1.6 Understanding microbes as essential to health

A step further beyond minimising harm to microbes in everyday practices is the intentional cultivation of microbes with which humans might share mutualistic relationship. Jeff Leach, an anthropologist and founder of the American Gut Project, describes his everyday practices to support the flourishing of gut microbes, in an interview with Chris Kresser, a blogger who writes about health particularly associated with the microbiome in the human digestive system:

I pay a lot of attention to fiber for my own health, from my own perspective. For example, the most dominant bacteria in my gut are members of Ruminococcus. Ruminococcus are dominant genera in things like cows and rhinoceros, things that eat a lot of grass, and so I eat a lot of dietary fiber. I eat a lot of the whole plant. I always tell people if you’re going to eat asparagus, the best part of the asparagus is down at the bottom, and that’s the part we tend to cut off and throw away. We tend to think of that as stuff that kind of passes out the other end,

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100 Coleman, “Why You Can’t Have Organic Food Without Soil.”
but depending on your microbial makeup, as much as 60% or 70% of that can actually be broken down. If you don’t have a lot of, let’s say, Ruminococcus and these other guys in there, then a lot of that stuff will pass out the other end. So, when I go to the grocery store and I push the cart around, I look in the produce section. I say, OK, if you put Haagen-Dazs ice cream in your shopping cart, there’s not a lot of food for your bacteria there. There’s a lot of goodness for you, and we all like Haagen-Dazs ice cream, but when you put that bell pepper in your basket or that leek or that cassava or whatever it may be, I always look at it and say how much food in this is for me, and how much food is for my bacteria? That math is really simple. It’s how much dietary fiber and resistant starch is in here, and how am I going to prepare this? How I prepare the food has a dramatic impact on the microbiota as well.101

‘Leaky gut,’ the reduction in intestine lining integrity, leading to dysfunction of the selective permeability of the mucus membrane, can compromise the human body’s finely tuned ability to distinguish between food and material that demands an immune response.102 This can lead to a wide range of different inflammatory health conditions, including crohn’s disease (the condition I have lived with for the duration of my PhD), ulcerative colitis, and conditions as diverse as asthma, lupus, even psychiatric disturbance. Some scientists call the gut “the second brain” for its influence on the human state of mind- and there is a physical grounding for this name, given that there are 100 million neurons in the gut, more than in either the spinal cord or the peripheral nervous system.103

The practices of feeding microbes through eating fibre, or through compost-making or

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102 Ibid.


The information particularly comes from a quote from Michael Gershon.
fermentation for the purposes of food and drink (such as wine, cheese, sauerkraut) represent examples of intentional cooperation, involving the mitigation of hygiene concerns to ‘live with’ microbes, particularly the microbes of decomposition, a process of mutual familiarisation which Donna Haraway calls *co-domestication*, discussed in chapter five. As popular interest in harnessing microbial processes has grown in recent years, old skills of fermentation such as making sourdough and pickling are also increasingly valued for their capacity to co-produce healthy and tasty food. I have made many efforts in recent years to learn fermentation techniques: making yogurt, sauerkraut, fermented carrot and cauliflower, and fermented buckwheat pancakes. The famous activist, long-term HIV survivor and “fermentation fetishist” Sandor Katz explains the significance of fermentation thus:

> Fermentation is the action of life upon death. Living organisms consume dead food matter, transforming it and in the process freeing nutrients for the further sustenance of life. Many fermentation recipes mysteriously instruct you to ferment “until the flavour is ripe.” You will have to be the judge of that. I advocate tasting your ferments at frequent intervals as the process progresses so you can learn about the spectrum of fermentation, discover what degree of ripeness you find most appealing, and experience the flavors of the other side of the elusive and slippery subjective boundary of rottenness.\(^{104}\)

What matters is the ability to judge how to support microbial processes, including providing the right kinds of surfaces and interfaces to facilitate the right kinds of exchanges, exposures, circulations; enabling selective openness.

The health of the microbial ecosystem *within* soil can impact upon the health of organisms that interact with it. One way this occurs is through transmission through

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proximity. Soil microbes can impart antidepressant qualities to people who conduct activities near soil.\textsuperscript{105} Healthy soil can also improve the nutritional value of food that is grown from it, “unlocking” or solubilising nutrients. Aristotle once said, “Worms are the intestines of the earth.”\textsuperscript{106} Walter Jehne, former CSIRO scientist and founder of both Healthy Soils Australia and Soils for Life in 2013 gave a very interesting talk on the role of fungi and other microbes in selectively making a wide range of nutrients available to plants and in turn to human consumers of plants.\textsuperscript{107} He claims that when soil fungi is depleted from farmland soil (now the \textit{status quo} with biocides, compaction, weeding, bare soil surfaces all contributing), plants instead access water-soluble nutrients via a less selective pathway, which can also allow toxins in to plant tissue. He cites data from both the UK Ministry of Health and the USDA to suggest that industrial agriculture-produced food has one third of the nutrient concentration of food prior to the Second World War. There is also a lower diversity of trace elements in soil. He particularly singles out selenium as having a major role in cancer-fighting enzymes and being depleted from soils managed industrially. Regenerative farmer and educator Patrick Holden sums up the function of biodiverse soil in plant nutrition thus: healthy soil is “the stomach of the plant.”\textsuperscript{108} Judith D. Schwartz asks “If there’s a body of work that makes the case that the caliber of soil helps determine baseline health


\textsuperscript{106} Quoted in David Murphy, \textit{Earthworms in Australia} (South Melbourne, Vic, Hyland House, 1993): 18.


and it’s acknowledged that our soils aren’t looking too good, why hasn’t soil been brought into discussions of public health?"109

1.7 Conclusion

Healthy soil has a multitude of functions and meanings for human life. One dominant meaning is that soil, and particularly soil microbes are dirty and unhygienic. This positions it as a substance to disregard, to sterilise and engage with distastefully and reluctantly. Yet attempts to control soil, to eliminate life within it and its contingency, aiming to create an environment free of contamination and dirt cause unintended negative consequences. In parallel with the role of the human microbiome in maintaining human health, countless mutually beneficial relationships exist between humans and soil microbes. Cooperation is not automatic, it must be worked on in particular ways, overcoming the barriers to relationship that we have created through our attempts to control both human biology and soil.

At this time of the Anthropocene, when multiple ecological crises collide to produce a radically uncertain future for life on earth, urgent questions regarding right human relationships to other species press upon our consciences. The challenge for humans is to recognise our dependence on healthy ecosystems, and our neglected responsibilities to adequately reciprocate by helping to create the conditions for flourishing. We must attempt to understand and build upon actually existing forms cooperation particularly symbiosis both at a macro ecosystem level and at a micro level within human bodies. Soils are one of the points of intervention at which humans

109 Judith Schwartz, *Cows Save the Planet and other improbable ways of restoring soil to heal the Earth*, (Vermont, Chelsea Green, 2013), 101.
can make the most difference to nonhuman life. This is one reason why I am very interested in how land stewards care for soils, and in particular the methods that can be included under the banner of “regenerative agriculture.” The next chapter will examine the barriers to regenerative agriculture, both material and ideological, analysing insights of critical theorists from the Frankfurt School as well as Heidegger, among others, who shed light on the ways in which instrumental reason and rigidly understood technological systems foreclosed the liberation of nature. By considering how these theories relate to the domination and mistreatment of soil, we might find ways in which these barriers to change can be circumvented.
In the tractor man there grows the contempt that comes only to a stranger who has no understanding and no relation. For nitrates are not the land, nor phosphates; and the length of fibre in the cotton is not the land. Carbon is not a man, nor salt nor water nor calcium. He is all these, but he is much more, much more; and the land is so much more than its analysis.\textsuperscript{110}

Most modern methods of agriculture and landscaping take a monoculture model for granted as the most efficient modes of production, presupposing that the control or elimination of other species is necessary to achieve productivity. Rather than building on interactions between species, practitioners in conventional agriculture and landscaping tend to break down and simplify interspecies interactions (with some minor exceptions). Technologies used to maintain monoculture simplify and order landscapes according to one-dimensional, zero-sum models of inputs and outputs. In monocultural production chains the only planned outputs are harvests of crops or animal products for human consumption. The other outputs are considered waste. In the case of landscaping, monocultures provide uniform surfaces for parks or sports games, or an appearance of order, influencing perceptions of suburbs’ real estate values.

In this chapter I will analyse the ideologies and epistemologies that underlie the aspiration to control implicit in these modes of organising life. I also consider the barriers to a more caring relationship with the land, making sense of ways in

\textsuperscript{110}John Steinbeck, \textit{The Grapes of Wrath}. (Australia, Minerva, 1995) 3-4.
which reification through control-oriented scientific and technological rationalities, particularly instrumental reason, can desensitise practitioners and reify soil. When goals are narrowly construed, they can format entire regimes of practice such that alternative possibilities are foreclosed from the outset, and reasoning is instrumentally oriented. This has become the norm in modern life, as Horkheimer and other figures of the Frankfurt School have argued. Inclusion of environmental goals can lead to more open-ended approaches, with additional goals functioning as avenues of critique through which practices can be questioned and adjusted. In this chapter I analyse open-ended orientations to knowledge and conceptions of technology such as those offered by Ivan Illich, Herbert Marcuse, as well as Andrew Feenberg, considering practices for deflating the power of particular technologies in structuring everyday ontological apprehensions of the world, drawing upon Hubert Dreyfus and Charles Spinosa, who are in turn influenced by the work of Martin Heidegger. When a practitioner’s approach is rigidly committed to certain goals without regard for those entities rendered as means, this can limit capabilities not only of human practitioners, but also potential capabilities of the land, that tend to emerge when supported and given the space.
2.1: The role of instrumental reason

Max Horkheimer was a major figure of the Frankfurt school who articulated a compelling critique of instrumental reason with Theodor Adorno in their 1944 book *Dialectic of Enlightenment*, and in Horkheimer’s own 1947 book *Eclipse of Reason*.

Beginning their critique of science in *The Dialectic of Enlightenment* with the figure of Francis Bacon, Horkheimer and Adorno liken the scientific attitude towards ‘disenchanted nature’ to patriarchy and slavery:

> Although not a mathematician, Bacon well understood the scientific temper which was to come after him. The “happy match” between human understanding and the nature of things that he envisaged is a patriarchal one: the mind, conquering superstition, is to rule over disenchanted nature. Knowledge, which is power, knows no limits, either in its enslavement of creation or in its deference to worldly masters.\(^{111}\)

Under capitalism, science tends to be oriented towards the goal of subjugating external nature, a kind of 'meta-goal' from which other goals and attitudes flow.

Horkheimer critiques the “categories and methods of scientific intelligence in which nature increasingly appears increasingly under the aspect of its most effective exploitation.”\(^{112}\) The ultimate endgame of this ideology is the perturbation of nature in ways that present an existential threat to human societies and to many parts of the human edifice. Horkheimer warned of the “fatal intimate connection between the domination of nature and the revolt of nature,”\(^{113}\) when [repressed] nature can manifest sudden changes that threaten the system itself. He also argued that


\(^{113}\) Ibid., 84.
domination of nature has negative existential consequences for humans: “The more devices we invent for dominating nature, the more must we serve them if we are to survive.”

In this context, science’s main problem is inadequate reflection on the implicit goals towards which it is directed. Faith in the scientific procedure as a transcendent vehicle towards societal improvement defers responsibility for thinking and debating the direction society is heading in and the principles and ends it endorses:

According to the positivists, what we need is abundant confidence in science. Of course they are not blind to the destructive uses to which science is put; but they claim that such uses of science are perverted. Is this really so? The objective progress of science and its application, technology, do not justify the current idea that science is destructive only when perverted and necessarily constructive when adequately understood.

Science could surely be put to better uses. However, it is not at all certain that the way of realization of the good potentialities of science is the same as its present road. The positivists seem to forget that natural science as they conceive it is above all an auxiliary means of production, one element among many in the social process. Hence, it is impossible to determine a priori what role science plays in the actual advancement or retrogression of society.

As an auxiliary means of production, science is subservient to the economy, which in turn is responsive neither to the authority of critique by intellectuals nor to that of democratic consent. Horkheimer targets the way that positivism is a key ideology that perpetuates the dominance of instrumental reason, filling a vacuum left by the demotion of substantive reason with the conviction that science can provide sufficient direction and articulation of progress to guide a good society.

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114 Ibid., 66.
115 Ibid., 40-1.
Horkheimer and Adorno argue that instrumental reason is becoming increasingly dominant in modern capitalism, diminishing the kind of public thinking that might assist with the task of achieving human and nonhuman liberation from relationships of domination. This is a concern shared in common by many critical theorists in the Frankfurt School as well as by Heidegger (in different ways). A rigid adherence to instrumental reason encourages a reactive and control-oriented stance, precluding engagement with deeper and long-term questions of purpose, and alienating humans from an intentional and active connection with their environment and with products of their labour.

Horkheimer centres his critique of modern knowledge systems and pathways of inquiry on Max Weber's categories of substantive and formal rationality, contrasting two main conceptions of reason: one that involves reasoning about ultimate ends, usually involving value judgements, and the other instrumentally oriented, involving technical decisions that match means to pre-given ends. Andrew Feenberg explains the distinction thus:

Rationality is "substantive" to the extent that it realises a specific value such as feeding a population or maintaining the social hierarchy. The "formal" rationality of capitalism refers to those economic arrangements that optimise calculability and control. Formally rational systems lie under technical norms that have to do with the efficiency of means rather than the choice of ends.¹¹⁶

Weber considered the substantive form of rationality to be value-laden, and the formal form of rationality-as-calculability-and-control, to be value-free, devoting most

of his efforts to the elaboration and explication of the latter form of rationality.

Horkheimer rejects Weber’s portrayal of formal rationality as neutral. Writing more recently in a similar vein, Feenberg argues that while Weber's conceptual distinction seemed to both “open up a whole new field” it also frustratingly “shut the door:”

Whereas substantive rationality is clear about its normative commitments, formal rationality either evades articulating them or takes a principled stance to avoid such articulation in the name of neutrality.

Horkheimer argues that as a result of its reliance on formal rationality, modern reasoning has withdrawn from the substantive task of discerning and debating to what ultimate ends humanity should devote itself, dropping the pursuit of 'enlightenment' and the uplifting of humanity. Instead, individual conscience has been elevated to become the primary guide of practical reason, diminishing other moral sources from which public normative reason was sustained:

The philosophers of the Enlightenment attacked religion in the name of reason; in the end what they killed was not the church but metaphysics and the objective concept of reason itself, the source of power of their own efforts. Reason as an organ for perceiving the true nature of reality and determining the guiding principles of our lives has come to be regarded as obsolete.117

Thus reason in the modern age was subjectivised and privatised: instead of playing a role in public deliberation regarding ends (such as helping to clarify a public conversation about which goals agriculture ought to serve), reason was simply seen as an individual faculty used to co-ordinate means: “There is no reasonable aim as such, and to discuss the superiority of one aim over another in terms of reason becomes

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117 Horkheimer, Eclipse of Reason, 12-3.
meaningless. From the subjective approach, such a discussion is possible only if both aims serve a third and higher one, that is, if they are means, not ends."¹¹⁸

Horkheimer depicts the modern subject as caught in a tragic bind: while the possibility of realizing human freedoms may have more of a material basis than ever before in the modern era, we are constrained in inhabiting such freedoms due to the pressures of modern production systems, which tend to predetermine our ends, leading us to be fixated on efficient means, on instrumental reason, to the detriment of thinking critically about ends:

reason is now limited to a technical and subservient role in providing means for given ends and carrying out experiments. While modern production systems may have broadened human freedom, humans are also subjected to greater pressures than they ever have been. These pressures narrow the scope of our focus on reality to a narrowly instrumental and reactive mindset. Our spontaneity has been replaced by a frame of mind which compels us to discard every emotion or idea that may impair our alertness to the impersonal demands assailing us.¹¹⁹

On an everyday experiential level, our minds become increasingly pre-occupied by demands that originate in accommodating ourselves to pre-determined systems in the world, rather than opening ourselves up to the world and to each other in non-instrumental modes of aesthetic contemplation, normative reflection, world-building, democratic debate, environmental experience, social life, care for other people or even bodily reverie that might take us out of habitual acceptance of the given parameters and meanings of the world:

Survival-- or let us say, success-- depends upon the adaptability of the individual to the

¹¹⁸Ibid., 6.
¹¹⁹Ibid., 67.
pressures that society brings to bear on him. To survive, man transforms himself into an apparatus that responds at every moment with just the appropriate reaction to the baffling and difficult situations that make up his life. On the one hand, nature has been stripped of all intrinsic value and meaning. On the other, man has been stripped of all aims except self-preservation. He tries to transform everything within reach into a means to that end. Every word or sentence that hints at relations other than pragmatic is suspect. When a man is asked to admire a thing, to respect a feeling or attitude, to love a person for his own sake, he smells sentimentality and suspects that someone is pulling his leg or trying to sell him something.  

Casualties of the dominance of instrumental reason include spontaneity, creative interaction with our environments and open-ended responsiveness, as well as the recognition of intrinsic value of things including nature. The implicit normativity of the status quo is locked in place through instrumental reason’s predominance, with very few people understanding this existential situation in such a way that they can critically examine it, and thus develop a free and intentional relationship to it.

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120 Ibid., 65, 69.
2.2 Scientific ontologies and the mechanistic philosophy

Like instrumental reason, mechanistic philosophy also saturates much of both the method and the ontology of science, limiting its imaginative and innovative resources, even though it has been widely recognised since Kuhn that scientific discovery often does not follow a linear or rational model, drawing instead upon intuition and from accident for many innovations.\textsuperscript{121} In his book \textit{Requiem for a Species}, Clive Hamilton traces a history of mechanistic thinking in Western science, arguing that it works against an environmental ethic adequate to recognize and address the crises we find ourselves in. Hamilton sees the mechanistic philosophy as prevailing not because it is intrinsic to science but because it suits certain economic interests that benefit from exploiting the Earth. To draw out the non-essential quality of mechanism to science, Hamilton shows how the esoteric and the mechanistic coexisted in the early years of science. He focuses on the figure of Newton, whose name is often identified with the mechanistic point of view, with the adjective \textit{newtonian} signifying a view of matter as “inert and inactive... unless acted upon by an external force.”\textsuperscript{122} Hamilton examines Newton’s skilled practice of alchemy to show how his understanding of reality was more complex than is often portrayed. Newton made efforts to interact with mysterious forces of the world through this discipline, associated with Hermeticism and now debunked by modern science. Hamilton argues for a shift in consciousness towards values centred on life, and an understanding of the Earth that is more

\textsuperscript{122} Clive Hamilton, \textit{Requiem for a Species: Why we resist the truth about climate change}, (Crows Nest, NSW, Allen and Unwin, 2010), 141.
dynamic than mechanistic science can impute: “Humanity is now forced to confront 
the question of whether a consciousness rooted in a dead earth subjugated to our 
material needs can respond adequately to the climate crisis, or whether we need to 
rediscover some form of consciousness that recognises a living Earth yet remains 
scientifically credible. Clearly a return to pre-scientific animism is out of the question; 
we know too much.”123

The representation of life through abstraction: models or mathematical equations – 
when there is not a concurrent engagement with that life in other ways – can 
deracinate human understanding from its context, leading to reification. According to 
Hannah Arendt, rendering objects mathematically flattens them into human created 
schemas rather than revealing their otherness: through the influence of Descartes, 
“mathematics succeeded in reducing and translating all that man is not into patterns 
which are identical with human, mental structures.”124 This distances the human 
subject from the things of the world such that “every assemblage of things is 
transformed into a mere multitude,”125 and also produces a human subjectivity whose 
orientation is to ourselves rather than to the world, a kind of anthropocentric solipsism 
that she calls “world alienation.”

Just as machine metaphors have become commonplace in neuroscience, yet distort 
our conception of the brain,126 the language of biology beyond the human is replete

123 Hamilton, Requiem for a Species, 146.
124 Hannah Arendt, The Human Condition, 266.
125 Ibid., 267.
with terminology that serves to objectify life rather than opening up the possibilities of coming to know, interdepend, work with and understand different organisms. Hamilton notes, “The notion of ‘adaptive complex systems’ does not easily translate into any recognizable idea of life.” Hamilton has similar reservations about the term ‘ecosystem,’ arguing that cybernetic thinking has become commonplace in ecology. He states, “Although ecologists themselves may be motivated by some deeper intuition, as a science ecology remains within the confines of the mechanical philosophy.” “How can we be ethical towards 'systems' and 'networks'?” Ellen Herda asks, critiquing the hegemony of logical positivism in thought: “scientific metaphors have structured our thinking -- input, interface, functional, system, network, output -- and most do not engender critical reflection or an ethical stance. Our language reflects our values and priorities.” Stephan Harding and Lynn Margulis likewise critique the term ‘adaptation,’ which they claim obscures “the emergent and intimate synergies between our planet’s physics, chemistry and biology,” particularly the fact that life dramatically modifies its environment, evident in the vastly different patterns of water circulation on planet Earth, compared with lifeless planets holding large volumes of water at their surface. They call for a greater focus on ‘emergence,’ and on the multidimensional communicative processes that guide ecological change and evolution. Such language centres attention upon the creative capacities of life, the ability of life to become more than a sum of its parts.

127 Hamilton, Requiem for a Species: 146.
129 Hamilton, Requiem for a Species, 146.
Bill Mollison, the co-founder of the ecologically-informed farming and design system, permaculture, expresses the limitations of control-oriented scientific ‘ways of knowing’ thus:

Rigorous scientific method deals with the necessity of rigorous control of variables, and in a life system (or indeed any system), this presumes two things that are impossible: 1. That you know all variables (in order to control some of them and measure other) before you start; or 2. That you can in fact control all or indeed any variables without creating disorder in the life system. ... Life exists in conditions of flux, not imposed control, and responds to any form of control in a new fashion... It is only by returning self-regulating function and responsibility to living things (such as people) that a stable life system can evolve... Scientific method is one of the ways to know about the real world, the world we are part of and live in. Observation and contemplative understanding is another. 132

Mollison portrays a tension between ‘rigorous scientific method’ and ‘supporting the life system,’ with regard to control. That doesn’t mean absolute incommensurability between the knowledge paradigms, nor that permaculture rejects science and the cultivation of some degree of control by humans, but his claim does challenge the dominance of the control-based sciences over the domain of life. Restoring responsibility to nonhuman life is shown to be a preferable option to the paternalism of human controlling relations that limit growth.

Control and manipulation are now central standards for scientific inquiry, even in soil ecology. This is evident in the following statement: “Despite our long understanding of the relationship between soil building practices and their benefits to SOM [Soil Organic Matter], and the general appreciation that SOM underpins ecosystem function in

132 Mollison, Permaculture, 11.
terrestrial systems, our ability to quantify or manipulate its characteristics remains quite limited.” If science cannot definitively quantify or manipulate soil organic matter, is it still a valid object of attention and concern? The fact that soil organic matter is difficult to manipulate may account for the relative neglect of soil ecology in scientific inquiry and agriculture, despite the widespread evidence that soil organic matter is essential for healthy soil ecology. Many dimensions of soil microbial life- as well as the extent to which humans and other forms of life depend on microbes have remained opaque to scientists (despite the fact that they make measurable contributions to our ability to feed ourselves) to a large extent because scientists have not developed a method to grow these complex life forms in a controlled environment:

Though it is widely accepted that soil biodiversity is vital for maintaining productivity in natural and managed agro ecosystems, the understanding of the microbial communities, soil fauna and their diversity is extremely limited (Buckley and Schmidt 2003; Nannipieri et al. 2003; Lynch et al. 2004; Fitter 2005; Fitter et al. 2005; Nannipieri and Smalla 2006). Of the soil microbes, 99% cannot be cultured; identification, characterization and finding their role are particularly difficult for such organisms.

A considerable proportion of microbes depend on the presence of particular other microbes and structures produced by microbes in ecosystems such as biofilms to live. Bacteria in biofilm communities are good examples of microbes in relations of symbiosis with each other that cannot be cultured in labs using the conventional


scientific method of inoculating agar in petri dishes, because they produce their own
structures that must be present for their proliferation to be possible. Biologist Anders
Hakansson describes the habits of biofilms in an interview with *New Scientist*:

[Biofilms] are a way that bacteria aggregate, usually in pretty intricate architectural features.
They are like little cities, with towers and water channels ... In the biofilm, bacteria act a lot like
an organism. Different bacteria and regions within the biofilm have different functions. Some
retrieve nutrients or fix nitrogen, some might be good at taking up DNA from within the
biofilm, and some even sacrifice themselves for the benefit of the community. The bacteria also
communicate with one another. They can sense oxygen levels in their environment, so
depending on their location, some might increase their metabolism or, if there are few
nutrients, stop metabolising. We think of bacteria as individuals, but in biofilm communities
they're also altruistic.\(^\text{135}\)

In the 1990s scientists became aware of the influence of biofilms in the spread and
resilience of disease from the human body's immune system. A more collective model-
and the collectively- generated *architecture* had to be taken into account in order to
have any hope of understanding and treating disease. A 2016 study has found that a
biofilm involving a yeast species, and two bacterial species may be a cause of Crohn's
disease, which has evaded scientific understanding for many decades.\(^\text{136}\)

The dominant chemical approach to soil amendment disregards dynamic properties
that soil has that are mediated by life. This blind spot is what Markus Reichstein from

\(^{135}\) Robyn Braun, “I’m infiltrating the walled cities where bacteria hide,” *New Scientist*, 26 March 2014
https://www.newscientist.com/article/mg22129620-300-im-infiltrating-the-walled-cities-where-
bacteria-hide/ 28.

\(^{136}\) Case Western Reserve University. "Fungus in humans identified for first time as key factor in Crohn's
www.sciencedaily.com/releases/2016/09/160920151435.htm
the Max-Planck Institute for biogeochemistry calls “the dead soil paradigm.” Why is soil so often neglected? Michael Usher, a British soil ecologist, gives three reasons for the relative neglect of soil ecologies in conservation:

1. “lack of charismatic” soil organisms able “to grab the attention of the public and make an emotional and financial connection,”
2. soil’s “poorly understood taxonomy,” and

The first and the third points prompt reflection on the conditions that regulate our seeing of soil, and the cultural and social mediums that influence our emotional and financial connection to soil. The second point implies that greater technical mastery over soil’s past and genetic provenance is needed, as well as knowledge regarding the vulnerability of the species to extinction.

I am reluctant to give taxonomic categorisation a major role in explaining the neglect of soil. Given the immense diversity of soil organisms and the resistance of a large percentage of microorganisms to being grown artificially in a lab, as well as the ever-lengthening lists of endangered species that occupy a limited space in public attention, I just don’t think the taxonomic and the population dynamics routes are likely to gain the appreciation and commitment of conservationists to advocate for soil ecologies. Taxonomy is limited in its ability to disclose the physiological aspects of soil, particularly the functional attributes that cannot necessarily be inferred from familial

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relation. The bacterial genus *pseudomonas*, for example, can be found in an extraordinarily diverse range of environments: acting as cloud condensation nuclei influencing continental weather patterns, or living in the stomata of broadleaf vegetation, or in the soil, or causing disease in humans.

Taxonomies may also hinder more than help with recognition: *Imagine living in a society in which only people with specialist training became privy to the official names of people. If you attend university and study human systematics, this seal of silence on the official names of people would be broken. As a learned specialist, you would be entrusted with all people’s names, being presented with a large index categorising the names of the thousands of citizens of your country, organized by means of a dichotomous key. While you had the proper names of people at your fingertips, the naming would still rarely be spontaneous, as you had to identify them according to physical characteristics. Carrying your index with you, upon encountering another human you would enter into the laborious process of narrowing down physical characteristics until you had determined their family, genus, and finally their name. Your mind might recite a checklist: Fixed earlobes. Hazel Eyes. Stigmatism. Sally Dredge. You might pull out the index and examine various body parts before pronouncing the name. This would increase the awkwardness of the conversation, immediately distancings the person from you.*

In studying botany, I similarly learned an atomistic method of identifying plants, instead of learning about the dynamics of relationships at work in particular ecosystems- or how to care for these relationships. In Charles Dickens’ book *Hard Times*, the teacher, Mr. Gradgrind, interrogates his student, Sissy Jupe:
‘Give me your definition of a horse.’

(Sissy Jupe thrown into the greatest alarm by this demand.)

‘Girl number twenty unable to define a horse!’ said Mr Gradgrind, for the general behoof of all the little pitchers. ‘Girl number twenty possessed of no facts, in reference to one of the commonest of animals! Some boy’s definition of a horse. Bitzer, yours.’

…‘Bitzer,’ said Thomas Gradgrind. ‘Your definition of a horse.’

‘Quadruped. Graminivorous. Forty teeth, namely twenty-four grinders, four eye-teeth, and twelve incisive. Sheds coat in the spring; in marshy countries, sheds hoofs, too. Hoofs hard, but requiring to be shod with iron. Age known by marks in mouth.’ Thus (and much more) Bitzer.

‘Now girl number twenty,’ said Mr. Gradgrind. ‘You know what a horse is.’

In this passage, Sissy Jupe’s tacit, experience-based knowledge of a horse that does not yield concrete ‘facts’, so her teacher humiliates her in front of the class. Yet the string of facts that Bitzer recites has little coherence or meaning in itself. A more holistic understanding of a horse, one that can support practical and cooperative relations with that horse can only be gained through a slow and embodied process, in which each person, organism or object is encountered within a broader context of interdependence.

When I was a child I learned the common names of many different plants from my dad, who would get my sisters and I to contribute to the tedious and sweaty work of weeding. While walking to school each day, each naming of a plant in the front gardens I passed would feel like the recognition of a friend. Naming plants helped to

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animate and personalize the landscape. After long days at school, I would burst upon my vegetable patch, eager to see if anything new had grown. However, studying botany at university, learning to identify plants formally using Linnaean terminology and a dichotomous key was an experience that I found alienating, making me feel disconnected from the knowledge that I had of plants. I dropped out of this subject as a major, and it took many years to recuperate my interest that I had gained through gardening. The main problem is not that botanical and microbial knowledge and classification methodology itself is taught; it is that such learning is often disembodied, alienating and deracinated: at university, rather than being embedded in broader context and significance.
2.3 Knowledge production and specialisation

Wendell Berry mounts an extensive critique of the specialisation of agricultural knowledge production in his classic book, *The Unsettling of America*, particularly pointing to the way that specialization tends to desensitize people. A major problem of specialization, according to Berry, is that its aspiration for total control is ultimately neglectful of the broader landscape and the bigger picture:

the specialist and the idea of total control also have a symbiotic relationship, that neither one can exist without the other. The specialist puts himself in charge of one possibility. By leaving out all the other possibilities, he enfranchises his little fiction of total control. Leaving out all the "non-functional" or otherwise undesirable possibilities, he makes a rigid, exclusive boundary within which absolute control becomes, if not possible, at least conceivable...he simply abandons the rest, leaves it totally out of control.\(^{140}\)

We can see the way that instrumental reason is also at work in this description of specialisation. The terms “rigid, exclusive boundary” convey a certain practice of knowledge hygiene, through which an “inside” of control and an “outside” of disorder are distinguished. Only in an artificially contained environment can control be attained. Beyond this domain, specialists are unable to make sense of their surroundings, to be useful, and to work with the emergent patterns of interdependently organized nature.

Berry is committed to knowledge production that engages with ethically-conscious and non-specialist forms of reason, characterised by practical concern and committed

judgement:

No longer can we have that paltry "objective knowledge" so prized by the academic specialists. To know anything at all becomes a moral predicament. Aware that there is no such thing as a specialist-- or even an entirely limitable or controllable-- effect, one becomes responsible for judgements as well as facts. Aware that as an agricultural scientist he had "one great subject," Sir Albert Howard could no longer ask, "What can I do with what I know?" without at the same time asking, “How can I be responsible for what I know.”\(^{141}\)

In other words, to address any problem in its full extent requires responsibility for interconnection. This in turn requires concern for the relational significance and the multi-dimensional integrity of the objects of knowledge. Berry holds Sir Albert Howard in high esteem, and Howard inhabits The Unsettling of America almost as a scientific guardian angel. Berry concurs with Howard's approach, treating “the whole problem of health in soil, plant, animal, and man as one great subject.”\(^{142}\) Having started out as a 'laboratory hermit', Howard “unspecialised his vision...so as to see the necessary unity of the concerns of agriculture, as well as the convergence of these concerns with concerns of other kinds: biological, historical, medical, moral, and so on.”\(^{143}\) The image of 'laboratory hermit' evokes the ways aloneness is constituted not only in an interpersonal sense but also in a material sense, being disconnected from life-infused surroundings.

According to Berry, specialization breaks down conceptual and moral ties between different domains of knowledge, weakening responsibility for good judgement and impacting upon the human character. Specialisation is seen as inappropriate for agriculture, undoing age-old wisdom regarding diversity: “specialisation...means the

\(^{141}\) Ibid., 47-8.  
\(^{142}\) Ibid., 46.  
\(^{143}\) Ibid.
abandonment of the ancient, proven principle of agricultural diversity—agricultural stability through diversity—with its attendant principles of mixed husbandry of plants and animals and crop rotation. It is now, for the first time, deemed provident and wise to put all the eggs in one basket.”\textsuperscript{144} In his chapter \textit{The Body and the Earth}, Berry writes of the problem of erosion. After two days of rain, the Kentucky River is yellow-brown. He wonders how many people recognise this as a sign of land degradation. He then goes on to describe “some of the worst-eroded corn fields that I have seen in this country in my life,”\textsuperscript{145} tracing the cause to the “big business fantasy of the Butz mentality,”\textsuperscript{146} leading to the growing pattern of absentee ownership and “the temporary and shallow interest of the land-renter, the row-cropping of slopes, the lack of rotation, the plowed-out waterways, the rows running up and down the hills.”\textsuperscript{147}

The problem is not that policymakers and green-revolution farmers \textit{can’t} see, it’s that they \textit{won’t} see: they are unreceptive. Berry states several times that damage to the land is obvious to all those who look. He acknowledges that the forms of knowledge that carry power and weight in agricultural policy tend to crowd out sight in such a way that alternative ways of seeing are foreclosed: “the Department of Agriculture is lost in the paper clouds of "agribusiness," propagating statistical proofs of visibly ruinous agricultural practices. One can imagine the average American nodding over these "expert" reports and projections. Whether he is nodding because he agrees or because he is asleep does not matter; there is no difference.”\textsuperscript{148} These forms of knowledge promote both boredom and acquiescence. Berry laments the norms of official US

\textsuperscript{144} Ibid., 36.  
\textsuperscript{145} Ibid., 107.  
\textsuperscript{146} Ibid.  
\textsuperscript{147} Ibid., 107-8.  
\textsuperscript{148} Ibid., 37.
agricultural policy as outlined in fifteen speeches by the former secretary of Agriculture Butz and his assistant secretaries who celebrate the increasing mechanisation of agriculture and lauding both 'economy of size' and specialisation. While they claim that such goals are neutral, Berry challenges the short term focus of economic models that value certain things and not others and yet are required to provide no justification of these arbitrary choices; the economics that legitimises models of input-intensive enterprise. The triumphalist narratives of technical progress that agricultural secretary Butz propagates are only possible in a world of overwhelming physical separation from the land, creating ideological blinkers that obscure the damage to the land. Propped up by abstract schemes of authority and management, they follow technical formulas rather than the poesis of embodied recognition and skill.
2.4 A brief history of modern soil amendment

The story of the rise of commercial fertilisers provides a good example of the role of mechanistic science and specialisation in reifying soil, limiting practitioner options and diminishing public concern for ecological integrity. The success of the fertiliser industry in claiming technical control of soil has played a major role in the decreased public interest in soil in the twentieth century and its displacement from an ethical domain. Soil’s liveliness, contingency and vulnerability is no longer foregrounded, and the question of its functioning is understood to be a technical issue that has been solved. In Latour’s terms, it has been turned into a matter of fact, as well as a ‘black box,’ for only specialists to open up and tinker with.149

In Nineteenth Century Europe, soil was the focus of more public attention and concern than today, mainly due to widespread fears of human starvation owing to ‘soil exhaustion.’ The Irish famine of 1845-52 and the Great Famine of 1876-8 in India amplified public anxieties about soil degradation and famine, prompting Thomas Malthus to propagate his prescriptions of population control through non-intervention for both famines, and Karl Marx to critique capitalist agriculture while arguing for revolution. In Ireland the potato blight Phytophthora infestans spread on the damp and marginal land that peasants used to grow monoculture potatoes, after up to 75% of the more arable land was controlled by powerful moneyed interests to grow crops such as oats for export.150 Marx wrote: “England... has indirectly exported the soil of Ireland, without even allowing the cultivators the means for replacing the constituents

of the exhausted soil.” Malthus wrote in a letter to Ricardo, “the land in Ireland is infinitely more peopled than in England; and to give full effect to the natural resources of the country, a great part of the population should be swept from the soil.”

Ultimately the influence of Malthus’s ideas motivated policies that led to one of the largest emigrations of modern times: masses of poor Irish people left their homeland to arrive in the colonies: this is why many of my ancestors migrated to Australia.

For much of the 19th century, agriculture in Europe was in upheaval, characterized as “the Second Agricultural Revolution” by F.M.L. Thompson, which “broke the closed-circuit system and made the operations of the farmer much more like those of the factory owner.” This ‘closed circuit system’ of carefully managed and timed mixed farming used animal manures and legume rotations to replenish the soil, sharing some characteristics of modern regenerative farming. This model gave way to a more specialized land regime, which instead imported nutrients from colonized locations. As farms increasingly began to grow particular crops as industrial monocultures, advancements in agricultural chemistry made it possible to more precisely amend soil, using externally-obtained inputs, and thus farmers could justify growing several consecutive cereal crops without fallow periods.

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153 F. M. L. Thompson, “The Second Agricultural Revolution, 1815-1880,” *The Economic History Review* 21, No. 1 (1968). This was a time of dramatic upheaval. In Thompson’s framework, the *First Agricultural Revolution* involved the enclosure of lands into private property, which in the United Kingdom had been occurring since the 12th Century, with laws consolidated in 1801, and in 1845 further empowering commissioners to enclose land without requiring an act of parliament. The first agricultural revolution also involved the orientation of agricultural production towards markets, as well as the systematisation of mixed farming such that crops were rotated and grazing animals used to replenish the soil of manure. The enclosures led to mass migration to the cities and into the colonies such as Australia.
154 Ibid., 64.
Justus von Liebig was a German agricultural chemist, and a key figure in the transformation of agricultural science to what it has become today. Liebig systematically analysed soil nutrients, publishing *Organic Chemistry and its Application to Agriculture and Physiology* in 1840. He popularized Carl Sprengel’s concept of the *limiting nutrient*—namely that plants take up nutrients in a specific ratio to one another, and the quantity of all nutrients taken up by the plant will be determined above all by which nutrient is in shortest supply relative to requirements. Scientists could then identify which soils are best suited to growing certain crops, as well as which inputs would be necessary to amend soils to make them suitable for a particular crop. The degree of technical control that scientists could then gain over the growing conditions of land was dramatically increased, with efforts devoted to making land surfaces as chemically uniform as possible to prepare for the planting of new crops.

While Liebig’s scientific work made industrial agriculture possible, he was by no means a passive spectator or a political supporter of capitalist exploitation of the land. In fact he was a humanitarian who was highly critical of the forms of soil management in agriculture that were becoming increasingly common. Liebig and his British chemist colleague James F.W. Johnston singled out British high farming for criticism. Britain’s soil degradation had become so serious that by the mid 19th century it was digging up Napoleonic battlefields and catacombs in Europe for fertiliser. Britain also initiated a colonial scramble for guano extracted by forced labour on islands off the coast of Peru. Liebig was so moved by the condition of soil degradation that he

157 Ibid.
encountered that he exclaimed, “Truly, if this soil could cry out like a cow or a horse which was tormented to give the maximum quantity of milk or work with the smallest expenditure of fodder, the earth would become to these agriculturalists more intolerable than Dante’s infernal regions.”

Marx, an admirer of Liebig, took up his concerns regarding the depletion of the soil arising from capitalist land use and urbanization: specifically theorising the declining replenishment of land-based nutrients, what he called the metabolic rift, arising from the redirection of effluent from human sewage away from agricultural land, as well as the decline in good quality sources of phosphate fertiliser to replenish such nutrients. This has depleted agricultural soil’s capacity to support life. Marx memorably wrote:

All progress in capitalist agriculture is a progress in the art, not only of robbing the worker, but of robbing the soil; all progress in increasing the fertility of the soil for a given time is a progress toward ruining the more long-lasting sources of that fertility…. Capitalist production, therefore, only develops the techniques and the degree of combination of the social process of production by simultaneously undermining the original sources of all wealth-- the soil and the worker.

While the changes to agricultural practice during Marx’s time focused upon the modification of soil chemistry through natural amendments such as manure and guano, the rapid exploitation of guano supplies soon revealed scarcity in supplies of good quality fertiliser, particularly quality deposits that were not in high rainfall areas and thus leached of nitrogen.

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159 Marx, Capital, Volume 1, 637-8.
160 Foster, “Marx’s Theory of Metabolic Rift.”
Liebig’s work gave a means of diagnosis to identify limiting nutrients, yet it was not until the invention of the Haber-Bosch process of synthesising nitrogen from the air that the fertiliser industry truly transformed the scale and modes of farming, with land that was previously viewed as infertile brought under cultivation. This process of nitrogen fertiliser synthesis was named in *Nature* as the most important invention of the twentieth century, enabling unprecedented abundance including the exponential growth of the human population.\textsuperscript{161} Jason Clay points out,

Since 1900 the world’s cultivated area increased by about one-third, but because of a more than fourfold increase in productivity, total production has increased almost sixfold. A major portion of this gain can be attributed to selective breeding programs and to an *eightyfold* increase in external energy inputs, mostly in the form of fossil fuels."\textsuperscript{162}

The ready availability of NPK fertiliser in the 20\textsuperscript{th} Century has calmed down public anxieties about “soil exhaustion” that haunted the 19\textsuperscript{th} Century, rendering soil far less a matter of public concern, and in my view entrenching a popular understanding of soil that does not pay enough attention to soil’s vulnerability. The success of the input intensive model of agriculture has strengthened widespread cornucopian and technocratic beliefs that technology and mass production, rather than care for soil, can save us from the calamity of famine. Yet industrial agriculture depends upon inputs that are unsustainable and costly. Current analysis predicts that global supplies of phosphorus will peak in 2035,\textsuperscript{163} with phosphate being mined in conflict-riven parts of the Majority world such as Western Sahara. The crisis of soil “exhaustion” has been deferred, rather than adequately addressed, through these technological stopgap

\begin{itemize}
\item \textsuperscript{161} Vaclav Smil, “Detonator of the population explosion,” *Nature* 400 (29 July 1999) 415.
\end{itemize}
measures that increase productivity but create negative “externalities” outside agriculture’s frame of reference, on both a planetary and a microscopic scale.

Fertilisers can sometimes conceal the full impact of soil degradation, particularly artificial nitrogen fertiliser, which produces rapid rates of growth, but often at the cost of soil ecological integrity. The use of fertilisers particularly impacts upon soil microbial ecosystems by short-circuiting the usual route by which plants obtain mineral nutrients. When biocides are used in land stewardship, they can destroy microbial relations. As Jeff Lowenfels and Wayne Lewis write:

Chemical fertilizers, pesticides, insecticides, and fungicides affect the soil food web, toxic to some members, warding off others, and changing the environment. Important fungal and bacterial relationships don’t form when a plant can get free nutrients. When chemically fed, plants bypass the microbially assisted method of obtaining nutrients, and microbial populations adjust accordingly. Trouble is, you have to keep adding chemical fertilizers and using “-icides”, because the right mix and diversity—the very foundation of the soil food web—has been altered.¹⁶⁴

Thus soil’s ecological connectivity is depleted through the use of fertiliser, as the mutualistic relationships of exchange in the rhizosphere diminish. Feeding plants with fertilisers is similar to feeding humans with vitamins: as supplements they can be useful, however if they are used to replace a balanced diet they cannot satisfy the full spectrum of nutritional needs of multicellular organisms, particularly the microbiomes that are crucial to each. Lowenfels and Lewis instead argue for Teaming with microbes as the title of their book has it. Their approach is to withhold from using biocides and chemical fertilisers and instead create conditions that nourish soil microbial

proliferation and diversification.
2.5 Technology’s role in defining parameters of practice

In the lobby of the Coca Cola Building in North Sydney, which I walk past in order to reach the Institute for Social Justice, there is a sculpture that evokes the double-edged capacity of technology to connect and sever, to enable new capabilities and to create new forms of limitation.


This is a work by Hany Armanious and Mary Teague, entitled *Lines of Communication*. What appears to be a child’s makeshift telephone, with large Styrofoam cups linked by a tangle of analogue telephone wires, representing the site’s previous function as a telephone exchange, also resembles a tangled net of oceanic pollution, the flotsam and...

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jetsam of the Great Pacific Garbage patch, which Coca Cola bears great responsibility for. I like to think that the artists were consciously subversive, depicting a child’s telephone, and a destroyer of marine life; curiosity and connection versus convenience, consumerism and curtailment.

Many of the possibilities of modern life are structured by technologies that both enable and constrain, and which non-specialists are rarely given the tools to tinker with, thus they appear as black boxes. The very ubiquity of certain technologies in everyday life worlds would seem to naturalise their existence as part of the landscapes and background ‘givens’ of our lives. The contingency of these relationships is often obscured, as are the values that inform each of them. In this way, certain ends that are not consciously or freely chosen are given material force through the construction, proliferation and automation of standardized technological systems that presuppose and foreground some categories, modes of accounting and procedural norms above others for their effective and meaningful operation, as well as centering attention on certain aspects of the world and thus constructing certain ways of seeing. As Herbert Marcuse says, “when technics becomes the universal form of material production, it circumscribes an entire culture; it projects a historical totality – a “world.”” This is what Marcuse calls “the technological a priori,” which “is a political a priori inasmuch as the “man-made creations” issue from and re-enter a societal ensemble.” Thus the contingencies of technology are hidden, naturalised by the seamlessness in which some technological constructions envelop understandings of the world.

168 Ibid., 126.
Technologies exhibit inertia, and are embedded in regimes of practice, enabling and foreclosing certain futures. In this way they become part of the ‘given.’ The remarkable resilience of the QWERTY keyboard letter arrangement shows the socially-constrained path-dependence of technology, especially those that connect with human embodied practice. Such path dependence can ‘lock in’ mediocre designs when they reach a critical mass of embodied use. To alter such entities, particularly with regard to plant equipment and hardware, ownership of capital or the shouldering of substantial risks are required. Apart from the exceptions of 3D printing and workshops of resistant technicians/tinkerers who reconfigure everyday objects for new uses, it is often difficult to make a strong distinction between widely available machinery and the capitalist economy, since ownership of capital is usually required to reach production beyond a prototype stage. To achieve widespread use, new models must make the old redundant, achieving economies of scale and embeddedness in knowledge regimes, in turn requiring substantial economic and epistemic power respectively.

Marx diagnosed the effect of capital in extending the hand of the dead on the lives of the living, producing outdated and unasked-for constraints on the everyday lives of people through the stubborn and lasting forms of the technologies and the ideologies that capital organizes. Those technologies that become prevalent feed into the social process, making some possibilities more ‘real’ and attractive than others, concretising and giving particular shape [and the illusion of stability and objectivity] to them.

Oligopolistic capitalism is in some ways becoming ever more naturalized within the very forms and requirements of certain technologies in agriculture. Certain technologies are more institutionalised today than in earlier stages of capitalism, not
only due to the economies of mass production as mentioned, but also as package deals are embedded into the structure of technical goods/ proprietary goods, such as the ‘Roundup Ready’ genetically modified seeds produced by Monsanto and the new 2,4-D-resistant seeds produced by DuPont. These create imperatives for the purchase of particular agrochemicals and increase the rigidity of farming methods. Machinery in particular requires significant capital investment and thus commitment to particular courses of action. Large harvesting and planting machinery ideally requires the construction of uniformly wide rectangular fields with wide gaps between trees in the case of orchards; centre pivot irrigators require the clearance and levelling of uniform circular surfaces of land for their effectiveness. In constructing land to accommodate such machines, trees and bushes are destroyed, along with the habitat that they harbour. After a centre pivot irrigator was installed adjacent to my friends’ house in Tasmania (with numerous trees cut down), a possum moved into their roof and would often urinate and make a rumpus, as if to exact revenge upon humans (though they were not responsible for the irrigator).

When agricultural technologies are designed, financed and serviced in prescriptive and monopolistic ways, it can become difficult for regenerative agricultural practitioners to innovate, modifying mass-produced farm machinery to make ‘lighter footprints’ on the earth. Several of the practitioners I interviewed were able to retrofit a pesticide sprayer to spray compost tea, changing the settings of the spray jets as well as a few other minor design elements. Others modified the shape of plough blades so as to only minimally impact the soil surface.

The tractor manufacturer John Deere now locks machine exteriors to prevent tinkering
and only allows accredited company-approved technicians to carry out servicing. It has also copyrighted the software of the internal computers in the name of preventing music piracy:

The company argues that allowing people to alter the software—even for the purpose of repair—would “make it possible for pirates, third-party developers, and less innovative competitors to free-ride off the creativity, unique expression and ingenuity of vehicle software." The pièce de résistance in John Deere’s argument: permitting owners to root around in a tractor’s programming might lead to pirating music through a vehicle’s entertainment system.\(^{169}\)

Such restrictions have led to major delays for many farmers who now must bring machinery into regional service centres at crucial times such as planting or harvesting when there is sometimes only a small window for delay.

2.6 Heidegger and technology

Heidegger sees modern technologies as enframing the way we see the world,\(^\text{170}\) and thus having ontological, aesthetic, epistemic and ideological power in helping to constitute certain coherent *pictures* of the world,\(^\text{171}\) which in turn have an impact on our understanding of the world and our place in it, as well as the practical and political possibilities available to us.\(^\text{172}\) Each technology formats our patterns of action, implying certain praxes combining theory, implied goals and practices.

Each technology 'enframes' nature, impacting what is brought forward and what is hidden, as well as how users of the technology perceive their responsibilities. How do these technologies enframe the generative and vulnerable interfaces of diverse life that interact to maintain the ecosystem functioning? How might they structure the affordances that can be recognised within that field? How freely can practitioners create new pathways of action by using the technology? Technologies often create templates and scripts for action, which seem to commit us to certain paths, becoming mutually exclusive from other courses of action, constraining the development of certain capabilities or enabling others.

Heidegger sees modern technology as oriented to control, to 'challenging forth'. Dreyfus and Spinoza identify this as an ideology of *technicity*: a mode of life in which


\(^{171}\) Heidegger discusses the concept of *picture* in greater depth in the chapter “The Age of the World Picture,” Ibid., 115-54.

efficiency and instrumentalism are taken for granted as the *modus operandi*. Practices in the paradigm of technicity are understood as mechanically determined, and require little in the way of ethical reflection for their success. Things are reduced to assessment of their properties, and are judged according to how well the object can serve as raw materials in predetermined processes. This influences our perception of things in the world: an object at hand becomes just one in a ‘standing reserve’- as Heidegger says: replaceable and insignificant, subordinate to the process in which it has been enrolled, especially in the case of mass production. According to Dreyfus and Spinosa, “the essence of modern technology Heidegger concludes, is to seek to order everything so as to achieve more and more flexibility and efficiency: "[E]xpediting itself is always itself directed from the beginning... towards driving on to the maximum yield at the maximum expense": That is, our goal is optimum ordering for its own sake.”\(^{173}\) They illustrate this by quoting a robot HAL in *2001: A Space Odyssey*: "I'm using all my capabilities to the maximum. What more could a rational entity want?"\(^{174}\)

Heidegger counsels us not to reject the technological way of being [technicity] but rather to transcend it, to become mindful of the ways that technologies enframe and form our practices, and thus to become more aware of our decisions as far as technological ways of being are concerned. Dreyfus and Spinosa discuss Heidegger’s view of our 'right relation' to technology thus:

> Only those who mistakenly think of Heidegger as opposing technology will be surprised at the next point. Once we see that technology is our latest understanding of being, we will be grateful for it. This clearing is the cause of our distress, yet, if it were not given to us to encounter things and ourselves as resources, nothing would show up as anything at all, and no

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\(^{173}\) Dreyfus and Spinosa, “Further reflections,” 269.

\(^{174}\) Ibid., 270.
possibilities for action would make sense. And once we manifest in our dealings with people
and things, not just understand conceptually, that we receive our technological understanding
of being, we will have stepped out of technicity. For we then can see that what is most
important in our lives, namely our practical understanding of ourselves and everything else, is
not subject to efficient ordering and enhancement. This transformation in our sense of reality is
precisely what Heideggerian thinking seeks to bring about. Heidegger seeks to make us see that
our practices are needed as the place where an understanding of being can establish itself... The
change is a matter of developing a sensitivity to the way understandings of being are not
created or mastered by us. They are received by us.  

A free relationship to technology is seen by Heidegger as enabled by the proper
understanding of it, if it “opens human existence to the essence of technology,” to
experience the technological in a way that is not itself inflected, distorted or impinged
on by that technology but rather limits it “within its own bounds.” Heidegger calls
this way of being ‘a clearing’: a way of opening up a world. We then have the
opportunity to become aware of the commitments we implicitly make by adopting
certain technologically-mediated practices: “We can affirm the unavoidable use of
technical devices, and also deny them the right to dominate us, and so to warp,
confuse, and lay waste our nature.”

To have an intentional relationship to technology means to be aware of its
consequences, and to develop a conscious orientation to them, rather than to “merely
to conceive and push forward the technological, put up with it, or evade it.” In this
way we can take or leave in an intentional manner according to our needs: “we let

\[\text{175 Dreyfus and Spinosa, “Further reflections,” 271. Emphasis added.}\]
\[\text{176 Heidegger, The Question Concerning Technology, 3.}\]
\[\text{177 Ibid., 4.}\]
\[\text{178 Heidegger, quoted in Dreyfus and Spinosa, “Further Reflections,” 272.}\]
\[\text{179 Dreyfus and Spinosa, “Further Reflections,” 270.}\]
\[\text{180 Ibid.}\]

technical devices enter our life and at the same time leave them outside... as things which are nothing absolute but remain dependent on something higher. I would call this comportment towards technology which expresses "yes" and at the same time "no," by an old word, releasement towards things."181

### 2.7 Technology and poeisis: art and craft

Heidegger argues that the control-based understandings of knowledge and technology are historically specific to the modern era. There were more expansive meanings of both technē and epistēmē prior to Plato that were connected to one another and “meant knowing in the widest sense... to be entirely at home in something, to understand and be expert in it.”182 The Greek roots Technikon and technē, relate not only to the skills of the craftsman but also the artist. Both take part in the work of bringing forth, revealing hidden aspects of an object through poiēsis, and thereby in disclosure and knowledge production. The wide ranging and embodied knowledge of the ancient concepts of both technē and epistēmē as Heidegger describes them implies a process of apprenticeship, initiation, coming to know, understand and become proficient, in which the subject develops a repertoire of capabilities with relation to the tools and materials, and develops and exercises judgement with regard to how and when to use them. The practitioner is a capable and discerning subject, and there is an intimate relationship between the subject and the object materials, in the way that skilled arts and crafts develop sensitivity towards objects, seeking to draw out something from within the object rather than entirely impose their own designs on it.

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181 Ibid., 272.
Their action with these objects is meaningful, taking in context and responding to it in a free way.

Tim Ingold traces the ancient connection between art and technology in the concepts of *ars* and *tekhne*, meaning skill associated with craftsmanship in Latin and classical Greek respectively. Drawing upon the work of Raymond Williams, he situates a historical break in England of the late eighteenth century, in the exclusion of engravers from the 'fine arts' taught at the Royal Academy. From then on, art and technology became estranged. Over time, the character of technology fundamentally shifted from one that took its direction from embodied practice to one in which embodied practice was directed by technological imperatives: “Technology, now, did not discipline the scholar in his study of techniques, but rather the practitioner in his application of them. He became, in effect, an operative, bound to the mechanical implementation of an objective and impersonal system of productive forces.”¹⁸³ Ingold contrasts the replacement of subject-centred skills with object-centred machine-operation. The modern machine displaces the intimacy between labourer and the materials of their labour:

- the relations between workers, tools and raw material have been transformed, such as to replace subject-centred skills with objective principles of mechanical functioning. It is to these principles that the modern concept of technology refers...whereas in the artisan’s handling of his tools, the movements of their working points are guided by his own perception, the motions of the machine, and any tools attached to it, are predetermined.¹⁸⁴

The modern day concepts of art and technology now define worlds that do not see eye to eye epistemically, practically, politically: “the purpose of art to communicate ideas”

¹⁸⁴ Ibid., 289.
whereas “technical action is aimed to produce results in a mechanically determined way.” In many ways this split mirrors the “two cultures” of the humanities and the sciences that C.P. Snow diagnosed in 1959. The conceptual domain of art has been empowered with freedom of thought, whereas discretionary latitude in the technical domain has been severely curtailed - with considerable limitations on the range of permissible actions, particularly for lower-status workers. Such a division of responsibility and labour could only have been legitimised through the denigration of the body and a hierarchical split between mind and body, another Greek construct that in turn, has origins in Plato’s effort to legitimise slavery. Ingold argues “to recover the essence of skill we need a different concept of use from the one invoked by Plato,” which means overcoming the traditional mind-body distinction.

Several writers have advocated for a transformation of agriculture towards a more craft-oriented praxis. Colin Tudge, long time British humanitarian, advocate for agrarianism and care for the land, writes, “Agriculture is, fundamentally, a craft industry, and the craft must prevail again, with science relegated to its proper role as helpmeet, and the devices of modern accountancy employed simply to keep score.” The social anarchist Murray Bookchin articulates a similar vision for agriculture:

a free community will regard agriculture as husbandry, an activity as expressive and enjoyable as crafts. Relieved of toil by agricultural machines, communitarians will approach food cultivation with the same playful and creative attitude that men so often bring to gardening. Agriculture will become a living part of human society, a source of pleasant physical activity

185 Ibid., 351.
189 Colin Tudge, “Feeding people is easy: but we have to re-think the world from first principles,” *Public Health Nutrition*: 8, No. 6A (2005) 722.
and, by virtue of its ecological demands, an intellectual, scientific and artistic challenge. In a wide-ranging essay relevant to agriculture but not focusing upon it, Tony Fry argues for care that is embedded in work, through a craft-based approach, in which care is developed through practice:

...care needs to be designed into being, and it is by craft that this can be done... the placement of craft on the economic margins and within a wholly aestheticised space as an expressive object and practice requires challenging. At the same time craft has to be placed in the path of the otherness of non-human centred manufacture as an expression of human being as carer and cared for. This adds up to a deconstruction, but not a destruction of craft.

Here Fry argues for reconstruction of craft centred on care. He places craft within the realm of interspecies livelihood making, emphasising that other species also take part in manufacturing, largely resulting in humans being provided for by their environments.

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2.8 Democratic transformation of technology

Carol Cohn incisively summarises the task facing feminist and democratic critics of technoscience:

[We] have a dual task before us—a deconstructive project and reconstructive project that are intimately linked. Our deconstructive task requires close attention to, and the dismantling of, technostrategic discourse. The dominant voice of militarized masculinity and decontextualized rationality speaks so loudly in our culture, it will remain difficult for any other voices to be heard until that voice loses some of its power to define what we hear and how we name the world—until that voice is delegitimated. Our reconstructive task is a task of creating compelling alternative visions of possible futures, a task of recognizing and developing alternative conceptions of reality, a task of creating rich and imaginative alternative voices—diverse voices whose conversations with each other will invent those futures.192

The task of deconstructing technostrategic discourse involves re-politicising technology and exposing its contingent qualities. Andrew Feenberg points out that technology is rarely taken to be malleable in political philosophy, and thus its contingency is obscured in the very categories and debates that pass for critical thinking about technology:

We have seen that the philosopher of technology can refer to the humanistic tradition to ground the right of workers to technical advances that protect and develop their skills. It is true that such arguments are rarely made explicit and worked out in detail in philosophy of technology. This is a legitimate complaint. But political philosophy suffers a corresponding failure insofar as it does not appreciate the contingency of many aspects of the material environment and so does not judge them ethically.193

Feenberg points out the ways in which political philosophers fail to adequately account

for and problematise the political qualities of certain modes of ordering materiality, thus the ways in which such orders tend to further particular agendas, having tangible ethical consequences. Thus technology has been let off the hook, rarely being subject to political critique.

Historicising technology, Feenberg shows how social factors shape the direction of technical progress, rather than any objective or determinist process. This reveals that technical development can accommodate particular values and is “far more flexible, far more able to internalize popularly supported values than is usually imagined.” He thus shows important roles for political struggle, political critique and the foregrounding of contingency in the analysis of technological change. Feenberg continues Marcuse’s line of critique in targeting technological rationality. He argues: "Technological rationality is indelibly marked by the presupposition that production goes hand in hand with social domination. The trace of this presupposition can be found in economic thought, managerial methods, and the very design of technologies." In One Dimensional Man, Marcuse argues that the concept of technological rationality "presupposes the separation of the workers from the means of production...as a technical necessity requiring the individual and private direction and control of the means of production." In such a framework, “rules and procedures that achieve a certain kind of universality may also represent private interests through the assumptions that form their horizon. These interests are overlooked because they are not expressed through orders or commands, but are

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195 Ibid.
196 Marcuse, One Dimensional Man, in Feenberg, Transforming Technology: 66.
technically embodied, for example, in apparently neutral management rules or technical designs.” Feenberg sees the task of a critical theory of technology to use substantive reason to decide on goals, values, and ends for technology, to "cross the cultural barrier that separates the heritage of the radical intelligentsia from the contemporary world of technical expertise and explain how modern technology can be redesigned to adapt it to the needs of a freer society."

Democratic possibilities for technology are powerfully articulated by Marcuse, Feenberg and Illich, who see a need for transforming the conditions of work to enable greater individual and collective control over production. Valorising the creative and innovative "reappropriations" of technologies that users are capable of developing, Feenberg argues that "an alternative may yet be created on the basis of public participation in technical decisions, workers' control, and requalification of the labor force." He is particularly interested in controversies over technology, which he sees as important democratic moments that open up the specialist processes of design, despite the fact that they are often perceived by technical professionals as unwanted threats to their impartiality, representing the imposition of ideology from without. He argues for the broadening of such deliberation in modes of 'technical democracy' in which participatory discussions on the purposes of technologies takes place in a 'technical public sphere' animated by social movements such as environmentalism.

Ivan Illich in his book *Tools for Conviviality* reflects on a tension within science that pulls scientists in two directions: either a highly specialized way that centralizes control

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in the hands of experts, or in a collaborative way that builds capabilities with each new relational contribution to the collective:

scientific discoveries can be used in at least two opposite ways. The first leads to specialisation of functions, institutionalisation of values and centralisation of power and turns people into the accessories of bureaucracies or machines. The second enlarges the range of each person’s competence, control, and initiative, limited only by other individuals' claims to an equal range of power and freedom.\(^{199}\)

Illich aspires towards “a convivial society... designed to allow all its members the most autonomous action, by means of tools least controlled by others.”\(^{200}\) He strongly advocates for a user-directed vision of technology. Distinguishing between convivial and industrial tools, he argues for individual and collective creative control, in supporting the creation of meaningful worlds and thus societal wellbeing:

An individual relates himself in action to his society through the use of tools that he actively masters, or by which he is passively acted upon. To the degree that he masters his tools, he can invest the world with his meaning; to the degree that he is mastered by his tools, the shape of the tool determines his own self-image. Convivial tools are those which give each person who uses them the greatest opportunity to enrich the environment with the fruits of his or her vision. Industrial tools deny this possibility to those who use them and they allow their designers to determine the meaning and expectations of others. Most tools today cannot be used in a convivial fashion....

Tools foster conviviality to the extent to which they can be easily used, by anybody, as often or as seldom as desired, for the accomplishment of a purpose chosen by the user. The use of such tools by one person does not restrain another from using them equally. They do not require previous certification of the user. Their existence does not impose any obligation to use them. They allow the user to express his meaning in action... The telephone is an example. Anybody can dial the person of his choice if he can afford a coin.\(^{201}\)

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\(^{200}\) Ibid., 20.

\(^{201}\) Ibid., 21-2.
Illich identifies convivial tools as those that can be used freely, rather than determining a course of action. He gives the example of a telephone, a technology that does not definitively define the form nor the content of the activity, but rather the user freely uses both the technology and the living entities affected by the technology. Today, one would hesitate to classify the modern ‘smart phone’ as a convivial technology given its demands on everyday life and the way it can shape users’ attention patterns.

Illich’s vision for easily modifiable technology was extremely influential in influencing the generation of hackers that first developed personal computers in the 1970s, according to Michael Slattery: “Felsenstein convened a discussion group around the concept of a convivial computer... including Bob Marsh and Ray Bruman. Felsenstein’s proposition, following Illich, was that a computer could only survive if it grew a computer club around itself.”

As Lee Felsenstein recounts:

[Ilich] described radio as a "convivial," as opposed to an "industrial" technology, and proceeded to describe basically the way I had learned radio, but from the standpoint of its penetration into the jungles of Central America. Two years after the introduction of radio in Central America, some people knew how to fix it. These people had always been there. They hadn’t always known how to fix a radio, but the technology itself was sufficiently inviting and accessible to them that it catalyzed their inherent tendencies to learn. In other words, if you tried to mess around with it, it didn’t just burn out right away. The tube might overheat, but it would survive and give you some warning that you had done something wrong. The possible set of interactions, between the person who was trying to discover the secrets of the technology and the technology itself, was quite different from the standard industrial interactive model, which could be summed up as "If you do the wrong thing, this will break, and God help you." So radio could and did, in effect, survive in that environment because it

"grew up" a cohort of people around it who knew how to maintain and sustain it. And this showed me the direction to go in. You could do the same thing with computers as far as I was concerned.203

The example of radio technology as a convivial tool, which can be readily serviced by enthusiastic amateurs has much in common with the idea of “appropriate technology,” as it does not require expert outsiders to constantly service the machinery, but can be readily serviced by amateurs. This is not just due to its simplicity but also due to its attractiveness: there is an affective dimension at play, as radio is a technology that matters: it serves the needs of communities, and thus attracts dedicated tinkerers. If technologies can serve diverse desires and needs, human and nonhuman, while also not predetermining the path or the method through which such desires are served it will qualify as ‘convivial,’ avoiding reification and the closure of possibilities that reification involves.

A convivial tool in agriculture is one that does not presuppose control, nor does it sever ecological relations: it does not presuppose a uniform, bare soil surface furrowed with ploughs as the standard operating environment. A convivial tool in agriculture gives a wide scope of action to respond to needs of organisms on the land. It preserves and encourages free, dynamic interaction as a domain of production.

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2.9 The Crafts of carbon farming

Among farmers who are making efforts to build carbon in the soil, there is a minority who can do it well. This is a craft that is just as much art as it is science—with practitioners often ahead of the scientists. In one study the most successful regenerative farmers were simply recorded as a long tail at the upper limit of a “normal curve,” without an examination of the substantively different quality of their techniques that make this “tail” so extended.204

There are so many things to get right in implementing these techniques that there is a methodological issue with several of the studies that “disprove” the carbon sequestration claims of methods such as rotational grazing. Testing techniques by engaging unskilled and disinterested practitioners to carry out recipe-book prescriptions is likely to end in failure, since it is interestedness, passion, which sustains the kind of meticulous attention and subtlety of technique that enables soil-carbon and soil building. Such work is also the product of accumulated knowledge built over many years. The generic, context-blind quality of the scientific method can give little room for recognition of the difference that skilled participants make to whether or not a method is able to reliably demonstrate the outcomes that it claims that it produces. Here is a problem with the requirement that the scientific method be easily reproducible and with participants who can be readily swapped with one another.

The studies of rotational grazing conducted by the NSW Department of Primary Industries and the Queensland Department of Employment, Economic Development and Innovation were roundly critiqued on the Carbon Farmers of Australia blog:

The science community has a track record of finding difficulty with farmer-driven innovation. The same resistance from science was encountered by the no-till movement, according to Bill Crabtree, who was scientific officer with the West Australian No-Till Farmers Association and the leading light of the no-till movement. “The adoption was farmer driven. Much of the scientific data being presented during the time of explosive change, during the early 1990s, was negative towards no-tillage.”

Despite the initial lack of scientific justification, the farmer adoption of low-till methods has been immense, and driven from the grass roots, with belated endorsement by scientific institutions. Today, over half of the farmers who prepare land for pasture or cropping in Australia use no-till or low till methods. We see very clearly many of the issues that Silvio Funtowicz and Jerome Ravetz highlighted in their work on Post-Normal Science:

Practical techniques that cannot be explained in principle by accepted science are commonly dismissed as the products of dogmatic tradition or blind chance. And when persons with no formal qualifications attempt to participate in the processes of innovation, evaluation or decision-making, their efforts have tended to be viewed with suspicion or scorn. PNS provides a means for correcting this sort of mindset, which has now become quite counterproductive, both for the legitimacy and for the quality of science-related policy processes.

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207 Funtowicz and Ravetz, “Post-Normal Science,” 3.
Farmers who trail blaze in building carbon in their soils, and backing it up with research often do so at great effort, and with little formal scientific support.

Several scientists do play a supportive role to the innovative work of farmers, but they do so in a freelance, an NGO or a private capacity. One of these is Christine Jones, who runs the *Amazing Carbon* website. A practitioner interviewed by Rebecca Cross had the following to say about Jones:

> Primarily Christine Jones was the main person that influenced me, she was the only scientist who understood what I was trying to do...very supportive of what I was doing...surprising, we had the basic idea and it worked straight away, the concept of it...so we didn’t actually run into many real problems...one of the things we ran into problems with, [we were] so into grasses, but many [were] dormant...Christine, you could ring [her] up and she’d see things from the plants point of view, how the plant was functioning and what we were doing to it with the soil...and then I knew we had to graze the grasses a lot shorter.

It does not make sense in contexts such as community-based landcare groups to quarantine theory construction, synthesis and global interpretation from the spaces of ordinary engagement, leaving them exclusively to the experts, until such a time that participants are deemed to be suitably acculturated into scientific discourse to be trusted with the construction of ‘impartial’ and ‘objective’ knowledge. Rather, learning processes involve a dialectical relation between experience and abstraction, mutually informing one another as they are discussed in communities of practice, such as the conferences and workshops that several of my interviewees regularly attend. These praxes of working with nature generate synthetic insight as a matter of course, offering rich and context-specific sources of understanding. The relational

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environment of Landcare then forms a ‘public,’ 209 a context in which matters of fact can be examined collectively, debated and be transformed into matters of concern, while dilemmas regarding the relative prioritization of production goals versus ecological integrity are seriously grappled with.

Yet there is a knowledge hierarchy whereby land stewards are rarely recognized as knowledge producers, they are more often considered knowledge recipients, and thus agricultural science institutions sometimes do not adequately recognise the innovation on farms, particularly in regenerative land stewardship. Within farming communities such innovators are highly regarded. Grassroots groups such as Landcare and various catchment management groups help to facilitate peer-to-peer knowledge sharing, while the NGO Soils For Life has compiled a book and a website of case studies of regenerative farming from throughout Australia, highlighting the knowledge-production work of farmers. 210

2.10 Factors affecting farmers’ capacity to change

Learning about sustainability and particularly soil biology can encourage land stewards to become curious about ecological worlds that interact and persist beyond human control, which can prompt questioning of practices that suppress certain capabilities of land-based ecosystems. As articulated by Wendell Berry, a commitment to sustainability often involves integrating different forms of knowledge, including

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ecology and chemistry, in addition to the usual horticultural or agricultural disciplines.

In his book about Landcare, Andrew Campbell writes about the broadening of epistemic horizons of land care groups:

Landcare groups tend to broaden their concerns, initially from a sole land degradation issue (say salinity) to a range of degradation issues, then to a more positive focus on developing a more sustainable farming system, which then leads to the integration of social and economic concerns into group activities. The beauty of the Landcare group model is that the linkages and interdependencies between land degradation problems, between conservation and production issues, and finally between environmental problems and social and economic issues, can be exposed in a way which encourages an integrated approach to tackling them. The other side to this coin is the potential for people to be overawed by the scale and complexity of these issues, and to feel powerless to influence the forces shaping their lives. This duality means that the type of facilitation support available to groups, the processes they use to work out where they are going and how, and the institutional context in which they operate, are critical factors influencing long term effectiveness.211

It is significant that practices of regenerative agriculture such as those of the Soil Food Web Institute open up technologies and forms of knowledge production previously restricted to the use of specialists so they are available to be used by amateurs. One of my interviewees, Jan, an academic who teaches farmers to use low-magnification microscopes to view soil macro fauna,212 describes a process of wonder-prompted learning that invites care for ecological relationships:

When [farmers] look at samples [of their soil] they see mites, springtails, other invertebrates. To know the soil is alive doesn't mean anything in particular but it starts [farmers] off. They then start asking other questions. They really have to shift their thinking, gain confidence to listen to their own environment, to know their own soil, don't rely on others to tell them what

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212 The name of the interviewee has been changed.
to do, and not follow recipes.

This not-knowing prompts curiosity for learning, expanding the horizons and the boundaries of concern and inquiry. In provisional and experimental ways of relating with the world, practitioners slowly gain confidence in their own direct interpretation of the environment. This can activate an open-ended orientation to the world that is both responsive and responsible, reinforcing commitment as the learning process advances. This example resonates strongly with the approach of John Dewey:

“[experimentalism] is not an insurance device nor a mechanical antiseptic… it inspires the mind with courage and vitality to create new ideals and values in the face of the perplexities of a new world.”213 As Melvin L. Rogers, a scholar of Dewey remarks, “If action allows the self to control and understand the world, to disclose the possibility within life and the potentiality of one’s own life, then action can equally make clear and deepen the contingent dimension of human projects.”214

Some of the “change stories” of land stewards interviewed by geographer Rebecca Cross for her recent PhD reveal a process whereby a control-oriented approach is superseded by a broader approach that accommodates more goals. Farmers’ desires for control are seen as inversely related to trust, a byproduct of a broader anxiety regarding economic and other forms of insecurity:

‘letting go of control’ was a major part of the journey, as was ‘regaining a sense of controlling one’s own destiny’. As argued by Armstrong and Shulman (1990), a farmer’s perception or sense of control is a key resource that can be tapped into to overcome stress, adversity and life strains. Control and trust are highly related concepts, as ‘diminishing trust tends to occur when

214 Rogers, The Undiscovered Dewey, 78.
the vision is contested, needs revisiting, or lacks clarity. Increased ‘control’ is often seen as a way of compensating for a lack of trust…’ (Church et al., 2002: 20). Along this journey, a lack of trust in and disillusionment with the main agricultural paradigm found many innovators rediscovering trust in a new paradigm…

Practitioners interviewed by Cross identified reduced input costs as a buffer that reduced the imperative for high production yields during transition periods: lowering the stakes of making mistakes in the newly experimental mode of practice. Cross details the changes made by individual farmers, which were commonly made in dialogue with ecologically- minded communities of practice. Often the use of technology is modified to serve new goals:

\cite{Cross2002}

\cite{Cross2002a}
Stories of Eco innovators: Extract from Rebecca Cross’s PhD thesis

[We] phased out cropping over 3 years, went through our rotations...sold all our gear...the money [we used] for pesticides and fertilisers went towards water and fencing (ME 7, LCMA)

While this innovator kept his machinery, its purpose on the farm had metamorphosed and its use situational:

The revolution...[we had] just bought all this machinery for precision agriculture, seeders that use lasers and GPS to control crop rows...changed over completely, [and] developed [an enterprise based on] saltbush fed lamb...[we] kept the equipment but use it for different purposes now (PRA 8, MCMA)

While these innovators also restructured their farm layout as an initial step to change:

[We] have changed the entire enterprise in 8 years...changed fencing layout, comprehensive water system... [we] put in long-term infrastructure (ME 4, LCMA)

Most innovators ...explained this in terms of changing to ‘controlling only what you are able to control’, a key starting point in the Holistic Management and Grazing For Profit movements. For example, this innovator described using native grasses as a way to regain a sense of control and reduce the impact of unpredictable rain on production:

[You] can only really control the farm level inputs...that was my plan, not to control what I couldn’t, weather, markets etcetera...you have to go back to natives and cop the lower production and find the trade-off later (ME 12, MCMA)

This action plan to ‘control the controllable’ was a common feature of innovators in this landscape, and in a sense was the beginning for many in rediscovering and renewing the independent farming locus of control. Simplifying the farm and business in this way also produced well-being benefits associated with less risk and more time for managers.

Extract from Rebecca Cross’s thesis.217

Risk is a major dimension of these decisions, and it is more often than not a factor inhibiting change. Walter Jehne, a soil scientist who regularly teaches farmers about soil biology, had this to say about banks:

217 Ibid., 192.
From the farmer point of view, it’s all about risk management. You might go to your bank and ask for a loan of half a million. The bank manager won’t look too kindly upon changing practices. If you tell them you are using compost tea, they will ask, “What’s your risk management strategy?” and tell you to buy fertiliser.\(^{218}\)

Agronomists also often advise on such major decisions, giving detailed directives regarding the purchase of crop technologies and chemical inputs, and thereby exerting considerable power regarding the development of norms in agriculture.

They often take profitable production to be the only goal that matters: goals of soil health or broader ecosystem integrity are rarely considered core business. In an interview with the ABC, former CSIRO agronomist Maarten Stapper criticizes the narrow thinking that he was expected to adopt:

I was told by bosses that I was not allowed to work on biological farming because biological farming was not viable for the future, and we have to feed the world. So I got the choice last year, either to stay and be a good (inaudible) agronomist in the current thinking, or be made redundant if I pursued biological.\(^{219}\)

While there are particular institutional constraints that the CSIRO is under as an organization required to bring in money from industry, it is also the case that agronomists in general tend to narrow down options for farmers who wish to develop ecologically sound modes of practicing agriculture. My interviewee Peter had the following to say about soil testing: “we send [the soil tests] to a lab [company name]-it’s more independent than some. The local agronomists push a certain company that’s y’know, meant to sell you more fertiliser products, so that's pretty hard to get around.”

\(^{219}\) Australian Broadcasting Corporation, ABC Rural Radio Western Australia. Accessed 2 November 2012 [No longer current link]: http://www.abc.net.au/rural/wa/content/2006/s2417896.htm
Often it is only in unusual circumstances that practitioners seriously call their priorities into question: for example, when human health problems arise. In the preface to his book *Organic lawn maintenance*, Paul Tukey recounts his shift in practice towards organic methods, prompted by two events. The first was when a botanist colleague gave an unexpectedly hostile response to his efforts at chemically eliminating weeds from a lawn at a hospital garden for convalescents: he “scoffed at me and scurried away.” The second was a health wake up call less than a year later, when his doctor asked about his use of lawn chemicals:

> In 1993, after a spring of frequently applying *Weed ‘n’ feed*, I began suffering nosebleeds and shortness of breath at the end of each workday. “Do you work with chemicals of any kind?” he asked. “No,” I replied. “I mow lawns for a living, the same thing I’ve been doing off and on since junior high school.” My doctor immediately ordered me to cease applications of lawn chemicals, and coincidentally or not, my health problems went away. My company ended all lawn chemical applications by the Spring of 1994, and it has been part of my mission in life ever since to research and present alternatives.221

Fortunately for Paul, owning and controlling a business gave substantial discretionary power to change his approach. Thus he could maintain the use of a particular means (the business), and direct it towards more plural ends: his health, the health of the land and his business. One of my interviewees, Peter, had similar health reasons for reducing chemical use, but in his case family tragedy had focused attention upon them:

> Mum and dad were dairy farmers on South Coast before they came here. My father died and that's what brought us back out here- he died of chemical poisoning... [The chemicals] were all safe back when he was a farmer [joke]. There was no safety rules.... Dad...didn't know any

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221 Ibid.
different. Since that, I suppose, that started me on the line that we’re looking at: We shouldn’t be using this sort of stuff. I’ve taken the approach that, y’know, *What are we as farmers? What’s our job? And our job is to produce food for our fellow man…. The important thing is to produce a quality product that you can eat: I suppose that’s where I’m coming from.*

In this account, the farmer broaches the topic of the ultimate goals of farming, without prompting, very early on in the interview: goals that extend beyond productivity towards nourishment. These broader themes form the backdrop to his personal story.

Many practitioners feel trapped, unable to change their practices even if they are personally inclined to do so. I phoned Trevor, who, along with Peter’s son, was a fellow student of the *Soil Food Web* course, several months after we studied together, to inquire about whether his approach to work had changed. As a garden maintenance business owner, he expressed regret that he was unable to shift to the chemical-free methodology taught in the course, due to fears of not being able to deliver with what clients expected. The expectations of clients, formed by home garden design trends and social norms, exert disciplinary force. Ordinary workers are even further removed from the capacity to change methods than this business owner was: only the possibility of a consultative boss or a good union may provide an avenue to make a change.
2.11 Conclusion

Land in Australia is overwhelmingly managed according to one of three implicit and rigid aims: to produce large volumes of food or fibre for sale in markets; to produce a functional surface for sport or recreation (for example to create a uniform golf green surface); or to maintain a particular aesthetic (for example a neat garden). These goals are weakly related to the wellbeing of soil ecosystems: only insofar as they depend on functional ecosystem for their realization.

Instrumental rationality, inhabited through routine technical practices, can foreclose the possibility of a cooperative relationship between land stewards and soil ecologies. Alternative epistemic and ontological stances towards the land and towards technologies are supported by organisations such as Landcare, facilitating a public for the grassroots sharing of practical knowledge of soil and landscape care. Empowered and responsive orientations to the land and to technology can be found in the recovery of the ideal of craft, supported in practices of tinkering. Such stances can be supported through more robust public debate, reflection and discussion regarding the implicit goals of farming and technology, leading to cultural change of making adoption of such goals more intentional rather than defaulting to market logics which are proving to be decreasingly compatible with supporting healthy ecologies.
Chapter 3: Regenerative land stewardship

In this chapter I will explore the concept of regenerative land stewardship, as it is understood by organisations using the concept. I will give an overview of several types of regenerative agriculture, tracing their global influences, as well as some of the justifications behind these methods, some of them more contested than others. Then I will describe in detail two Australian case studies: a golf course and a sheep and wheat farm, from my fieldwork, in which soil microbiology is focused upon as a domain of care, and monitored through the use of microscopes and other tools. I finish by reflecting upon the way that my learning has changed the way I see and relate to local landscapes and parks in Sydney, with reference to experiences in suburban spaces of both control and wildness, and conversations shared with a local artist, who has undertaken many ecologically-minded interventions into parklands.

Figure 5: A march in Oakland, California, Source: Peg Hunter, November 21, 2015

3.1 Definitions of regenerative land stewardship

The concept of sustainability is often understood (particularly in business discourse) in a thin sense as the ability to maintain a specified practice, institution or form of production, into the future in an environment of limited resources. The work of regeneration shifts our focus towards the sources of generativity, ecological integrity and vitality, such that an agroecosystem is not depleted over time. This draws attention towards factors such as energy flow from plants to other species, and the health of biogeochemical cycles that make water and nutrients available, as well as the topographies and material textures that perform functions such as channelling and holding water.

Regenerative land stewardship involves improving the species diversity, relationships and ecological integrity such that assemblages of species interact in ways in which they produce beneficial emergent properties. It enhances the land’s capability to perform functions that are beneficial for many species, harnessing the roles of “ecosystem engineers,” such as fungi and worms, by creating conditions that support their proliferation.

Unlike 'restorative' the term ‘regenerative’ does not point to an idealised past or to a mythical equilibrium point; it does not idealise nature as pure or whole, and unlike 'conservation' it does not imply a governing mentality of caution and thrift: rather it focuses on generativity: the production of living matter, particularly plant matter, which feeds broader ecosystems, a multiplicity of secondary and tertiary relations, with redundancy built into the system, as well as the transformation of dead matter.
into soil-based forms that can be recycled and used by the ecosystem.

The Rodale Institute in the United States defines “regenerative organic agriculture” thus: “Regenerative organic agriculture improves the resources it uses, rather than destroying or depleting them. It is a holistic systems approach to agriculture that encourages continual on-farm innovation for environmental, social, economic and spiritual well being.”

Touching on similar themes, with a mention of technology, Regeneration International (a project of the Organic Consumers Association, globally focused but based in the US) states: “The key to regenerative agriculture is that it not only “does no harm” to the land but actually improves it, using technologies that regenerate and revitalize the soil and the environment.”

Soils for Life, an Australian non-government organisation, defines “Regenerative landscape management” as “the application of techniques which seek to restore landscape function and deliver outcomes that include sustainable production, an improved natural resource base, healthy nutrient cycling, increased biodiversity and enhanced resilience. These outcomes benefit not only primary producers, but also the community - environmentally, economically and socially.”

All these statements emphasise the improvement of landscape function. One point of difference to note is that while The Rodale Institute insists upon organic methods, Soils for Life is agnostic about this question. Soils For Life provides a list of techniques in its conception of regenerative agriculture:

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Applying organic composts, fertilisers and bio-amendments; encouraging natural biological cycles and nutrient transfer; adopting Holistic Management; implementing time-controlled planned grazing; using grazing management and animal impact as farm and ecosystem development tools; retaining stubble or performing biological stubble breakdown; constructing interventions in the landscape or waterways to slow or capture the flow of water; fencing off water ways and implementing water reticulation for stock; investing in revegetation; pasture cropping; direct-drill cropping and pasture sowing; changing crop rotations; incorporating green manure or under-sowing of legumes; managing for increasing species diversity; reducing or ceasing synthetic chemical inputs; integrating enterprises.\textsuperscript{226}

Almost all these practices share the common feature of providing enhanced habitat for delicate soil organisms, as well as maintaining conditions for healthy biological decomposition.

A different formulation of practices of soil care focusing on the human relationship with the soil surface can be found in the following principles in a Facebook meme propagated by \textit{Soil Solutions}, a project of the US-based Center for Food Safety:

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{facebook_meme.png}
\caption{New Year 2017 Facebook meme summarising four principles of “better care” of soil ecosystems.\textsuperscript{227}}
\end{figure}

\textsuperscript{226} Ib\textit{id.}

In this case, the main temporal and policy orientation for the “resolutions” and proposed “solutions” is sequestering carbon to address the climate crisis.

### 3.2 Roots of regenerative agriculture

Many old agricultural practices can be found among regenerative agricultural techniques. In some cases, farmers have revived their own culture’s peasant practices of coaxing abundance out of land using manures and cover crops. In other cases, cross-cultural knowledge transfer is facilitated through the production of texts that document agricultural practices of particular cultures, from data gained through field trips and from agricultural institutions.

Cover crops have been used for thousands of years, having been documented in 70 – 19 BCE by Virgil in his *Georgics*. Legumes in particular were widely grown in the ancient Roman world as a soil fertiliser. They also were used in Asia, as documented by F.H. King:

> Centuries of practice had taught the Far East farmers that the culture and use of [legumes] are essential to enduring fertility, and so in each of the three countries the growing of legumes in

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rotation with other crops very extensively for the express purpose of fertilizing the soil is one of their old, fixed practices.\textsuperscript{230}

King, an American agricultural physicist, undertook fieldwork in East Asia in the early 1900s, learning about traditional farming practices, and wrote the book \textit{Farmers of Forty Centuries}, which influenced the Western organic agriculture movement. He notes the extreme resistance by scientists in Europe to accept the theory that bacteria associated with legume roots maintain soil nitrogen:

\begin{quote}
It was not until 1888, and then after a prolonged war of more than thirty years, generated by the best scientists of all Europe, that it was finally conceded as demonstrated that leguminous plants acting as hosts for lower organisms living on their roots are largely responsible for the maintenance of soil nitrogen, drawing it directly from the air to which it is returned through the processes of decay.\textsuperscript{231}
\end{quote}

Indian soil enrichment practices inspired some of the key thinkers of the early English-speaking Organic movement. Sir Albert Howard spent several decades as director of the Institute of Plant Industry, Indore, and Agricultural Adviser to States in Central India and Rajputana, documenting the traditional practice of composting (now known as the \textit{Indore} method) in addition to many other farming techniques.\textsuperscript{232} Lady Eve Balfour, the founder of the UK soil association, who wrote a book entitled \textit{The Living Soil},\textsuperscript{233} was greatly inspired by Howard, helping to popularise these techniques in England.

In 1901, Prince Pëtr Kropotkin, the Russian philosopher best known for his debates with Karl Marx and his early articulation of anarchist philosophy, gives a great early

\begin{footnotes}
\item[231] Ibid.
\item[233] Eve Balfour, \textit{The Living Soil}. (London, Faber & Faber, 1943).
\end{footnotes}
description of a type of agriculture very similar to what we would call regenerative agriculture. He particularly notes its soil-building capabilities, summarising paradigmatic differences with more chemically-oriented agriculture thus:

While science devotes its chief attention to industrial pursuits, a limited number of lovers of nature and a legion of workers whose very names will remain unknown to posterity have created of late a quite new agriculture, as superior to modern farming as modern farming is superior to the old three-fields system of our ancestors. Science seldom guided them, and sometimes misguided—as was the case with Liebig’s theories, developed to the extreme by his followers, who induced us to treat plants as glass recipients of chemical drugs, and who forgot that the only science capable of dealing with life and growth is physiology, not chemistry...they proceeded in the empirical way; but, like the cattle-growers who opened new horizons to biology, they have opened a new field of experimental research for the physiology of plants. They have created a totally new agriculture. They smile when we boast about the rotation system, having permitted us to take from the field one crop every year, or four crops each three years, because their ambition is to have six and nine crops from the very same plot of land during the twelve months. They do not understand our talk about good and bad soils, because they make the soil themselves, and make it in such quantities as to be compelled yearly to sell some of it: otherwise it would raise up the level of their gardens by half an inch every year.  

Kropotkin insightfully points out the difference between approaching the study of life through the prism of physiology versus chemistry, stating a clear preference for physiology. He also contrasts ‘science’ and 'proceeding empirically,’ with the latter more oriented towards 'working reason.' He mentions that such farmers build new soil, a phenomenon that is widely affirmed by regenerative farmers who I came into conversation with, but is often not recognised by many scientists who mostly

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234 Kropotkin, *Fields, Factories, and Workshops*, 60.
understand pedogenesis (soil creation) as a product of rock weathering, thus occurring at geological time scales.

We can see even from a superficial glance at the above sources that early forms of modern regenerative agriculture were documented and popularized in Europe by scientists sent on official business by major geopolitical powers, as well as people with family backgrounds as feudal elites and landed gentry. It is interesting to think about the concurrent decline of feudalism with the rise of capitalism, and the rise of anxieties about capitalist land use among those who lost their privilege as capitalism began to reign supreme (although Kropotkin’s political commitments made him an opponent of the feudal regime that had given him privilege).

Masanobu Fukuoka, another influence upon the modern Western organics movement, and like Howard, a disenchanted scientist, developed “Natural Farming,” which he sometimes called “Do-Nothing farming,” around the mid 20th century. This was informed by Zen Buddhist concepts and by traditional Japanese agricultural practices. In a 1982 interview with Mother Earth News, Fukuoka explains his method thus:

> It actually involves a process of bringing your mind as closely in line as possible with the natural functioning of the environment. However, you have to be careful: This method does not mean that we should suddenly throw away all the scientific knowledge about horticulture that we already have. That course of action is simply abandonment, because it ignores the cycle of dependence that humans have imposed upon an altered ecosystem. If a farmer does abandon his or her "tame" fields completely to nature, mistakes and destruction are inevitable.

> The real path to natural farming requires that a person know what unaltered nature is, so that he or she can instinctively understand what needs to be done—and what must not be done—to work in harmony with its processes.235

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Fukuoka supports a minimalist approach to intervention, working to support emergent forms of ecological order. He argues for no tillage, fertiliser, pesticides, weeding or pruning. Such cooperation with nature can be learned over time through careful observation and applied instinctively.

Regenerative agricultural practice has a rich global heritage from both the Global South and the Global North, which is only partially documented. There is a large overlap here with Permaculture, an ecological design system developed in Australia, which has similar global roots in peasant knowledge and indigenous practices around the world, a point made by the editor of *Permaculture* magazine:

> It was not really ‘invented’ by two Australians, Bill Mollison and David Holmgren, in a bolt of enlightenment. I believe it evolved, and was coded from, protracted study of perennial systems in agroforestry, tree cropping, Yeoman’s keylining and specifically Bill’s interaction with, and observation of, Aboriginal and other indigenous peoples and their practices wherever he travelled. These ways of observing and working with nature are the legacy and heritage of indigenous peoples all over the globe.

An ecological orientation to the land often involves recognising alternative forms of order to the straight rows of highly controlled monocultures. The anthropologist James C. Scott describes the reaction of British agricultural extension agents in the nineteenth century to indigenous field crops in tropical West Africa thus:

> Visually, the fields seemed a mess: there were two, three, and sometimes four crops crowded into the field at a time... the assumption was that the cultivators were themselves negligent

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237 Maddy Harland, “Permaculture & Indigenous Cultures” *Permaculture*, 21 May 2015 https://www.permaculture.co.uk/articles/permaculture-indigenous-cultures
The extension agents set about teaching them proper, “modern” agricultural techniques. It was only after roughly thirty years of frustration and failure that a Westerner thought to actually examine, scientifically, the relative merits of the two forms of cultivation under West African conditions. It turned out that the "mess" in the West African field was an agricultural system finely tuned to local conditions. The polycropping and relay cropping ensured there was ground cover to prevent erosion and capture rainfall year-round; one crop provided nutrients to another or shaded it; the bunds prevented gully erosion; cultivars were scattered to minimize pest damage and disease.

Similar techniques of maintaining ecological (rather than imposed) order can be seen in modern forms of regenerative agriculture, particularly in the planting of biodiverse ground covers as cover crops, and in the use of tree crops as shade in agroforestry.

**Regenerative grazing**

Some more modern techniques of regenerative agriculture include Holistic Management, “Holistic Planned Grazing,” “cell grazing” or “pulse grazing,” all of which have been taken up enthusiastically by graziers in Australia. Developed in Zimbabwe by Allan Savory, a former parks ranger (and Stan Parsons who developed cell grazing), holistic planned grazing is based on Savory’s close observations of wildlife including the disturbance patterns of large migrating herds. This is a method for those climates that have low and irregular rainfall, what Savory calls “brittle zones,” and it uses large herds of ruminant animals timed very precisely (according to grass recovery times) to initiate a change in the chemical process of decomposition taking place on the land. According to its proponents, intense “pulses” of grazing can break a vicious cycle of soil decline by which vegetation dries out and is unable to decompose except through

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weathering. The composting that the land surface alone is unable to accomplish instead takes place in the gut of the herbivore, and when manure is deposited, it fertilises the grasses that will regrow after the disturbance.

To perform such techniques well require a high degree of training, experience and detailed monitoring of the land, as Terry McCosker emphasises:

Nobody can claim to be cell grazing unless at least the first 5 principles are followed strictly and in priority order. Experience over the last 10 years shows that it takes several training events and 3-5 years practice at running cells, to competently manage cell grazing. It is therefore not for the faint hearted or those unwilling to invest in training. The principles are:

1. Control rest to suit the growth rate of the plant
2. Adjust stocking rate to match carrying capacity
3. Plan, monitor and manage the grazing (includes recording grazing movements, stock types etc.)
4. Use short graze periods to increase animal performance
5. Use maximum stock density for the minimum time
6. Use diversity of plants and animals to improve ecological health
7. Use large mobs to encourage herding.

Advocates of holistic management and similar techniques claim to be able to sequester more carbon than the methane emitted by the ruminants involved, provided that the animals are entirely pasture raised, and that the soil microbial ecosystems are healthy. Steven Rich in *Range Magazine* explains that rapid soil carbon sequestration requires careful timing of disturbance events to promote the transformation of dead roots into humus:

If practiced primarily to sequester carbon, pulse grazing is a careful process of timing grazing

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(or haying) events to optimize rates of root death and replacement so as to stuff as much carbon into soils as possible. For the purpose of rapidly increasing soil carbon, plants are grown tall and then grazed fairly short. Next, their regrowth is monitored and timed to let the plants fully recover before grazing prunes their roots again.\textsuperscript{241}

However the carbon sequestration claims of timed grazing are controversial. While Allen and others in a study funded by the CSIRO found no soil organic carbon benefit to cell grazing compared with continuous grazing and exclosure,\textsuperscript{242} a different conclusion affirming the sequestration capacity of the method was reached by W. Richard Teague and others: “ruminants consuming only grazed forages under appropriate management result in more C sequestration than emissions.”\textsuperscript{243} In an earlier study by Teague and others, multi-paddock rotational grazing was found to significantly improve fungal mass as well as fungi: bacteria ratio improving carbon sequestration and water holding capacity.\textsuperscript{244} Yet this method is also controversial in terms of its ecological impact: there are many ecologists who dispute the claims that holistic planned grazing produces ecological benefits in the manner claimed.\textsuperscript{245}

Like most techniques of land stewardship, holistic management is not a “one size fits all” method, and the appropriateness of holistic management for any particular location would need to be considered on a case-by-case basis, and monitored over time. Furthermore the method also must be adapted to each environment. There is a

\begin{footnotes}
\textsuperscript{244} W.R. Teague, S.L. Dowhower, S.A. Baker, N. Haile, P.B. DeLaune, D.M. Conover, “Grazing management impacts on vegetation, soil biota and soil chemical, physical and hydrological properties in tall grass prairie,” \textit{Agriculture, Ecosystems and Environment} 141 (2011) 315.
\end{footnotes}
strong emphasis in holistic management training on the process of defining a *holistic context*, which brings particular human and ecological needs evident in the farm context into central focus. This management for multiple goals means that while much of the rhetoric surrounding the public narrative of holistic management focuses on profit, in practice, the goal of profit is de-centred by the broad goals defined as part of the holistic context.

**The System of Rice Intensification**

![Rice grown using the System of Rice Intensification method (left), and rice grown using conventional methods (right). Source: Weblog Padi Selangor.](image)

An ecological farming method now adopted and adapted to the local contexts of over 41 countries is the System of Rice Intensification (SRI). According to its main academic proponent, Norman Uphoff, SRI can “raise irrigated rice yields to about

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double the present world average without relying on external inputs.\textsuperscript{248} It is now being modified as a method for wheat production.\textsuperscript{249} Developed in 1983 by a French priest,\textsuperscript{250} in Madagascar, SRI has been “largely a civil society innovation, embraced by hundreds of national and local level NGOs as well as many international NGOs, [as well as] the governments of Cambodia, China, India, Indonesia, and Vietnam—where over two-thirds of the world’s rice is produced—[giving] explicit endorsement of SRI methods in their national food security programs.”\textsuperscript{251} SRI transforms rice growing to encourage ecological relationships in the soil in several ways. The roots are only ever immersed in water for less than one week, to ensure that they don’t begin to decompose anaerobically. For most of the growing season, the rice is barely flooded at all, and even then, only for a few centimetres, and only at night. This is to enable more oxygen to reach the roots, to promote the growth of aerobic microbial relationships. It also has a substantial beneficial consequence in reducing the output of methane from rice paddies by 30%, due to the reduction in methanogens, methane producing bacteria, and the increase in methanotrophs, methane-consuming bacteria.\textsuperscript{252} As the soil progressively develops a robust ecosystem through use of this technique, growers thin the density of plants - still gaining the same output of rice per square metre but


\textsuperscript{250} SRI is in many ways also a product of the Global North, in that it was developed over two decades by a French Jesuit priest in Madagascar, Father Henri de Laulanié, and popularised by Dr. Norman Uphoff from Cornell University. System of Rice Intensification, India, “About SRI” http://www.sri-india.net/html/aboutsri.html


with more ecological benefits, such as water filtration and increased nutrient availability.

**Natural Sequence Farming**

Natural sequence farming, developed by Peter Andrews, is a method of farming that utilises the depositional power of water for the purpose of soil renewal. It is greatly influenced by P.A. Yeomans, a much earlier Australian regenerative farming innovator and minimal-till plough inventor, as well as author of the book *Water for Every Farm.* Much land degradation occurs through erosion: Natural Sequence Farming encourages its opposite, deposition, through creating as many obstacles as possible to the flow of water overland, slowing down the velocity of water flow and creating shallow watercourses. This creates fertile flood plains. Andrews sometimes calls his method a “wetland” approach to farming. The method resembles the functioning of wetlands in filtering water, making the water that runs off properties that practice the method far clearer than the water that runs into them. Such filtering helps to remove excess nitrogen and other dissolved substances, in a similar manner to the impact of beaver-built dams in North America. Andrews battled to win recognition. Media appreciation for his work was easier to achieve than support from establishment science. Peter saw Tarwyn Park as a testing ground, a piece of public science: the whole point is that it can be replicated, that it was not irreplaceable: it could forge a path for others to follow.

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253 Andrews, *Back from the Brink.*


I visited Peter Andrews’ farm, *Tarwyn Park*, as part of a Soils for Life field day. Andrews showed us how he uses weeds for many purposes: to indicate soil mineral needs; as “scabs” that stabilise and protect disturbed soil; as mineral scavengers able to obtain trace elements from soil depths; as rotational crops able to remedy soil deficiencies; as sources of nutrients if slashed, gathered and left to decompose on higher points in a landscape so as to distribute nutrients downhill; as obstacles that can slow water flow, especially if planted in streams. He taught us to keenly observe topography. Using a bale of hay and a hose, Andrews demonstrated the erosive and depositional qualities of landforms, even those that on first glance appear flat. Andrews also uses earthmoving equipment to mould the land so to slow water flow and maximise its replenishing capabilities.

Figure 8: Peter Andrews demonstrates the erosive and depositional power of water. Source: Anne O’Brien, 14 April 2014.
The Soil Food Web method

Another method of regenerating soil is the Soil Food Web Institute’s method of applying compost tea, developed by Elaine Ingham, a soil microbiologist from the United States. Ingham claims, “Pests, diseases and lack of fertility don’t exist anymore if you get the biology correct in your soil.” The institute which she founded teaches composting, compost tea brewing and microscopy, so that land stewards can develop skills of tailoring particular biological compositions to requirements of a crop or the soil, and exercising quality control of the compost tea they produce. After brewing tea, practitioners examine it under a microscope, and undertake a census of the different species groups that have grown, to get a picture of the biological composition of the tea. The method aims to build the robustness and diversity of the soil ecosystem, however it can be very hard and fiddly work, and it also requires inputs of relatively expensive and resource-intensive fish hydrolysate, as well as seaweed, mineral extracts and many other ingredients in order to “feed” the compost in a way that is favourable to the land steward’s purpose, and requiring a motor that will maintain aeration for a full 18 hours (otherwise the brew will be unusable). The beauty of this method is that large volumes of compost do not need to be made in order to inoculate the soil and to improve soil biology over large areas of land. Conventional farming machinery can be fitted with compost sprayers, and thus compost tea can be applied during planting or during other routine tasks. What matters is building a good living system in the soil, a principle articulated well by American farmer Dan Kittredge:

> Once you get a good living system in your soil, it will build the nutrition you need... By living system I mean bacteria and fungi. There are presumed to be ten million species of soil bacteria,
and three million species of soil fungi. Typical cropland has about five thousand species, and we need at least twenty-five thousand for the plants to function anywhere near their potential.²⁵⁷

Kittridge’s language makes visible the work that soil microbes do in agriculture. Landscapes can increase their carrying capacity for many forms of life when soil biodiversity and carbon levels are increased. This is called “ecological intensification.” The United Nations has recently called for “a paradigm shift in agricultural development: from a ‘green revolution’ to an ‘ecological intensification’ approach.”²⁵⁸

Ecological intensification involves proliferating relationships of interdependence, so that different organisms are able to exercise mutual aid to produce goods shared by many.

3.3 Protecting and feeding soil: Permanent plant cover

Soil and other physiological entities such as the human gut must be able to constitute themselves in such a way that they can act coherently, receive resources and use them, build and preserve their capabilities to circulate, hold and transform water, minerals and the products of photosynthesis, protected from the elements, preferably with an intact surface, a living “skin” to protect it from the elements. Even ‘low till’ and organic farming methods in their most common forms can neglect the needs of soil ecologies and thereby destroy soil integrity. The standard regime of practice for low or no-till cropping still requires the spraying of herbicides such as glyphosate to eliminate

²⁵⁷ In Schwartz, Cows Save the Planet: 102.
weeds. Over 110 million hectares worldwide are now managed through ‘no till’ practices. On the other hand, organic farming withholds herbicides and other chemicals, but often involves regular tilling to eliminate weeds. Both tilling and chemical use damage soil structure and biodiversity, particularly impacting mycorrhizal fungi, as I have mentioned. A lack of ground cover exposes soil surfaces to harsh sunlight, drying out and oxidising carbon, thus releasing it to the atmosphere, and also starving the soil microbes of the sweet food of liquid carbon from photosynthesis that the plant secretes in order to build relations. The following still image from a YouTube documentary displays the slogan “Soil is meant to be covered” embroidered on the presenter’s hat, encapsulating the growing conviction among regenerative farmers that avoiding disturbance of the soil surface is crucial:

![YouTube video](https://www.youtube.com/watch?v=xgy9ArBpNil)

*Figure 9: Online video explaining reciprocal relations between plants and soil, which encourages farmers to enable such exchange through modifying their practices. Source: Kloot 2014.*


While soil is sometimes popularly understood of as the “skin of the earth,” a more accurate analogy is that plant cover is the skin of the soil. Kristin Ohlson, author of the book *The Soil Will Save Us* explains, "When the ground is bare, that partnership [between soil microbes and plants] is broken." Conventional cropping methods particularly of annual crops involve regimes of practice that rely on regular disturbance of the land, that Wendell Berry describes as “keep[ing] the land in a state of emergency.” Annual plants tend to grow naturally during the initial stages of succession after disturbance, rather than at later more stable stages closer to a climax community. Wendell Berry and his scientist colleagues at The Land Institute in the US have for many years worked to select and breed perennial grains, which do not require land disturbance, patenting the wheatgrass grain *Kernza*, which recently reached markets in the form of “Long root Ale,” fermented from Kernza. Perennials in the form of Australian native grasses are also at work in Colin Seis, Darryl Cluff and Christine Jones’ method of “pasture cropping,” with this picture showing the maintenance of continuous ground cover with perennial native grasses while producing crops such as the peas here:

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262 Tilling and cultivating the earth came to be associated with the care of the earth, a norm that has been fundamentally challenged by the rise of “low till” or “no till” methods. See for example, David R. Huggins and John P. Reganold, “No Till: The Quiet Revolution” *Scientific American* July 2008, 71-7.

I visited Seis’ farm, Winona, near Gulgong, NSW, as part of a field day with Mudgee Microscope Group, in which he gave a presentation and a tour of his fields, alongside Dr Peter Ampt, who presented his research documenting the work of “innovative farmers” in improving key landscape function characteristics observable at the soil surface, particularly the “stability, water infiltration and nutrient cycling” capacities of the soil. Seis has achieved Carbon bio-sequestration rates of up to nine tonnes per hectare per annum, plus significant improvements in the water holding capacity, nutrient dynamics, biodiversity, and resilience to climate stress of the land, with a

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203% increase in soil carbon over ten years, along with a $120,000 reduction in the annual cost of inputs.\textsuperscript{266} Seis’s approach involves very minimal disturbance of the soil, using a modified scarifier with fine steel discs cutting narrowly through the mulch to very gently plant annual seeds directly into perennial grassland during its Winter dormant period. The same machine also applies compost tea.\textsuperscript{267} He also uses herbicide once during winter to keep weeds down. The modified machinery can be seen in the following image:

![Figure 11: Modified scarifier used by Colin Seis to plant annual crops into perennial pasture. Source: George Main, 2014.\textsuperscript{268}](image)

Colin Seis describes the other part of this method, whereby cell grazing is carried out on the pastures:

Pulsed grazing is based on the cell grazing principle of large mobs of sheep, in this case, 2000 per mob, that rotate around a number of smaller sized paddocks [average 20 ha]. The sheep


\textsuperscript{267} These details are described by George Main, “Machinery for Ecological Thinking” The People & Environment Blog, National Museum of Australia, 19 December 2014. https://pateblog.nma.gov.au/2014/12/19/machinery-for-ecological-thinking/

\textsuperscript{268} Ibid.
are moved every 4-6 days and this creates a rest period of 70-90 days before each paddock is re-grazed. This grazing method has significantly increased the number and density of native perennial grass species in less than two years.269

Along with increased diversity of native grasses, other qualities have improved on Seis’s land, such as the abundance and diversity of insects. George Main writes, “Inside the paddocks of Winona, insects numbers have increased six fold, and insect diversity by one quarter, since Colin began pasture cropping in the early 1990s.”270 Thus there are biodiversity benefits to these methods at many levels, providing food sources and hospitality for many more creatures than conventional farming allows.

3.4 Soil as ecological infrastructure

The future-orientation of life lies in its ability to consolidate matter, form, experience and liveliness from the past in a way that produces emergent properties including resources for the future. This is an inter-generational, inter-species infrastructure creation, what Maria Puig de la Bellacasa calls an “infrastructure of bios” or bioinfrastructure.271 As she points out, referring to the “infrastructure” of soil can help to highlight the work that soil organisms do. Puig de la Bellacasa writes, “If we understood and acknowledged an infrastructure before it broke down and back up measures kicked in, we might be able to avoid some of the devastating effects of its breakdown.”272 Like other infrastructures, soil is crucial and yet generally “taken for

270 Ibid.
272 Ibid., 11.
granted,” receding from view, especially when it is functioning as expected, a feature that Heidegger calls “ready to hand.” The term “bioinfrastructure” could articulate a similar but less anthropocentric concept to the term *ecosystem services*, if the *bios* of the bioinfrastructure is understood as both a recipient and a provider of such infrastructure. Of course we could perform the same conceptual work on the term *ecosystem services*, it would just take more work to challenge and resignify this term. The organisms of soil bioinfrastructure perform many types of work, imparting nutritional value to vegetative material, building the “soil sponge” that stores and purifies water, building conduits through which resources are transported through the soil, building soil architecture by facilitating the aggregation of mineral particles, breaking down toxins, regulating global climate patterns through stabilising carbon.

Like public utilities, bioinfrastructure needs to be allocated resources for maintenance, with regular check ups, modifications and repairs undertaken.

A similar concept to “bioinfrastructure” is “green infrastructure:” ecological features built into urban landscapes, performing functions such as storm water purification, urban runoff reduction, silt collection, flood reduction, storage and groundwater recharge, often built next to road verges or in culverts. These are designed assemblages of plants, soil and built elements that produce a “soil sponge” through the selection of plants with vigorous spreading root systems such as sedges and grasses. Local councils such as the Inner West Council and City of Sydney Council; the

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Australian Capital Territory government as well as flood-prone housing developments such as The Ponds shown in Figure 12 managed by Urban Growth NSW have devoted funds to green infrastructure, producing benefits that are familiar to all who champion healthy soil, such as healthy waterways due to reduced nutrient runoff and increased ecological robustness. In this case the term “infrastructure” in green infrastructure is used in its conventional sense, as a human-designed amenity serving policy goals, funded and constructed by government. The term recognises the public benefits produced by the healthy functioning of robust ecosystems, acknowledging the capabilities of such ecosystems.

Figure 12: Flood prevention “green infrastructure” made of reeds, sedges and other monocotyledons such as Lomandra. The Ponds Housing Development, Western Sydney. Source: Anne O’Brien, 10 April 2013
Of the images of soil that I have seen over the years of writing my thesis, one stands out as revealing soil bioinfrastructure and the contingency of its functioning in a most striking way. It arrives to us via the highly specialised technology of Magnetic Resonance Imaging (MRI) - a medium that often discloses bodily information of humans: this time it reveals the 'body' of the earth.

Figure 13 compares two soil core samples: one that has never been driven over by a vehicle [control] and another that was driven over by a vehicle over a decade ago. The contrast is striking. A single event of heavy downward force from the car resulted

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276 Lyseng, “CT scan tech used to check soil health.”
in a loss of oxygen and water circulation in those soil zones and in turn, a loss of underground biomass. The intricate pore structure of the soil is damaged, thus aerobic soil organisms will not be able to obtain oxygen, and lateral transfer of water is reduced, transmitting rain prematurely beyond the reach of plants. The writer comments: “It’s interesting that the initial X-ray imaging of soil cores was done with equipment intended for human use because the large, air-filled macropores in untilled soil often resemble the branching vessels of the human circulatory system.”

He quotes a news release from the Soil Science Society of America,

> Just as in the human body, this constriction of the soil’s circulatory system can have ill effects. Blocked and narrowed pores likely impede the diffusion of air through bulk soil. The dominance of vertical pipes in the compacted soil also suggests that water flows mostly downward, with relatively little reaching the surrounding soil matrix.

If this soil were an animal body, the loss of structure would be the functional equivalent of crushed ribs or vertebrae, compromising processes of breathing and circulation. No longer would space be protected for the full development and functioning of key organs. If this is at all representative of soil vulnerability in general, what has become of soils in the thousands of years since the invention of the wheel and the decades since the invention of synthetic biocides?

This image affirms regenerative farmer Peter Andrews’ view of the soil: "most people think that water can't move laterally through [the soil] but it has a whole series of veins through that allow that to happen.”

An ‘in-between’ zone, soil plays a major role in mediating the transfer of nutrients and water overland and into water tables.

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277 Ibid.
278 Ibid.
Bardgett and others argue that all soils, and soils of riparian zones in particular, qualify as *critical transition zones* between aquatic and terrestrial ecosystems.\(^{280}\) The life in the soil has a major impact upon the ability of these zones to hold and transport water underground. While much attention is devoted to the macro processes of water movement that take place on a catchment level, much less attention is focused on the small-scale hydrological interactions particularly of biotic elements in the soil.

### 3.5 The crucial role of fungi in soil

Fungi contribute greatly to soil’s coherence, its systemic “infrastructure” properties. Between 700-420 million years ago, a special partnership between algae or cyanobacteria and fungi enabled plants to commence living apart from the great oceanic world of life, on dry land.\(^{281}\) The fungus partner in these symbioses protected, hydrated, solubilised minerals for the plant, helping create soil through biochemically weathering rocks. The land at that time was covered with forests of towering fungi, *Prototaxites*, standing as tall as trees do today, which also helped to create soil.\(^{282}\) This soil helped form a new substrate and matrix for ever-more complex forms of vascular plant life, in turn making land more conducive to other life forms.

Several of the farmers I interviewed regularly monitor the biological composition of their soils, particularly measuring the Fungi: Bacteria ratio. For them, a high ratio of

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fungi is interpreted as a sign of soil health. Teague and others explain thus:

A higher fungal population increases the soil’s ability to hold C and other nutrients creating a more persistent microbial food source and nutrient pool. Fungi are also better able to buffer against low pH. Consequently, the fungal/bacterial ratio is a good indicator of environmental change and health in the soil and increases in fungal/bacterial ratios indicate improvement in soil health and C sequestration.\textsuperscript{283}

Yet mycorrhizal fungi in particular are extremely vulnerable when subjected to biocides such as glyphosate\textsuperscript{284} and to disturbance by tilling.\textsuperscript{285}

In his fascinating book, \textit{Mycelium Running: How Mushrooms Can Help Save the World}, Paul Stamets introduces readers to a complex underground world of fungal relationships: “the mycorrhizal, saprophytic, and endophytic mushrooms...benefit [plants] in 3 ways. These complementary mycological systems help plants survive starvation, dehydration, and parasitisation. The richer the fungus-plant partnerships, the more the organisms the habitat can support.”\textsuperscript{286} Central to Stamets' argument is the life-giving impact of saprophytes (decomposer fungi). A former forester, Stamets worked daily in the presence of forest fungi, and witnessed their generative activities in enriching, even creating the enabling conditions for certain forest ecosystems. Each time a tree lies rotting on a forest floor, he claims, it contributes far more to the ecosystem than it ever did while living. (And that is no mean feat!) He describes an instance in Oregon in which a single underground fungal mycelium covered a

\begin{footnotes}
\footnote{283} W.R. Teague \textit{et al}, “Grazing management impacts on vegetation,” 319.
\footnote{286} Stamets, \textit{Mycelium Running}, 34.
\end{footnotes}
horizontal area of 1,665 American football fields before the construction of logging roads restricted its extent through compaction and clearing. Throughout its life, the organism occasionally manifested pathogenic properties, “kill[ing] the forest above it several times over, and in so doing it has built deeper soil layers that allow the growth of ever-larger stands of trees.”

3.6 Soil structure as a common good.

In my gardening efforts while weeding on hot dry days, I would often be surprised by the contrast between the powdery texture of dry bare dirt and the rich, clumping aromatic soil that would cling to the roots of the weeds I pulled out. Thus I started to notice the water-holding properties of soil. I developed a practice of only planting seedlings when there was a weed to pull out, so I could use its damp patch of earth. I also began applying much more compost, which changes the texture of the soil by increasing organic matter and building its sponginess. Tim Marshall explains that this sponginess is due to the colloidal quality of compost:

Finished compost is dark in colour, moist, sweet smelling and colloidal. This latter term refers to its ability to hold water and nutrients. A colloid remains in suspension in water for a very long time, or indefinitely. For example, jelly crystals are colloids. They can absorb enormous quantities of water to form jelly, but it is not easy to squeeze water back out of them. Plant roots can extract water, and nutrients, from colloids. The colloidal properties of compost can be roughly demonstrated by rolling it into a tight ball in your hands. Break it up, and then roll it again into a ball. This can be done repeatedly, without loss of crumb structure, because of the colloids.

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287 Ibid., 49.
Marshall later writes, “Imagine what that sort of stability can do for your soil when it is
under pressure from walking (or driving on farmland), irrigation or rainfall,” which
prompts me to think about the MRI image of Figure 13. I wonder how much organic
matter was present in the soil sample affected by compaction, and whether its
resilience to the impact of the harvester would have been greater, had more compost
material been incorporated into the soil.

Sponginess in soil is a good indicator that the soil holds a considerable amount of soil
carbon. The carbon either enters the soil through the transformation of decomposing
matter into humic substances, or via living plant roots, which exude the products of
photosynthesis, via what regenerative farming expert Christine Jones calls “the liquid
carbon pathway.” Plants convert over 40 per cent of the energy produced by
photosynthesis to root exudates in order to attract companion species. Through
these channels of carbon excretion, whose extent defines the rhizosphere, plants both
feed an intricate soil food web, and communicate with those soil organisms. Figure 14
shows some of the signalling molecules: flavonoids and amino acids that attract
particular microbes:

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289 Robert E. Pettit, “Organic matter, humus, humate, humic acid, fulvic acid and humin: Their
importance in soil fertility and plant health.” Humates.com Accessed 4 November 2016,
290 Christine Jones explains the concept of the “Liquid Carbon Pathway” in an article, “Liquid carbon
pathway unrecognised” in the now-discontinued Australian Farm Journal 338 (2008). Article accessible
at AmazingCarbon.com http://www.amazingcarbon.com/PDF/JONES-LiquidCarbonPathway(AFJ-
July08).pdf. In it she draws upon the following two articles:
M.F. Allen, “Mycorrhizal fungi: highways for water and nutrients in arid soils,” Soil Science Society of
America, Vadose Zone Journal 6, No. 2 (2007) 291-7. www.vadosezonejournal.org and
Leake, J.R., Johnson, D., Donnelly, D.P., Muckle, G.E., Boddy, L. and Read, D.J. “Networks of power and
influence: the role of mycorrhizal mycelium in controlling plant communities and agroecosystem
291 Mike Amaranthus, Larry Simpson, Jeff Lowenfels, “Making the Most of Microbes: Tiny Soil Organisms
Provide Big Soil Health Benefits,” Reprinted from Acres USA 42, No. 10, October 2012,
While some of the sugars are consumed and resired as CO₂ in the short term, some is stabilized long term by mycorrhizal fungi into glomalin. Many regenerative farmers emphasise the importance of both glomalin and humic substances in building new soil and soil carbon. These are stable compounds that can last in soil for hundreds of years. Some people who have worked with soil biology for a long time have high hopes of the capabilities of the land to sequester carbon and be a part of efforts to curb dangerous climate change. Graeme Sait of Nutri-tech solutions in Queensland is one of them. He writes:

The loss of 70% of our soil humus over the past 150 years has contributed 470 gigatonnes of CO₂ to the atmosphere. All of mankind’s other enterprises, including industry and transport,

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have contributed 270 gigatonnes of CO$_2$. Agriculture has been the big culprit and it will also prove to be the savior as no one else can save the day in time. Humus is built from CO$_2$ that would otherwise be in the atmosphere. If we increase soil organic matter levels by 1% in US croplands, for example, we capture 4.5 billion of the 8 billion tonnes of CO$_2$ that the Americans release each year. This is the only strategy, at this stage that is capable of halting or reversing climate change.\textsuperscript{293}

While I applaud Sait’s clarity of purpose and argument, I disagree that soil sequestration is “the only strategy.” Such thinking can undercut the efforts of campaigners to transition away from fossil fuel dependence. Soil sequestration should be promoted as a complementary, not competing strategy to a transition away from fossil fuels, and to this end, land-based sequestration should not be classified as “offsets,” relieving pressure upon the fossil fuel industry.\textsuperscript{294} Thus I am critical of Australia’s current Carbon Farming Initiative policy, because it is founded on a conceptualisation of sequestration as providing offsets to pollution elsewhere. I am undecided on the question of whether farmers should be paid by government to build carbon in the soil: certainly it would help with a rapid uptake of sustainable methods, making banks more likely to issue loans to land stewards considering a transition away from chemical-intensive methods towards low-input methods that build soil carbon. However land-based carbon accounting systems have had many methodological issues with measurement and quality assurance. Many activists also distrust land-based carbon offsets because they see it as a process of commodifying nature at the same time as diverting attention and political will from phasing out fossil fuel dependence.


\textsuperscript{294} Soil sequestration may be also threatened by future temperature rises, depending on how heat-sensitive soil carbon is.
Carbon sequestration through soil carbon may avoid some of the negative impacts of forest plantations, which generally are incompatible with other agricultural uses of the land, and must stay in place for 100 years (though soil carbon must be maintained through continuous stewardship, otherwise carbon can be easily oxidised).

Figure 15: Grass plant with roots showing soil aggregates attached. Source: Anne O’Brien 24 May 2013.

Whenever I pull particular grasses from my pot plants, I am intrigued by the clumps of soil that cling to their roots. Some of these clumps, or aggregates are pictured in the photograph above. Aggregates are the “fundamental unit[s] of soil function,” according to Christine Jones. They are formed by glues, mainly synthesised by mycorrhizal fungi associated with minimally disturbed and non-biocide-affected plant

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Grasses are known to readily associate with mycorrhizal fungi. Jones continues:

A great deal of biological activity takes place within aggregates. For the most part, this is fueled by liquid carbon [the products of photosynthesis]. Most aggregates are connected to plant roots, often to very fine feeder roots, or to mycorrhizal networks unable to be detected with the naked eye. Liquid carbon streams into the aggregates via these roots or fungal linkages, enabling the production of glues and gums that hold the soil particles together. If you gently lift a plant from healthy soil, you’ll find aggregates adhering to the roots.

An aggregate creates a variety of habitats for different microbes—both anaerobic and aerobic. Micro and macro-aggregates in healthy soil can be seen as bioinfrastructure serving a wide diversity of organisms, at all scales from the microscopic to the global.

Six and others write,

Aggregates not only physically protect soil organic matter [SOM] (e.g. Tisdall and Oades, 1982), but also influence microbial community structure (e.g. Hattori, 1988), limit oxygen diffusion (e.g. Sexstone et al., 1985), regulate water flow (e.g. Prove et al., 1990), determine nutrient adsorption and desorption (e.g. Linquist et al., 1997; Wang et al., 2001), and reduce run-off and erosion (e.g. Barthes and Roose, 2002). All of these processes have profound effects on SOM dynamics and nutrient cycling. Mycorrhizal and saprophytic fungi are the most important soil microorganisms involved in the formation and stabilization of aggregates, but also bacteria can have profound influences on aggregation, especially at the microscale.

Penetrating roots can mechanically break up existing aggregates, but they also stabilize surrounding aggregates through drying the soil and root exudation with its associated microbial activity.

Later on in the same paper, they summarise the work of Oades and Waters, who use a compelling metaphor for the role of the fungal mycelium: “The fungal mycelium has

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been described as a ‘sticky string bag’ because it entangles particles within the hyphae network and cements particles together through extracellular polysaccharide production.”²⁹⁹ Worms and termites can also play important roles in helping build soil aggregates.³⁰⁰ As long as the soil is not upturned, a portion of the carbon content will remain in a stable form.³⁰¹ If it is disturbed by ploughing, much of the carbon will be oxidised, and enter the atmosphere.³⁰² Soil aggregates are fed by plants via roots and mycorrhizae, connecting in a pattern that Tim Ingold calls a ‘meshwork.’³⁰³

3.7 Case Study 1: Golf Course, Mid-North Coast, New South Wales.

I peer through the lenses of the microscope and turn the fine focus knob. Suddenly a world comes into view. Long translucent filamentous threads extend from a black sphere. Tiny creatures scurry around, with larger ones occasionally entering the field of light. With the help of our teacher, the mass of dots and threads begins to differentiate. I learn to distinguish bodies and functional features. An energetically moving dot becomes a ciliate. Smaller dots are protozoa. A double line becomes a sprouted fungal mycelium. It extends across a quarter of the field of view. I scroll

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³⁰⁰ J. Six et al “A history of research...” 8
³⁰³ The earliest reference I can find to the term “meshwork” is by Stuart A. Kauffman, “Random Grammars: A New Class of Models for Functional Integration and Transformation in the Biological, Neural, and Social Sciences” SFI WORKING PAPER 20, (Santa Fe, Santa Fe Institute, 1990), 428. http://www.santafe.edu/media/workingpapers/90-020.pdf. My familiarisation with the term was initiated with Tim Ingold’s “Bindings against boundaries.” Manuel Delanda also refers to the concept, and cites the Kauffman paper.
across and follow it until I see the spore it has sprouted from.

It is the second day of the *Soil Food Web* course held in a cottage beside the facilities management sheds at Southern Cross University Lismore. My classmates and I are observing samples of the aerated compost teas that we have left overnight bubbling away. Each is a sign of a certain biochemistry that has expressed itself in the 18 hour period of the brewing, allowing some potentialities to become actual. Some organisms have multiplied, others haven’t. Some samples are healthy, diverse and aerobic, containing fungi, protozoa and adequate bacteria. Others are more sparse — and contain ciliates — a sign of anaerobic conditions created when a motor broke down, leaving the compost tea to stew. In the class we are told that if the brew is anaerobic, bacteria and yeasts will produce alcohol that is so detrimental to plant growth that roots will bypass the patch of soil on which the compost tea has been applied. While some bacteria and invertebrates will thrive in anaerobic conditions such as compacted soil, plant roots and fungi will not, and thus the patch of soil will lose its connectivity to fungal hyphae and plant roots.

For many of us, this workshop is an initiation to another world, opening the *black box* of soil microbiology for amateurs to learn from the microbes in their soils: their needs and how their presence or absence reveals characteristics about the soil itself. Some at the course have gained permanent access to microscopes, buying them as businesses or farmer groups (such as the Mudgee Microscope group and the Hawkesbury Microscope Group). I, perhaps unwisely, borrowed my late grandfather’s super-heavy microscope and luged it around in a backpack, copping a bodily beating in the process. Others engage with the microscope for this workshop only: to reconstitute
their black boxes, changing their everyday practices accordingly. Whether microbes remain in view or not, things will never be the same again. Our imaginations have been broadened. Microbes are now no longer a matter of fact: they are a matter of concern. Plant species selection, machinery and tool use, planting methods, water provision, fertilising, composting, pest control, harvesting and dealing with vegetative remains of crops now are considered in the light of impact on the soil food web.

Several months after attending the training course, I contact participants, following them up to see how they have implemented the microscopy and compost techniques in their work. I am invited to a golf course on the mid-North coast of NSW. Tom, the superintendent, has undertaken an extensive overhaul of their day-to-day practice. Biodiversity, at least at a soil level, is now regarded more as an ally than as a threat to their work. Compost tea is now brewed regularly and sprayed over the grasses.

Pointing to hundreds of pesticides, herbicides and fungicides listed on charts on his office walls, Tom explains the use of these chemicals is now reduced by 90 per cent, with health benefits for workers— they no longer must be tested yearly for health problems. Now that they are nourishing soil ecosystems under the greens, they are building organic matter and soil structure that buffers extremes of temperature by acting as a sponge, holding water. Tom says “We’re able to apply a lot less water— I haven’t watered for the last seven weeks... in years before, under the same weather conditions.”

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305 Tom’s name has been changed in accordance with the Human Ethics research protocol.
306 I have heard from personal testimony from a friend that there can also be health hazards from regular use of compost tea, arising from the numerous organisms in compost that are also human pathogens, so I do not mean to portray an entirely idealised picture of this different method of land stewardship.
conditions, we would have watered several times by now. Even on the fairways, there’s pure sand under the turf, and it’s starting to hold a lot more water.”

In the office, a microscope with its field of view displayed on a computer screen sits prominently on Tom’s desk. He points to a blurry thread: “That’s our first nematode there. I carried on like an idiot here when I saw it,” he says proudly. If you know gardening and agriculture, you’ll know how strange this sounds. Nematodes are usually seen as bad guys: they eat plant roots. The Soil Food Web Institute’s course taught us that the nematode only eat roots when other food webs have broken down,
when their preferred food source, bacteria, are limited in number. Nematodes in the right circumstances are beneficial to soils.

Caring for delicate microbes in the compost tea required the modification of spraying machinery (formerly used for spraying pesticides), “chang[ing] the filter nozzles, lower[ing] the bar in order to spray more gently.” It is very interesting that the same technology previously used to eliminate life through spraying biocides is now used to inoculate life into the soil. Practitioners adjusted the pressure after spraying the compost tea several times and then viewing a sample under the microscope after each attempt “to see what the carnage was like:” this led them to reduce the pressure further.

Instead of spraying alligator weed with herbicide on the sensitive watercourses, Tom noticed that a certain beetle has an appetite for the leaves, so he now encourages their proliferation. The local government and catchment management group designated this golf course a regional supplier for beetles to help farmers in the region with integrated pest management. They also use Peter Andrews’ natural sequence farming, constructing obstructions: ‘leaky weirs’ and encouraging the growth of weeds such as willows to slow down the velocity of creeks, which in turn create a depositional environment, reducing the outflow of silt and nutrients such as nitrogen. This produces an effect similar to that which beavers have on North American and Eurasian ecosystems, which have recently been recognized by ecologists for their dam building work, reducing the likelihood that deoxygenated ‘dead zones’ from algal blooms will enlarge further downstream. Thus the care for the land practiced by this club has overflow benefits that extend beyond the boundaries of the golf course.
Tom drives me by golf buggy to the grass nursery, where the green keepers show me a grass root profile, pointing to traces of older growth (two horizontal stripes immediately under the grass) with a proliferation of new growth extending far below these two stripes. This growth has occurred after withholding pesticides and chemical fertilisers and spraying compost tea for three months. The spreading roots grew in a manner that defied the model of grass structure they were taught at TAFE (Technical college). Tom says, "A lot of what we learned in TAFE we are throwing out the window. We were told that roots can only grow as deep as the height of the grass- now we know they can grow a lot deeper- and the compost tea is allowing that. We have more crumbly soil texture, more spreading root systems. It fascinates the hell out of me." In the following picture, the horizontal bands are the previous extent of the roots, compared with the roots now extending below the bands:

Figure 17: Bent grass sample showing deeper root growth than before after application of compost tea and withholding of chemical fertilisers and biocides. Photo: Anne O'Brien, 19 June 2013.
This image of grass roots can be interpreted as a physical manifestation of the idea of positive freedom-as-growth. The bent grass of the green is no longer manicured in such a way that it is stunted with many chemicals, opening up new pathways of expression, relation and capability, and associating with soil microbes in the process. It now has freedom of association whereas before it did not. In the older roots, we see a matted stripe pattern that has arisen out of duress.

But it is only in hindsight, after releasing the grass from its chemical constraints, that practitioners can see the morphology of the grass roots in a new light: recognizing the duress the grass was previously under. There is a similar temporality of disclosure and recognition with regard to many oppressions in human life. Before liberation, our knowledge of our own subjection is often confused and fuzzy, inflected with self doubt and uncertainty regarding the causes of our malaise.

Satya Mohanty writes:

> Objective knowledge of social phenomena [such as sexism and racism] is in fact often dependent on the theoretical knowledge that activism creates [in removing impediments to wellbeing]. For without these alternative constructions and accounts our capacity to interpret and understand the dominant ideologies and institutions is limited to those created or sanctioned by these very ideologies and institutions.\(^{307}\)

Thus knowledge regarding capabilities is a work in progress, requiring the practice of freedom, even for nonhuman others that may be afflicted by burdensome or restrictive relations. Such freedom requires a certain experimental approach, both building and practicing new modes and compositions of relation and removing and

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eliminating possible obstructions to wellbeing.308

The change towards more ecologically-attuned stewardship began when Phil, the owner who is also a farmer, began to learn about soil biology and to modify his farming practices, paying attention to the soil ecosystem in order to reduce inputs. He then decided to implement similar changes in the golf course, and called upon his superintendent to carry out this plan. However he did not comply, so he was fired. The second in command manager was then promoted to superintendent, even though he too was skeptical:

Phil: We had a superintendent who wasn't keen on the idea [of changing practices] so we replaced him, but Tom was the second in charge. It's the definition of stupidity- doing the same thing and expecting different results. We had these d*head green keepers... Same thing with the fertiliser companies- they were creating this vicious circle, with the superphosphate acidifying the soil. We tried mineral fertilisers also, then the Nutritech Solutions [biological and microbial additions], then the soil food web course.

While Tom’s initial environmental motivations were weak, his environmental concern grew as a result of adopting regenerative methods. His initial motivation was instrumental: he was afraid of losing his job.

Me: Why were you open to changing?

Tom: There had to be a better way. I went to Phil [The owner] and said, "There's something we gotta do. He said, "I have the same idea".

Me: Was there anyone who took a while to come on board, who had to be convinced?

A term that is germane for interventions such as this is what Noam Chomsky quotes as “expanding the floor of the cage,” an interim strategy for liberation work that builds political and/or social breathing space for enlarging capabilities. In The Common Good (Interviews with David Barsamian), The Real Story Series, (USA, Odonian Press, 1998), 85, Chomsky writes, "Some of the rural workers in Brazil have an interesting slogan. They say their immediate task is 'expanding the floor of the cage.' They understand that they're trapped inside a cage, but realize that protecting it when it's under attack from even worse predators on the outside, and extending the limits of what the cage will allow, are both essential preliminaries to dismantling it. If they attack the cage directly when they're so vulnerable, they'll get murdered."

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Skeptical about ‘greenie’ methods, he came on board because the previous manager lost his job for disagreeing with the boss. In this light, it is surprising to see how much Tom owned this work and developed a creative relationship with it after such initial coercion. When I asked if he enjoyed his job more, he said ‘absolutely.’ Yet both Tom and Phil had to work against taken for granted norms of golf course maintenance. Tom even mentioned that he was given death threats over the phone. He also worked hard to justify the changes in the club newsletter:

We started a conversation with members about changing the management. Some members were undecided especially regarding the discoloured parts of the green. You have to be careful because members expect results. If it gets beyond a point [of looking bad], the old school kicks in and chemistry comes out of the cupboard.

Thus the new practices remain vulnerable and subject to the judgement of members: they must not disturb the conventional model of what a golf green or fairway is supposed to look like. Some ecologically sound interventions are possible to make while maintaining the appearance of the surfaces known as ‘golf greens,’ ‘golf fairways’ or ‘the rough,’ and thus without confronting the idea of a golf course itself. While many of these changes are input-oriented, and do not build ecological integrity to the level of complexity and robustness that is likely to have been the condition of the soil before the golf course development, nevertheless the ecological integrity has improved, with multiple functional capabilities being improved in the soil.

Tom’s care remains selective and limited: some of the matters of concern for him include the grass’s growth and respiration, using a refractometer each morning and evening to measure the ‘brix level’ of the grass; the biological composition of the compost tea, measured by counting a sample of organisms viewed under
magnification with the microscope; and the presence of beetles that eat alligator
weed. Other entities are either outside his radar or considered negative (Tom certainly
didn’t like a fig tree I was admiring). Tom admits "we still force the plant to do what we
want it to do, but in a more subtle way," showing that only some aspects of his
practice have shifted from a stance of control to a more mutualistic approach.
3.8 Case study 2: Western Australian Wheat Belt

Figure 18: Marie mustering sheep in the ute. The two dogs pictured respond to Marie’s whistles and directions.

The role of microbes in unlocking nutrient availability was evident in one of my practitioner interviews. In July 2013, after a geography conference in Perth, I visit Marie’s sheep and wheat farm on the Western Australian wheat belt during a severe drought. The soil in the region is dull orange, and dust blows in a willy willy through the landscape. Land degradation is widespread in South West Western Australia, particularly in the wheat belt, as dryland salinity caused mainly by vegetation clearing, has scalded large areas of soil in this region. In the face of such salinity, the maintenance and regeneration of groundcover, involving the replanting of native

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309 Marie’s name has been changed according to the Human Ethics protocols.
grasses and regenerating stands of original mallee bushland along roads and perimeter fences, have become crucially important. Like many farmers in the WA wheat belt, Marie runs a mixed farming operation, with a wheat crop for 5 months of the year, and fattening lambs by grazing them on the stubble after harvest.

Marie’s curiosity led her towards seeing the soil anew as richly populated with microbial life. Yet it was also the unexpected behaviour of the soil itself that provoked surprise, astonishment and ultimately new thinking. When the soil functions according to plan, like most tools it is often taken for granted, within an instrumental relationship, ‘ready-to-hand’, to use Heidegger’s terminology, commonly viewed as a container holding nutrients with an uncomplicated relationship to the growing plants. When it does not function as expected, it becomes an object of interest, a broken tool, ‘present-at-hand,’ foregrounded as an object of puzzlement and inquiry.

In the following quote, Marie recounts the moment she began to consider the possible role of microbes in the soil: “...we have high calcium soils here, and we tested the soil and the plant tissues. What the soil test was telling us was not what the tissue test was saying. The plant tissue came out lacking calcium- so there was some kind of absorption problem with the calcium not getting in.” Another surprise was that on the salty land (which also contained some remnant bushland) she was getting a good yield- and didn’t understand why. She thought, maybe there’s something else at work there.

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310 Heidegger, *Being and Time*, 104.
311 The term “broken tool” has been written about by Graham Harman in his Object Oriented Ontology, in which he draws from both Latour and Heidegger. See Harman, *Tool-Being: Heidegger and the Metaphysics of Objects*. (Peru, Illinois, Open Court, Carus Publishing Company, 2002)
She then began to consider the possible role of microbes in the soil. Realising that something was blocking absorption, she learnt about microbiology and became convinced of the causal role of microbes in the disjuncture between calcium in the soil and calcium in the plant tissue.

Soil microbes became significant for Marie. She undertook a Soil Food Web microscopy and composting training course, and attended other workshops with experts on soil microbiology. Initially experimenting with compost teas, she analysed them under the microscope, also making compost extracts and applying them to the land. She developed a preference for the compost extracts above the more unpredictable and labour intensive compost tea. She planted perennial native pastures, which ensured that the soil was fed yearlong with the sugars exuded by the roots, particularly through the action of mycorrhizal fungi. Minimising disturbance of the soil surface, she uses low till techniques on the wheat fields, a knife plough, and small amounts of herbicide to keep weeds down: mechanical intervention would harm the land, especially in this dry climate.

The soil microbes were only the first piece of the puzzle. Soon Marie’s attention was directed towards other aspects of the system. The sheep were key mediators, allowed to roam on the wheat stubble, in the bushland mallee remnants and on the native grass pastures. She modified their diets, feeding them a concentrated nutrient mix to build up immunity before withdrawing worming treatment. Organisms in the sheep droppings could now survive and thrive in the soil, helping developing soil structure

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312 See Frisch, “SOS: Save our Soils”, 3.
and function. Marie points out that now the sheep have pink noses indicating their parasite-free status, thus they haven’t suffered from the removal of worming treatment, partly because it is so dry here that parasites find it difficult to thrive anyway. Marie calls the sheep ‘the inoculators,’ claiming that due to their impact, you can now feel the springiness of the soil when you drive or walk over it. Christine Jones emailed me some of the soil carbon results. They achieved a 41% increase in soil carbon stocks in the 30 cm top increment that amounted to a 10 tonnes per hectare of Carbon. Improvement in soil carbon was more pronounced at depth 20-30 cm increment there was a 53% increase. There also was an increase in soil water holding capacity and nitrogen stocks. As the grip of the drought worsened, she has had to sell the sheep at younger ages than she would normally, but at the same time, the sheep have fared better than sheep on neighbouring properties, gaining greater weight in the same time, and sporting pink noses indicating their parasite free situation.

Another surprising discovery came later on, once the biological methods were well established. It concerned the mystery of the unexplained nitrogen-fixing organisms:

Marie: A plant growing biologically is a different type of plant to one that's being force-fed with artificial nitrogen. It's a different plant to look at initially. You might think its stunted or something, not growing as fast initially 'cos the microbes get less active in the winter, but come springtime that plant will take off- they make their growth at that time. Our plants get going in August, then they take off -phooo! But with a lot of our crops you can't tell the difference much now, 'cos once you've been on a property a few years, the nitrifying bacteria are all present, and they can activate and the plant starts photosynthesising themselves.

[me] I thought Nitrogen fixing only happened with legumes...

[Marie] No, the nitrifying bacteria are quite strongly associated with cereals. Legumes have the rhizobium but the nitrifying bacteria tend to colonize in the grasses and the cereals. Well Christine [Jones, a well-known regenerative farming scientist] was telling me this the other day-
'cos we've seen it ourselves- we've seen the nitrogen levels going up in a continuous period rotation- they've got to come from somewhere.

The language of soil being ‘force-fed’ by fertiliser implies [through its negation] a concern for the free development of capabilities of the organisms, and the ability to build up the resources that will provision for the plants to enable increasingly vigorous growth, thus supporting a beneficial feedback loop that over time will regenerate the land and improve the integrity of the ecological processes (such as nutrient-return cycles) taking place.

This account also demonstrates the conversations occurring between farmers and scientists, in a mode in which the scientist responds to practical puzzles or questions that come up in the course of farming. This shows stakeholder contribution to science, creating an “extended peer community” that is characteristic of the post-normal science that grapples with the complexity of emergent processes and human interaction with them in the world.  

When practitioners run into problems or crises during the ordinary course of work, they are prompted to question things, and through this process of questioning, the grounds from which they previously proceeded no longer can be taken for granted. The practitioner enters into a process of searching, in which s/he become open to new forms of input, and develops a less instrumental relationship with the means of their work- which now becomes an end in itself, and an object of puzzlement and wonder-qualities have been revealed that are beyond human control that command respect.

Heidegger argues that practices of use and of respect are not mutually exclusive in an absolute sense, but rather in a temporal sense- at any one time, we are either using or appreciating. He describes a back and forth transition between having practical relations (ready to hand) and having a contemplative relation (present to hand). Objects ‘ready to hand’ can suddenly appear as 'present at hand', when tools break, “in the conspicuousness of the unusable.”

Suddenly that which was taken for granted is seen in a new light, and revealed in its contingency.

3.9 Ideologies of grass: suburbia and control

As I learn about these land interventions, I begin to see my own surroundings in new ways. I take interest in the patterns of erosion and deposition in the suburban parks I amble through, beginning to notice patterns of interdependence. Once plants -any plants, particularly weeds- become established, they can create the conditions in which other plants can flourish: one patch of green enlarges, enabling more plants to grow. In contrast, bare dry patches of soil, and even mulch, exposed to the sun with few plants, become more bare over time.

As a young geography student, I learned about geological processes of erosion and deposition by going on excursions, visiting coastlines and major rivers, viewing the evidence of the processes that take place, especially during king tides and floods. We could call this the “grand approach” to geomorphology. The practitioners of

314 Heidegger, Being and Time, 104.
Natural Sequence Farming and permaculture encourage us to broaden our perspective beyond major landforms to see these processes happening in everyday landscapes. It is not only the floodplains of rivers such as the Parramatta River, the Hawkesbury-Nepean or the Nile River valley that are the beneficiaries of the fertile silt deposited by intermittent flooding. Any surface that receives water from rain, if it has soil and plant life on it, can become a depositional landscape if it is of a concave/ minimal slope. Agricultural societies of Asia and elsewhere that built terraces for rice paddies attest to this fact.

A permaculture teacher in Canberra taught me several years ago to “look for the soil that gathers in the gutters- your roof gutters, underneath your driveway grille, the concrete gutters on your street. You will find some of the best mulch and soil there.” I should have learned this much earlier during my childhood. Once, my father and I cleaned out a drain at the bottom of our driveway, and found it full of fat worms each around 30 centimetres long. After the permaculture workshop I began to bring a dustpan with me around the garden and even the neighbourhood, rescuing large piles of leaves clogging up drains, or brushing up silt sitting in a gutter:
After learning from these teachers, I look for the convex, the concave, the flat, the inflexion point; I look for ditches and swales as well as the weedy obstacles that trap the good stuff and hold good soil in place.

I made a small intervention in Parramatta Park to reduce erosion: after my letter to the management, they installed a straw bale covered by a textile material secured in place by two star pickets, immediately downhill from a stormwater pipe outlet. This is still slowing down water two years later. As I follow the slope down from here, I notice the bunching of debris here and there: soil, sticks, leaves and rubbish, all the way down the slope. Furthermore, there is very little bare soil. The grass is lush and every now and then there are native groundcovers poking out near the grass: native violets and sedges. There are good signs that the velocity of the water along the small water course is slow enough for deposition (rather than erosion) to be the dominant process at work. As organic matter builds up along the stream’s path, sponginess is increased,
changing the habitat conditions to make an intermittent wetland. This means also that the grounds staff will no longer need to clean out the storm water drain of soil as often as previously. In contrast, there is a rill close to the footpath that traverses numerous zones of compacted soil, with many bare and eroded patches alongside some bunches of leaves and debris.

At the edge of the golf course near our house, my partner and I walk through the grass. I kick the soccer ball to him. He sends it back, and it skims along the ground, skipping from the golf green to the longer grass, ‘the rough.’ Moths, hoverflies, grasshoppers, scatter when the ball enters this zone - they are silhouetted with the long grass in the yellow afternoon sun. Across the divide, a single fly rests on the mown fairway surface. Moving between the smooth and the rough, one can see and feel the difference: the buzzing of insects that pollinate the small flowers, hiding in the tangle of stems, versus the virtual desert of the green. It’s remarkable to see.

There are many circular bare spots in the grass beyond the apartment block. These spots are of hard compacted soil, and bear the fruit of fungi after rain. I phone my friend Walter Jehne the soil ecologist, and he tells me the fungus is *basidiomyces*, which coats the soil in a waxy coating, preventing plant growth. I note during a run that there are several stumpy Eucalypt saplings that have emerged on these otherwise bare soil patches, which persist in growing despite being cut down every two weeks when the lawnmower grinds past. As I run, the thoughts repeat in my head: *which came first: the fungus or the trees? Do the fungi help the trees? Do the fungi clear the soil to enable the trees to grow? Or are they pathogenic?*

I speak to the ranger when his car pulls up. “Do you think we could let these trees
grow?” I ask. “Put protective plastic around them?” “No,” he says. “We have to keep the line of sight open for safety.” Ever since a tragic murder of Prabha Kumar last year, the chainsaw crews have been out in force: the spotted gums, forest red gums and melaleucas that fringe the pathway dividing the golf course from the high school sports field are thinned, and there’s also CCTV. But I don’t feel any safer at night. I avoid the now floodlit path through the park up towards my apartment block and walk around the long way.

The golf course business went bankrupt after Kumar’s murder, and the whole landscape shifted subtly. The greens turned brown, a dry thatch on the surface of the soil, with some clumping grasses breaking through, with clusters of kikuyu advancing from the perimeter. The green keepers disappeared, no longer attending meticulously to the surfaces. Two months later, I noticed a story in a local newspaper. One of the green keepers, who I spoke to occasionally on my walk to the station had died. After losing his job, it seemed he got into an argument with his electricity company, threatening to use his chainsaw to cut down a telegraph pole. He was tasered repeatedly by police, and went into cardiac arrest, dying soon after. Contractors engaged by Western Sydney Parklands still mow the lawns, but now in their haste create buffer zones of wild growth around fallen branches rather than clearing them, allowing wild patches to grow up wherever the mowers cannot reach.

One day a much larger tree fell down. On my walk to the train station I took photographs, my curiosity piqued by the worlds revealed in the tangle of branches, roots and soil, strangely intermingling in ways one wouldn’t expect. A strangler fig had grown upon a forest red gum, encircling and penetrating the trunk, eventually
restricting its ability to obtain food and water. The trunk of the gum snapped, so it lay across the track on the edge of the former golf course, incandescent silver, red heartwood broken all the way through.
The strangler fig seems to have gained nutrition from the decomposing wood of the gum, transforming and recomposing the interface between the root hairs and the decaying heartwood, eventually causing structural weaknesses and the collapse of the original tree. There is a soil production process of decomposition and recomposition here: rich, reddish-brown soil, flowing out halfway up the trunk among the fig roots. This soil grows high above the ground, through the microbial-root relations that have emerged. This is a faster pace than the slower process of rock decomposition, which
takes thousands of years. It has a beautiful rich texture that I can imagine would be an excellent growing medium. Should this be considered soil? Can soil live inside another living thing? This new soil has a clear structure: it would be more alive now than it was when just heartwood.

I wake to the splutter of chainsaws at 7am and drowsily take the lift downstairs to interrupt. Three tradies and their dogs pause and look up. I say, "My friend is a wood turner. Would it be ok if I can get some lengths of wood for him?" They reply, "come back in an hour and we'll have some for you." One of the men says, “that tree is probably hundreds of years old, judging from the rings- dating back from before the First Fleet.” I am not so sure, but I know there are some very old ones here.

I phone my artist friend Liam. He asks me, “Can they leave it all there to decompose? We can do a project around it.” "Probably not.” I say. “Occupational Health and Safety. They won’t allow that there in the park. Besides, they are already mulching it.” A decaying tree in the middle of an orderly landscape would go against all the conventional aesthetics of that space and the job descriptions of the workers. It would go against the norms of suburban and former golf course space. But Liam doesn't recognize these norms as valid, and that’s part of the beauty of his work.

Lawnmowers tend to bring about a similar division in suburban landscapes to that wrought by sewerage systems, moving decomposition away from public view. Sticks and cut grass are seen as messy, and are sometimes collected and disposed of as green waste, separated from sites of plant growth. Thus there is a constant drain of carbon and minerals from the soil. Sometimes cut grass is left in situ. Another way that decomposition is made compatible with mown areas is when clear barriers are
constructed between zones of natural decomposition and of lawn. This can be seen in the following photograph:

![ Figure 21: A tree-log edge demarcating a zone separate to the lawn, in which fallen branches can be left to decompose. Source: Anne O’Brien, Balls Head, Waverton, 4 January 2017. ](image)

I first met Liam when my local climate action group hosted a public event in a park where he launched and explained his sculpture, a joint project undertaken via a grant from the council. The sculpture was a meditation on edges, drips, and no-go-zones: an intervention to contest the dominance of lawns and lawnmowers in the park, and to make space for regeneration. Made of a circuit of painted drainage pipes, Liam drew our attention to the micro impacts that the sculpture would have on the way that water falls and collects on the land. Installed for around a month, the sculpture was cordoned off by brightly coloured bunting, granting an additional reprieve from the lawnmowers, and enabling the germination of endemic trees such as Ironbarks and
Prior to meeting Liam, I had encountered his works decorating a coffee shop I sometimes frequented, gangly plant tendrils and long waving grasses sprouting from pipes mounted on a wall. His art emerges from his playful engagement with place, particularly reflecting his childhood growing up in the area when it was still semi-rural, during which he came to know and value original native bush land and grasses. Engaging in bush regeneration for many years, he sees the land in vibrant detail including a multiplicity of plant species, and also the seeds hidden in the soil, his work reveals landscapes of possibility: what could yet be and what could have been. His experimental and quirky approaches to intervening in nature test, strain and prefigure relationships by calling into question taken for granted understandings about the use of the land and what is acceptable in public space, aesthetically and functionally.

Liam took us on a tour of that park, pointing to and explaining the significance of remnant vegetation and newly emergent plants. In particular, he denounced the ‘rings of death’ surrounding trees: bare patches that have been sprayed with herbicide in order to ensure neater edges and more efficient lawnmower operation. He later posted pictures of these rings on social media:
Figure 22: Glyphosate “ring of death” surrounding gum trees. Source: Anne O’Brien, Facebook, 25 May 2014.

Liam and other locals have cared for the park for over several decades, even fighting over its proper stewardship. Liam told us the story of a thwarted intervention into the management of this park dating back two decades. The intervention was controversial, and developed into an epic conflict, representing for him the petty real estate-centric imagination and values of so much of suburban Sydney: the backdrop to countless residential disputes:

_I was studying bush regeneration at Ryde TAFE [Technical college], and we were learning about Bradstock [the influential method of restoring native ecosystems in which initial efforts are focused on the healthiest areas]. We learned how the absence of fire leads to changes in the ecology.... In the park we had remnant trees and grassland being tractor mown and sprayed, but underneath there were seeds, waiting for the shrub layer to come back... we could tell the trees were in distress because of_
the dieback, so we translocated a pocket [of soil] around the edge to reinforce that edge.

In 1994-95 we approached council asking them to stop mowing on one third .... It was fully mown by heavy tractors, so the soil was compacted probably for 30 or more years and no fire had ever occurred - the grass hadn't been allowed to grow since the beginning of the suburb - probably for 35 years....

In 1996 we involved the fire brigade to burn on those alternate grids at different intensities, with high temperature burns in the corners. We also transferred a seed bank from a construction site. We “feathered” it into an area that had eroded significantly. It was informal car park - people were driving cars into this remnant tree area. There was broken glass everywhere... with the A-horizon washed away... what was incredible was there were rare species in the seed bank. There were species that were not recorded on site that came up - like chocolate lily.

I guess the seed bank is like a proof of a concept, that our suburban culture doesn’t have knowledge of. It's not something you can buy at Bunnings: it’s priceless.... We did a deep rip, to break up the compaction, and that's where Divisia grew, from nowhere, and other Bursarias did come up on the grassy side.... We grew loads and loads of things from seeds, we participated in that process of understanding local diversity, growing and collecting the seed.... On the side we made the intervention, the ironbark regenerated. The grey box regenerated. These trees regenerated for the first time in fifty years. They had been affected by mowing and compaction. That suggests the health of the trees is a partnership with the other plants and with the health of the soil.
Ultimately that was reversed. It was mulched over.... Our legitimacy was eroded by all the critique....Party politics: simple as that.... They brought together residents to say “We like it the way it is. We don’t want to lose our park the way it is.” So they are back to square one. Don’t want more bush.... The residents complained about the impact of the regeneration on the ‘character of the area’. There were also some concerns about snakes....

At this point Liam and his allies were cut off from participation in the park’s stewardship, all their hard work destroyed. After the controversy, contractors were only allowed to work there, so the community was banned from [working on] the site.... They used the word ‘risk’ to justify the removal. I don’t think it’s risk- people don’t get hit by falling branches all the time.

Through talking to Liam I learn to read the landscape in new ways: firstly, to see “rings of death” surrounding trees, showing bare and dead patches created to simplify lawn mowing operations: I notice such a ring in Melbourne, where I visit for a conference:
Secondly I begin to look for whether or not the original seed bank is present on any given piece of land. I become convinced that the park near my place has some interesting native species there. When I show Liam the land, he is immediately engaged: *Oh look! This is original soil, it's just all been mown. And they haven't even poisoned around the trees like they usually do. It's just whipper snippered. You've got a whole seed bank here. We could use fire here, and it would come back. You would get the original Dianella back- it would be the genetic strain from this locality- not the nursery variety.* Some of these plants that I had previously associated only with rural areas, such as saltbush (an important stock feed especially in arid and salinized areas) and microlaena (also important for stock, a high protein native grass grown by Marie which may have been deliberately cultivated by Aboriginal people) are growing in the park surreptitiously, creeping through grasses below the lawnmower blade level, or growing taller plants in sudden bursts after rain:
Figure 24: Saltbush growing in Parramatta Park. Photo: Anne O’Brien, 23 October 2014.

Lawns are the ultimate modern anthropocentric natural surface. They require substantial resources to maintain, and in their conventional management require intricate knowledge of herbicides, pesticides, fertilisers, machinery, transplanting techniques. In order to keep grass available as a more or less two dimensional surface that can be walked on or driven on without impeding or destabilising those walking or driving, it needs to be regularly cut, and its extent controlled so that the mown space is distinct from the garden bed and the foot path. Initially grazed by sheep in the 1800s, lawns have now come to be designed around the mechanical imperatives of lawnmowers. In the words of Illich, lawnmowers are a “means that has become an end,” with their requirements reconstructing the conventions of modern suburban land use. It seems that Australian cultural identity is invested in the aesthetic norm of neat suburban lawns, policed by powerful forces of social sanction that occasionally emerge when it is flouted.
When the PhD student inhabitants of the Flying Fox collective house in Panania (where my partner lived) turned a front yard into a vegetable garden in 2011 and let their back lawn grow wild, the real estate agent suddenly appeared at the front door. He gave a stern lecture, flanked by the passively nodding landlord who had previously granted his permission. His argument was basically “We don’t do that kind of thing in this country” (all the members of the household were international students). This intervention was a coercively assimilationist cultural education, with the message, in our country we value uniform suburban front yards of monoculture lawn to maintain our property values. It reminded me of a story from my childhood, when my grandparents told a story about the Vietnamese immigrants living on their street who let their front lawn grow long. One of the other neighbours sent nasty letters until they conformed.

The Flying Fox Collective’s small back garden’s value as habitat only became evident after it was almost entirely flattened. My partner recalls how a frog hopped out just as he was mowing the last square of lawn, in the centre of the yard. I was amazed to hear about this, because I had lived in Sydney all my life, and up until that time I had never seen a frog: not even this one. Letting the backyard grow wild opened up space for it to find a home. This habitat of moist long grass, scotch thistle, dandelion, cat’s ear and chickweed also benefited us because it yielded edible weeds to supplement the household salads. Similarly, when my parents let their swimming pool run “wild,” withdrawing the input of chlorine, due to the effort and expense of maintaining it, it began to harbour a large number of invertebrates and a population of Peron’s Tree Frogs (also known as the Maniacal Cackle Frog), which would sit beside the pool and on nearby shrub branches singing in a loud pulsing call and response chorus into the
night, especially in Summer. After a few months, a neighbour began complaining because dead frogs began to appear in her swimming pool. There was also regular visitation from ducks, and even water rats! The pool was also regularly watched over by kookaburras, which swooped down for a feed now and then. Just by withdrawing biocides from small pockets of the suburban landscape, we gain a glimpse of the diverse biotic relations that could be established in our suburbs if chemicals were withdrawn from whole localities or catchments.

Urban local governments in Australia are beginning to appreciate some native ground covers, some of which are visually very striking. The Western Sydney Parklands trust last year has planted some sections of Parramatta Park with a wide variety of native grasses. A sports field in Royal Park, Melbourne was replaced with temperate grassland in the 1990s, a place beautifully written about by Lesley Instone.315 The City of Sydney also used some very visually interesting native grasses in their landscaping for the past 10 years, notably in Prince Alfred Park near Central Station. These are small signs of hope that perennial grassland plants that nourish soil can make it back to locations where they have been banished for a very long time, even in places where neatness is a central organising principle.

3.10 Conclusion

Regenerative land stewardship involves practices that enhance, diversify or catalyse ecological relationships in ways that build buffers in the soil and in vegetation, enabling the sharing of resources between its members (particularly the products of photosynthesis via mycorrhizal fungi in the soil), and often the building of new soil. Regenerative stewardship requires practitioners to become much more curious about the land, the interactions and the driving forces at work, practicing attentive observation, noticing certain signs of health such as soil aggregation patterns, and using tools to monitor changes over time in order to respond to needs as they emerge. This enables an approach that is more about giving space than about control, encouraging the development of new capabilities by the organisms under the practitioner’s care.

In an era of climate change, techniques of regenerative agriculture hold promise as tools of both adapting to unstable weather and sequestering carbon. There is strong evidence to suggest that perennial grasses, associated with vast networks of mycorrhizal fungi, sequester carbon. Even annual crops when biologically managed and minimally tilled, are capable of accumulating soil carbon, as Marie’s soil showed. While there will continue to be much debate about the relative merits of different approaches as tools to mitigate climate change, it is less controversial that building soil ecosystems vastly increases capability of ecosystems to adapt to climate change: to withstand weather extremes, and requiring less inputs of water and energy-intensive fertilisers, thus also relieving financial pressures for farmers.
In chapter four, I consider concepts of ethically attuned practical action. I ask the question of whether instrumentalism is inherently wrong, or whether there are ways of moderating the objectifying tendencies that instrumentalism promotes. I think through how to embody a free relationship with the land through an aesthetically rich, embodied repertoire of practices of care for the soil, drawing on Indigenous practices of care and Wendell Berry’s concept of *kindly use*, bringing together the technical and the creative under a poiēsis of supporting life in the soil that can also enrich land stewards’ experiences of their work.
Many problems of the Anthropocene are reproduced and carried forth through
conventions and concepts of modern land use, with very few unpacked or examined
under an ethical lens. Institutions of industrial agriculture and landscape management
are dominated by a narrow conception of use, centred on satisfying demands that are
produced in and through markets. Environmentally destructive consequences are only
addressed to the extent strictly required by law or by the production process itself.
Older practices of Australian Aboriginal use enshrine reciprocal obligations to the land
in culture, ontologies and ritual. In the absence of cosmologies that recognise land as
inhabited by beings towards which we have duties, members of non-indigenous
cultures need other ways of foregrounding interdependence, developing ethical
imaginations to *broaden and deepen* our concept of use. In conventional forms of
manual and machine-mediated labour with the earth, practices of care towards the
land are possible, but they often require considerable latitude from narrow, exclusively
instrumental, control-oriented standard production protocols to allow for
responsiveness and concern for the nonhumans involved in the labouring process.
Transforming practice at least requires recognition of the nonhumans that enable our
use of the land, while also noting and enabling their uses of the land, their vulnerability
and needs. In this chapter, I use Wendell Berry’s concept “kindly use” as well as
Aboriginal concepts of use to consider the conditions that support deeper and broader
conceptions of use and intimate, reciprocal and receptive relationships of land
stewardship.
While in chapter two I argued that the dominance of instrumental reason is partly to blame for the neglect of the soil in the modern era, in this chapter I will try to recuperate a conception of ‘more than instrumental’ use that involves care for the land, taking into account the ways in which colonialism and capitalism have distorted our understandings of use, supercharging instrumental reason.

Critiques of instrumental reason particularly arising from the Frankfurt School and Heidegger have played an important role in helping us understand the problems of environmental destruction in general and soil destruction in particular with respect to the control-oriented and reified relations predominant in land stewardship, as I have explained in the previous chapter. Likewise, Hannah Arendt’s critique of the consumers’ society in her discussion of culture and judgement gives us tools for upholding an environmental ethic that is as practical as it is principled. Yet to redeem manual labour in Arendt requires some critical scrutiny of the categories labour, work and action, to open up space for care and for what Richard Sennett calls “material consciousness.”

Instrumentality and using the earth in themselves are not necessarily our main problems. Using the earth –if undertaken as kindly use, to use Wendell Berry’s term\(^\text{316}\)– can remind us of our interdependence with other species, particularly if our practices or technologies bring forth the Earth in such a way that its vitality and its life processes become more evident, yielding better understanding and care. Furthermore, integrating practices of use into broader cultural understandings of place, indigenous

\(^{316}\) Berry, The Unsettling of America, 31.
relations to land and *Country*, ecological responsibility and material consciousness can help to displace efficiency as the highest value, and create space for the respect of both soil and practitioners, as well as for bringing environmental concerns to a public realm.

4.1 The need for ecological conceptions of use

“Use” is popularly understood as both a generic verb and a pejorative, and its pejorative meaning bleeds into its generic meaning. When a human feel “used,” she is treated as means to an end without adequate regard for herself also as an end. The grievance arises from a deficit of recognition, interaction, sensitivity and “give and take.” The modern, narrow conception of use institutionalises an alienated and extractive relationship to the world that renders nonhuman objects as of instrumental value alone, replaceable means to anthropocentric ends rather than both means and ends in themselves. This is a one-way interaction in which one dominant agent exercises control over the object of their production or consumption. When the implied goals are profit maximisation and/or efficiency, it is often seen as a distraction to care for the qualities of the environment that make land use possible. In this mode, the only external feedback taken into account is that which enhances the task at hand. Thus this narrow form of use is effectively closed to care, curiosity or aesthetic appreciation. Environmental degradation often follows as a consequence.

An exclusively instrumental, narrow stance of use is often forged by the constraints of modern production chains, as well as technologies that predetermine patterns of
action and intervention. This pattern is maintained by coercion in the workplace, hierarchies that determine the temporalities and objectives of work without regard for the space and time required for an understanding of context in order for practitioners to develop good judgment and a working relationship with ecology. It is further compounded by the division of labour, by technological automation, and bureaucracy that distances managers and workers from the effects of a production process. Workers and managers assume a shallow, reifying stance as their default pattern, switching off capacities for care, thought and critical judgement towards the ecological consequences of their actions.

The Wise Use “movement” was launched in the United States almost thirty years ago in order to advance the agendas of logging and mining corporations in alliance with hunting and motoring enthusiasts seeking greater access to public lands. A key plank of their discursive strategy in battling the environment movement was to monopolise the concept of use, and thus to frame environmentalists as impractical. Similar tropes have been used this side of the Pacific by industry groups such as the National Association of Forest Industries and the Minerals Council of Australia. The strategy aims to drive a wedge between environmentalists and communities built primarily around employment and business from extractive and agricultural industries. This frame falsely implies that the only way to use land productively is through a narrow form of use: to maximise control for maximum output, without regard for ecological

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317 I am following Charles Taylor’s use of the term “exclusive humanism” to describe a world view that is closed to transcendental understandings of spirituality or religion. See Charles Taylor, A Secular Age (Cambridge: Harvard University Press, 2007), 19.

318 Sharon Beder, Global Spin: The Corporate Assault on Environmentalism (Carlton North, VIC: Scribe Publications, 2000), 47.
wellbeing or for future generations. To criticise environmentalists as impractical in this context aligns profit-maximising enterprise with practicality, reinforcing the belief that there is no alternative to exploitation.

If environmentalists respond by disavowing use and reinforcing the dichotomy between use and care, their access to the practical realm is discursively blocked. An avenue for advocacy is also lost when environmentalists consequently fail to engage with the innovations, joys and difficulties of manual labour: blaming land stewards for their role in environmental destruction. This reinforces the “jobs versus the environment” dichotomy, cutting off environmentalists from communities that depend on use of the land.

Environmentalists in their campaigns to end and reform numerous extractive industries, particularly logging and meat production have utilised disgust as a political weapon to direct attention to certain industries in which ecosystems or animals are. While this disgust is often a spontaneous response to devastating consequences of some forms of work, it can obstruct and foreclose relationships of solidarity. There are strong class overtones of blame in such language, in which mostly middle class environmentalists self-righteously target people who work in primary industries—farmers, loggers and miners, portraying them as vandals or ignorant fools. This view can be seen in the following song, composed for a forest blockade:

We wanna cut! We wanna kill
We wanna bulldoze at their hill
We don’t care who pays the bill
’cos we’re playing with our Tonka toys.
I’ve got a chainsaw
I've got a Bulldozer
He's got a yellow truck!
After lunch we'll clear fell the forest and that'll be the end of that, MATE!
We're all playing with our Tonka toys
Making lots of lovely noise
Just like good ol' Australian boys!
Playing with our Tonka toys.319

Instrumentality and using the earth as such are not inherently to blame for the environmental crisis in the Anthropocene. If use of the earth involves care as it does for Indigenous people, or for Wendell Berry in his concept kindly use, it can remind us of our interdependence with other species, particularly if our practices or technologies bring forth the Earth in such a way that its vitality, its diverse capabilities, its connectivity and its needs are more evident. Where instrumentality becomes a problem is where it narrowly and shallowly defines the relationship of use entirely: when there is a failure to treat the means of use as ends in themselves.

This idea of use is inscribed with the assumption of a one-way, extractive relationship in which one dominant agent consumes, exerts control over and does not open herself up to the other. The exclusively instrumental meaning of ‘use’ renders objects of production as subordinate to the goal to which they are directed. When pursuing capitalistic goals, objects are assimilated into a linear production process, beginning with the construction of 'raw materials,' extracted from their contexts, uprooted, set-upon, appropriated, exhausted and transformed, into products for sale. They are

rendered fungible 'standing reserves' as Heidegger says,\textsuperscript{320} made as uniform as possible with signs of their origins erased. After consumption they become ‘waste’ for which responsibility is disavowed.

\section*{4.2 Pragmatism and environmental philosophy}

“Practical cognitive orientations come first in the generation of values,”\textsuperscript{321} writes Piers Stephens, in his analysis of William James and the relevance of his work for environmental philosophy. Everyday practical work often brings people closer to the material substances and living organisms that they could care for. There are many unplanned encounters that we have with other species that we would simply not have if it were not for their usefulness to us. Through working with nature we can come to value certain qualities of nature, and resources and values arise from a practical relationship with the land that are essential for a caring relationship to the land.

Where instrumentality becomes a problem is when we fail to transcend the instrumental register: beginning, proceeding and ending there. To transform practices of use, among other things, we might consider the ways in which instrumental reason can be transcended in everyday practice: particularly through the creation of publics that argue and organise for alternative goals, or cultivate non-instrumental values.

According to deep ecologists and deep green environmentalists, nonhuman animals, plants and other organisms ought to be regarded as ends in themselves rather than as

\textsuperscript{320} Heidegger, \textit{The Question Concerning Technology}.

means to our ends: we should recognise the ‘intrinsic value’ of other organisms and ecosystems and allow them to live as free of human influence or impingement as possible, so that they can seek their own ends. J. Baird Callicott, Holmes Ralston III and others hold this position. I accept much of this argument, insofar as we should minimise the hold of the instrumental attitude on our activity, incorporating wonder and care to become central to our work. Yet the concept of ‘intrinsic value’ falls short when it comes to accounting for the sources of environmental valuing, particularly those that involve practical engagement with nature.

Piers Stephens insists that there are other forms of non-instrumental value to intrinsic value, such as what Anthony Weston calls “immediate value” which he draws from Dewey’s concept of “immediate enjoyment.” This form of value arises from appreciation of things in experience: events that enrich us through their ability to resonate with our values or remind us of pattern in nature. These things, Weston argues, should not be viewed as ends in themselves, or as intrinsic values. Rather we should consider the possibility of a space between *ends* and *means* and place them there. Stephens explains Weston’s approach thus:

If a key part of what we value about nature is its spontaneity and patterns, its counterpointing of the everyday instrumental planning of our lives, then acknowledging a more radical gap in instrumental rationality itself is needed, and so Weston suggests what he calls “immediate values,” of either episodic or patterned types to better capture the reality of valuing nature. Immediate values are radically non-instrumental and can thus resonate with the familiar environmentalist critique of instrumentalism, but they are not synonymous with intrinsic values in that they do not merely shift the axiological emphasis from the means to the ends.

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323 Ibid.
side of the spectrum, but rather try to undercut the idea that the means/end, instrumental/intrinsic distinctions are exhaustive of experienced value. Such values... do not fit into either the means or ends side of the instrumental ledger; rather, “they are more like surprises or gifts, not amenable to production on demand or to ordinary goal-seeking rationality.”\textsuperscript{324}

Stephens draws upon the concept of \textit{interest} developed by William James in order to argue against a binary understanding between intrinsic and instrumental values:

To “have an interest in” something often implies instrumentality, but “being interested” need not.... We too habitually take the noun \textit{use} as implying the verb form meaning “use for some predefined purpose,” defined with reference to human interests as constructed through a strongly instrumentalist (usually commercial) framework. However, contrary to the reduction of cognition to aggrandizement and atomized use-values implicit in Katz’s idea of desire-based “interest,” Jamesian “interest” emphasizes attention, relationship and fluidity in the flux of immediate consciousness. Jamesian interested consciousness embodies interest in the original Latin sense: “\textit{inter-esse}, ‘to be in (or) among’ it.”\textsuperscript{325}

Stephens argues that this Jamesian understanding of “interest” presupposes a greatly expanded, humanistic understanding of human wellbeing, beyond the narrow calculative sense of the term. This sense of interest involves the experience of noticing and valuing certain aspects of the manifold of nature, which provoke curiosity due to their constantly changing and spontaneous qualities: “when our attention is drawn to an item, then the item is \textit{of} interest to us, but this does not mean that the object has been \textit{defined in terms of use} in the strong sense; that definition, if it comes, will only come with time and reflection.”\textsuperscript{326}

\textsuperscript{324} Stephens, “Towards a Jamesian Environmental Philosophy,” 235.
\textsuperscript{325} Ibid., 240
\textsuperscript{326} Ibid.
Stephens laments that environmental philosophers have largely overlooked Jamesian pragmatism. In his view, Jamesian pragmatism is less reductive, instrumentalist and scientistic than Deweyan pragmatism, centering upon a more reflective and phenomenological account of human experience in the world. We need an account of practical activity in nature that is not tied to control, but rather is open-ended, enabling a continuing disclosure of possibility and of matters of concern, which in turn renew human experience.

4.3 Quality consciousness

Kerry H. Whiteside uses Hannah Arendt's work to transcend the debate over whether the intrinsic value of nature or human interests best ground environmental ethics, finding resources to argue for understanding and appreciation of nature as part of culture, part of an enduring 'world.' Arendt’s understanding of culture is a synthesis between the ancient Roman concern with caring for a life process and the ancient Greek concern for developing taste in appreciating beautiful artifacts. As Whiteside writes, “Fusing ancient Greek notions of non-instrumental value and Roman concerns for cultivating and preserving worldly surroundings, culture supplies an ethic for the treatment of nonhuman things.”

In the work of Arendt, Whiteside finds an ethics that permits humans to intervene in nature while having concern for its wellbeing, without flattening this concern to be equivalent to and reducible to respect for humans:

Arendt does not say that the Romans developed this concern by seeing natural things as possessing the same qualities that engender respect for human beings. They looked at nature

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as something that must be transformed ‘until it becomes fit for human habitation’. No appeal to respect nature will ever change the fact that a recognisably human life requires clearing some land of vegetation, reworking naturally given materials into homes and tools, selecting plant and animal species that will feed us. Nonetheless, it is possible to put a very special sort of human valuation on nature. It is possible, the Romans first understood, to adopt an attitude in relation to it that aims to advance the good of its nonhuman inhabitants.\textsuperscript{328}

Arendt claims that the Romans developed the original concept of culture: “in the midst of a primarily agricultural people [the Romans] ...the concept of culture first appeared.”\textsuperscript{329}

As an aside, the word \emph{culture} derives from the Latin \emph{colere}, meaning, “to till” or “toil over” [the soil].\textsuperscript{330} The words “culture,” “cult” and “cultivate” originate from this root. These terms are imbued with associations of care, with the Latin \emph{cultus} also meaning “care, worship, reverence.” “Cultivation” today is both a synonym for \emph{ploughing} and also a synecdoche for associated practices of farming: \emph{growing, tending}. It also is a verb of deliberate self and group actualisation. Such long-standing positive associations also reveal and reproduce an assumption that tilling the soil is necessary for agricultural landscapes to bear an abundant harvest, an assumption that is being challenged via the rise and success of “no till” methods. Whiteside argues:

\begin{quote}
As dwellers on the land, the Romans depended on crops for their nourishment. They were there for the duration; they cherished nature’s capacity to replenish itself. Raising crops or tending animals, they had to learn about the species’ own needs so that they could serve
\end{quote}

\begin{footnotes}
\item[328] Ibid., 32.
\end{footnotes}
them... Arendt credits [the Romans] with *combining* the caring attitude they had developed in relation to nature to the Greeks’ nuanced sense of taste and regard for beautiful things... the idea of cultivation is aestheticised, or one might say humanised by joining it to inherent worth...

Culture becomes a matter of nurturing things because one sees intriguing, non-instrumental qualities in them.\(^{331}\)

Arendt’s concept *Amor Mundi* articulates the importance of care for the world: “it is precisely in her account of caring for ‘the world’ that an ethic regarding nonhuman things, including natural ones, is to be found.”\(^ {332}\) She argues that we are experiencing a “crisis in culture” due to the rise of “consumers’ society,” which “cannot possibly know how to take care of a world.”\(^ {333}\) This society subjugates both politics and work towards the satisfaction of temporary needs, rather than producing durable works of culture or transformative political interventions. Arendt fears the debasement of culture through modern consumerism, in which more and more of human activity – including technical skill- is devoted to producing things of little cultural worth or permanence. Lasting objects of aesthetic value help furnish a world of significance in which humans can develop aesthetic judgement and sensitivity which can in turn enlarge capabilities for making distinctions, developing wise judgement and preparing us for virtuous political engagement.

Arendt views the capabilities for appreciating nature as continuous with those of appreciating culture. Attraction and care for the beauty of the material world helps to educate humans in quality consciousness, enhancing capabilities to make decisions in the public realm.\(^ {334}\) She draws a connection between the destruction of beautiful

\(^{331}\) Whiteside, “Worldliness and Respect for Nature,” 32-3

\(^{332}\) Ibid., 30.

\(^{333}\) Hannah Arendt, *Between Past and Future*, 211.

\(^{334}\) “Quality consciousness” is a term used by Whiteside, to summarise Arendt’s position on aesthetic judgement, on page 37, which is in turn influenced by Immanuel Kant’s work on aesthetic judgement.
environments and the decline of the political sphere as a space of free decision-making. As Whiteside puts it, “in consuming our world, we also destroy the very ethic of worldliness that supports our sense of discriminating taste and inherent worth.”

In *The Human Condition*, Arendt reworks Aristotle’s schema contrasting the tripartite categories of *labour, work* and *action*, with each category subject to its own constraints, potentialities and dangers. While labour is that which toils with nature to reproduce nature, work violates nature by moulding it into durable things and objects for use.Labour involves a bodily exchange with the earth, a toil that unites us in common with other creatures, while work engages human creativity and human hands, producing cultural objects. Agriculture belongs to this category, although with a possible exception: Arendt equivocates over the practice of tilling the soil, which permanently alters nature in a way that produces the soil surface as a cultural object. Tilling the soil in her view may belong to the category of *work*.

Above both these categories, *Action* is concerned with democratic judgement in the public sphere, manifesting the uniquely human capability to communicate and make commitments in public. This category is the least constrained by necessity. Labour and work provide supporting functions to action: the means of life and the means of culture respectively. While work and labour share a common domain of the private sphere, work is the uniquely human capacity to produce durable goods that furnish a meaningful world, and thereby influence the public sphere.

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335 Ibid., 38.
336 Christopher Mayes elaborates on this distinction in “The groundless politics of Hannah Arendt: Reassessing land and agriculture in the *vita activa*,” Paper given to the Australasian Society for Continental Philosophy Annual conference, 4 December 2014, Australian Catholic University, Melbourne.
4.4 Material consciousness and embodied enjoyment

I am interested in “material consciousness” as a source of gaining cultural appreciation for landscapes, appreciation that may help build adequate motivation for shifting Western cultures towards more reciprocal relationships with the land. Richard Sennett develops the concept of “material consciousness” in his book *The Craftsman*, where he argues that we gain an animated attentiveness towards certain objects that we have practical understanding of: “we become particularly interested in the things we can change.”337 Sennett departs from his teacher Arendt’s elevation of *action* to the highest realization of human potential, and *work* as its next highest manifestation, arguing that her schema “slights the practical man or woman at work.” He continues,

> The human animal who is *Animal laborans* is capable of thinking: the discussion the producer holds may be mentally with materials rather than other people; people working together certainly talk to one another about what they are doing. For Arendt, the mind engages once labour is done. Another, more balanced view is that thinking and feeling are contained within the process of making.338

Sennett describes sitting in a lecture theatre full of medical practitioners who become very distracted by an image unintentionally left on display, showing a gloved hand operating on the large intestine, but in an unconventional manner: “Their rapt attention to whatever the hand was doing to the large intestine is material consciousness.”339 Sennett then goes on to describe the various modes by which the attention of practitioners is attracted by materials: metamorphosis, presence and anthropomorphosis. Yet none of these quite captures the aspect of material

338 Ibid., 7.
339 Ibid., 119.
consciousness I am interested in, which is more about imagining creative possibility while regarding particular features of plants or landscapes *in situ*.

A problem that has in my view compounded the separation between settler Australians and the land beyond the ongoing consequences of colonialism is that the settlers did not learn a detailed material consciousness of the native landscape: they failed to appreciate the diverse offerings of the multitude of plants and other organisms in the landscape. Freya Mathews observes the alienated relationship between settler Australians and native plants when she writes, “it would be hard to find a people anywhere else on earth more alienated from its own land than we [Australians] are.”

Mathews claims that settlers fundamentally refused to know the land ‘carnally,’ in not eating its fruits. Instead they brought “a European Noah’s ark, and we have for all practical purposes remained within that supply ship.” By inhabiting the land as if it were a barren place that could not nourish us through its native fruits, settlers impoverished our capacity to perceive the landscape:

> The eye of the Aboriginal perceiver will be drawn into the detail and depth of the landscape; it will probe behind the external appearances into a honeycomb of interiors astir with secret activities. The eye of such a perceiver, guided by appetite, will leap from focus to focus, a thousand times over, and will uncover multiple layers or dimensions. To the perceiver whose appetites are satisfied in other ways, in contrast, the landscape will lack any particular point of focus, and will present a bland, merely two-dimensional surface. It will function, at best, as ‘scenery.’

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342 Ibid., 43.
Mathews draws attention to the different phenomenology of perception that can arise from a relationship of nourishment from Country. The embodied need that we share with other species to be fed and supported by the land can become a powerful motivator for caring for that land.

Those who champion the beauty or the biodiversity of nature often see provisioning or livelihood activities as in conflict with the values they want to preserve in wild areas, even when Aboriginal people are carrying out their cultural activities. Sea Shepherd’s campaign against various forms of indigenous subsistence hunting is a case in point. The industrial mode of production has become so dominant and so ubiquitous, that our understanding of “use of the land” has become saturated by an industrial mentality, and even subsistence practices come under suspicion. Government decisions to allow Indigenous hunting as part of subsistence provisioning generate anxieties that the floodgates of exploitation will be opened. Thus many Aboriginal people continue to be imprisoned on the NSW South Coast for gathering food such as Abalone, that they call “Mutton fish.”

I remember in high school in around 1996 when my class was taken on a "bush foods" cultural tour of the Sandstone heath and dry sclerophyll land near Pittwater, North of Sydney. Our Aboriginal guide said travelling through the bush for a person who practices culture on Country is similar to our experience of being in a supermarket. At that time I was shocked by that analogy. My anti-consumerist ethos was slowly

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343 See, for example Bronwyn Adcock, “‘Strangers in our own place’: Aboriginal community fights for cultural fishing rights,” Background Briefing, Australian Broadcasting Corporation, 18 February 2016 http://www.abc.net.au/radionational/programs/backgroundbriefing/aboriginal-fishers-report-harrassment-fishing-traditional-food/7180326
maturing as my younger sister and I staged boycotts of McDonalds, refusing to leave the car to join the rest of our family inside. The bush to me represented the polar opposite to going shopping, yet here was an Aboriginal person, who viewed the land as sacred, calling the bush a “supermarket.” In the intervening years since my school days, I have come to understand the supermarket analogy better. For many consumers, products on the shelves are not merely products: they are memories of the last time they cooked a certain dish; anticipations of a future in which delicious food is prepared; imaginings of how a certain tool might improve a skill or make life easier; psychic comfort to fill a perceived “lack” in our feelings of adequacy as human beings. Those of us who are affected by marketing, particularly children who have acquired “pester power,” can perceive some products as emanating compelling forces of attraction. For those of us who cook, products displayed on shelves can hold particular imaginative and sensuous power. Provisioning work – when carried out freely – can be rich in meaning and a particular creative joy, particularly when shopping for food, arts and crafts or hardware. Reading the labels on unknown products can initiate an imaginative journey of desire, learning how each object can be put to use. In my mind’s eye I can imagine new aesthetic experiences initiated through the tool or the material. In other words, the promise of an enlarged practical repertoire with the addition of a desired consumer object or tool is a large part of the appeal of buying food or new things. I now think this experience of perceiving abundance is what our cultural guide was pointing at.

Material consciousness of a landscape for a person skilled in bush craft might prompt strong desires and vivid imaginings: a streamlined tree branch could provide a good shaft for a hunting weapon, or it might evoke anticipations of moving one’s body in a
certain way, resonating with our body systems by stimulating mirror neurons; a piece of paper bark with the right texture and shape for wrapping food might prompt a strong desire for procuring both the bark and that food. To be in a place, surrounded by an awareness of abundance and rich practical possibilities can be an uplifting experience, one that has been largely lost from aesthetic understandings of the Australian bush as awareness of bushcraft has not become widespread among settler populations, and the violence of colonialism has meant that many Aboriginal people have lost their connection with this knowledge.

Browsing the internet several years ago while researching uses of my family’s backyard plants for a permaculture design certificate, I paused, examining a cross section of silky oak wood. The grain reminded me of my violin, an instrument that I hold a lot of affection for, made here in Sydney in 1964. I carried the violin to the computer and compared the patterns. They seemed to match. Silky oak wood is identified on one woodturning website as good for musical instruments. Since making this tentative connection, whenever passing a silky oak in the street, I feel a lot of gratitude. Material consciousness has helped me gain greater appreciation for these trees, and a more differentiated understanding of the landscape that inclines me towards wanting to care for such trees.

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344 For a reflection on the ways in which bodily resonance through the activation of mirror neurons can be harnessed for social change, see Romand Coles, “The neuropolitical habitus of resonant receptive democracy,” *Ethics and Global Politics* 4, no.4 (2011) 273-93.
4.5 Colonialism and capitalism: supercharging instrumental reason

When considering how to transform practices and ontologies of land use, it is important to also examine the barriers to such transformation, namely in certain tendencies towards instrumentalism and individualist ontologies that are encouraged by capitalist ideologies and materialities. Capitalism supercharges instrumental reason in many different ways: collapsing and homogenising space,\textsuperscript{345} separating cores from peripheries, cities from hinterlands, homes from workplaces. These processes concentrate decay and pollution in hidden “sacrifice zones”\textsuperscript{346} and “shadow places” of externalized environmental damage, separating decision makers from the consequences of decisions, diminishing the political power of embodied disgust and its potential contribution to ethical responsiveness, through making it a compulsory price to pay for employment, by people who have little spatial or upward mobility. As Ani Di Franco writes in her song \textit{Trickle Down}, “You cease to smell the steel plant after you’ve lived here for a while.”\textsuperscript{347} Capitalist regimes of time further constrain non-instrumental responsiveness by creating an atmosphere of urgency and strict goal orientation through Post- or Neo-Fordist “just in time production” and “total quality management,”\textsuperscript{348} diminishing the autonomy, discretion and power of workers and making it harder to reflect on the ends of work, in other words, to care.

\textsuperscript{345} See, for example, Henri Lefebvre, \textit{The Production of Space}, (Hoboken, NJ: Wiley, 1992).
The Lockean theorisation of use acccents instrumental reason, elevating the atomised individual as its primary agent, who, rather than acknowledging prior claims or the needs of earth others in their appropriation of land, can profit from gaining title to it, if they “improve” it through clearing trees and tilling the soil. In westernised countries, rights of land use are bound up in private property relations. Locke’s labour theory of property was employed by colonial powers to justify theft of indigenous land in Australia, based on judgements of inadequate use, codifying particular hierarchies of use into law. The principle, “as much land as a man tills, plants, improves, cultivates, and can use the product of, so much is his property”\(^{349}\) was widely evoked to justify the advance of the frontier in appropriating more Aboriginal land. Locke claimed that such appropriation and modification of the land ultimately serves the common good: “he who appropriates land to himself by his labour, does not lessen but increase the common stock of mankind.”\(^{350}\) Yet this framework valorized only particular forms of labour and particular labourers.

Australian Aboriginal people were compared unfavourably with other first peoples of New Zealand and North America with regard to their use of the land, and these claims justified the British refusal to recognise and enter formal treaty negotiations with their nations. Drawing on historical accounts of settler-indigenous relations, Rob Linn quotes two sources that judged the status of Aboriginal people in Australia on the basis of their non-tillage agriculture: “A people who have never learnt… in any way to till the ground... must belong to a very inferior grade of human beings.”\(^{351}\) They were


\(^{350}\) Ibid., 133.

also denigrated as “…savages, who had not even invented the bow and arrow, never built a hut nor cultivated a yard of land…. could lay no claim to the land nor life, so we confiscated both.” More recent historical research has exposed how wrong these judgements were, with the highly attuned and sophisticated agricultural practices of pre-colonial Aboriginal societies becoming more widely recognised. In the current era, land cultivation through tilling is increasingly understood to be a cause of land degradation. ‘No-till’ methods have grown rapidly in their adoption, with land area under no-till management in the United States growing by 1.5 per cent each year, whereas at the time of Locke, tilling the soil, involving the application of labour to modify the land’s surface, was seen as the quintessential example of improvement, sometimes being used as a metonym for such improvement.

Although the appropriation of Australian Aboriginal land was initially justified in the name of intensifying use, in the twentieth century, enclosure of land by government increasingly occurred in the name of conservation and de-intensification of use, as part of protecting ‘wilderness.’ William Cronon argues that in North America, the construction of wilderness depended on a kind of ‘forgetting’ of history, and the disavowal of responsibility towards that violent history of colonialism:


The most well known are the books by Gammage, The Biggest Estate on Earth and Pascoe, Dark Emu.


An exception to this is the creative utilization of Locke’s labour-based justification of land tenure by the MST [landless workers movement] in Brazil, who occupy and appropriate the land of large land holders for the purpose of subsistence agriculture.
The removal of Indians to create an “uninhabited wilderness”—uninhabited as never before in
the human history of the place—reminds us just how invented, just how constructed, the
American wilderness really is.... it quietly expresses and reproduces the very values its devotees
seek to reject. The flight from history that is very nearly the core of wilderness represents the
false hope of an escape from responsibility, the illusion that we can somehow wipe clean the
slate of our past and return to the tabula rasa that supposedly existed before we began to
leave our marks on the world. \(^{357}\)

The ideal of wilderness in settler-colonial societies responds to a specifically modern
and Western problem regarding the degradation that overwhelmingly accompanies
use, particularly since the Industrial Revolution (and to a lesser extent, the Neolithic
Revolution). A hierarchy of environments is constructed, with the level of conservation
in an inverse relationship to the level of human use, with both the protected and the
overused located away from the places where humans are supposed to live. This
typology avoids addressing the problem of reworking everyday practices of use to
reduce their destructive power, and in many ways displaces such a task to some time
in the future, by sheltering most members of society from the potentially distressing
consequences of their actions. Wendell Berry critiques practices of conservation that
do not attend to the problem of use, that fail to work with the land: in his view this
leads to capricious, self- centred and irresponsible attitudes:

the mentality of conservation ...is divided between its intentional protection of some places
and some aspects of “the environment” and its inadvertent destruction of others. It is variously
either vacation-oriented or crisis-oriented. For the most part, it is not yet sensitive to the
impact of daily living upon the sources of daily life. \(^{358}\)

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\(^{358}\) Berry, *The Unsettling of America*, 28.
While Berry supports wilderness protection, he is frustrated by approaches to conservation that exclude humans from meaningful relations to the land. Berry quotes approvingly and at length from a letter from David Budbill, characterising the mentality of conservation as “the terrarium view of the world.” The letter writer is sympathetic to those he calls “militant ecologists,” yet he is frustrated with their modes of representing human use of the environment, with the ideal of wilderness implying a certain “self hatred,” which forecloses the possibility of developing closer relationships with the landscape through use, in which we might come to identify with nature as intertwined in and with our lives:

I don’t care about the landscape if I am to be excluded from it. Why should I? In Audobon Magazine almost always the beautiful pictures are without man; the ugly ones with him. Such self-hatred! I keep wanting to write to them and say, 'Look! my name is David Budbill and I belong to the chain of being too, as a participant not an observer (nature is not television!) and the question isn't to use or not to use but rather how to use.'

Here, affective ties to the landscape are generated through close practical relationship: a participative instead of an observational proximity, relating with other species in their similar efforts to obtain livelihoods from the land.

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359 Ibid.
360 Ibid., 29.
4.6 Indigenous practices of use

While learning about the transformations in ontology that arise in farmers’ and green keepers’ increased care towards the soil, I kept being reminded of Aboriginal care for the land. Sheep, wheat and golf represent some of the industries that have most degraded land and destroyed habitat in Australia and that have most benefited from colonial land relations. Aboriginal belief systems that regulate use prevent a narrow, exclusively instrumental stance towards the land because of the kinship relations between humans and other species, which also give these relations of use their depth. These understandings and identifications strengthen intimacy and responsiveness, as they are embedded in meaningful cosmologies that define interspecies obligations and land relations. In Australian Aboriginal cultures, the use of land does not imply environmental damage because relationships of use take place in the context of reciprocity, as part of maintaining direct or close connections of care, with plenty of time in between harvest events. A Wiradjuri friend and colleague, Jennifer Newman, who is studying a PhD in the same doctoral program has explained to me that Country suffers if it is not used. Using helps to strengthen relationships because it involves engaged attention and responsibility for the land.

Deborah Bird-Rose recounts the response of a Ngarinman senior custodian to viewing a highly eroded gully on his Country:

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He looked at it long and heavily before he said: ‘It’s the wild. Just the wild’. Daly went on to speak of quiet country: the country in which all the care of generations of people is evident to those who know how to see it. Quiet country stands in contrast to the wild: we were looking at a wilderness, man-made and cattle-made. This ‘wild’ was a place where the life of the country was falling down into the gullies and washing away with the rains.362

This reveals a very different understanding of the wild than that celebrated by Western environmentalists. Inverting the environmental meanings of the terms “wild,” and “domesticated,” Daly is using wild to lament a lack of care in a similar way that this word is sometimes used to describe children who suffer parental neglect. The land is acting out, not of freedom or health but of distress and fragmentation. At this stage it would be very difficult to recuperate the losses that have already been sustained, thus Daly’s sadness. Rose interprets the term “quiet” in another paper: “‘quiet’ is a Kriol term. It means tame: domesticated, not dangerous, under control. The inescapable irony, and the hurt for many Aboriginal people, is this: the country Europeans would want to see as 'untouched wilderness' is the country that Daly Pulkara and others regard as properly cared for.”363 Relations between Aboriginal people and the land are seen here as domesticated, enabling a process of making homes together, rather than a relationship of domination. In these close relationships of care, traditional owners are responsive to the particular needs of the land.

Responsiveness towards a landscape over time strengthens recognition and respect for individual entities in that landscape and the uses to which they can be devoted. When such responsiveness is culturally anchored, it is reflected in language and ritual. In his

book on indigenous research methodologies Shawn Wilson, a Cree scholar, shows how in his language, the naming of objects is based on their use. He writes: "In the Cree language, the literal translation into English for a chair would be "the thing that you sit on" and the literal translation for a pen would be "something that you write with".... Objects themselves are not named; rather what they might be used for is described."³⁶⁴ Thus the Cree language reflects ontological relations infused with perceptual recognition of practical possibilities. Wilson elaborates on an indigenous method of learning which involves increasing the number of relationships you have with things in order to know them better: "the more relationships between yourself and the other thing, the more fully you can comprehend its form and the greater your understanding becomes... So the methodology is simply the building of more relations...Our axiology demands that we be accountable to these relations that we form."³⁶⁵

Rose sees a similar awareness of connectedness as the basis of respect in Australian Aboriginal practices of knowing the land: “Respect is a matter of ... knowing the connections so that one knows the many contexts in which respect is due, and knowing how to look after things so that one can fulfill one’s role in life.”³⁶⁶ Such respect for the particular role that each individual entity plays in maintaining the order of the ecosystem is generated through attentive observation and thought:

³⁶⁵ Ibid., 79.
[Respect] requires constant attentiveness to the value of something or someone, appreciation of the fact that that individual has its own contribution to make which is vital to the natural order.... None of this is possible without careful thought and observation, so that one can come to better understand what its function or contribution is, what conditions are needed to permit its continuation, how not to interfere with it, and how best to enable it.367

In a similar way, Laurie Anne Whitt and others discuss Diné rituals of gathering plants for medicine, which involve attentiveness to the particular individuals being cared for: “When you are collecting medicine healing herbs, you have to collect for the individual sick person. You make an offering to the plants in your prayers ....All these medicine plants have a specific song and prayer to go along with them.”368 For many Indigenous groups, obligations and knowledge relations are situated in place to such an extent that if a place is irreversibly changed, the knowledge associated with that place can be lost: “it was Mr. Sequoyah’s belief that if the Valley were flooded, he would lose his knowledge of medicine.”369 Whitt et al emphasise the modes by which knowledge arises intimately, in situ, in contrast to Western science: “western science, western knowledge of the natural world, is representational. Indigenous science, indigenous knowledge of the natural world, is... presentational. Its continuation, its transmission, its possibility turn vitally upon the presence of the natural world, and on the kind of experiences that world offers.”370 Thus such connection to ancestral land must be maintained for the extensive practice knowledges of respectful use to remain available to future generations of Aboriginal custodians.

369 Whitt et al., “Belonging to Land.” 702.
370 Ibid., 704.
4.7 Embodiment and Place-based obligation

Are there any conceptions of use in Western thought that may also support such a respectful orientation to the land? In The Unsettling of America, Wendell Berry advocates for *kindly use* that is intimate, sensitive and reflexive, attenuated to particular contexts but accommodating many provisional objectives. While the tradition of American agrarianism from which Wendell Berry comes has problems with its own inadequate reflection on the rootedness of American agriculture in colonialism, as well as the role of some of its early figures such as Benjamin Franklin in slavery, Berry’s principle of place-based obligation resonates strongly with First people’s place-based practices of use. Both the practices of use of Indigenous peoples and Berry’s elaboration of the concept of *kindly use* show that the possibility of a non-alienated, ecologically-attuned livelihood is a real one.

Berry’s concept of kindly use is both deeper— that is, more caring and knowledgeable, and broader— by which I mean more open ended— than the conventional concept of use:

> Institutional solutions tend to narrow and simplify as they approach action. ... Organizations tend to move toward single objectives—a ruling, a vote, a law— and they find it relatively simple to cohere under acronyms and slogans. But kindly use is a concept that of necessity broadens, becoming more complex and diverse, as it approaches action. The land is too various in its kinds, climates, conditions, declivities, aspects, and histories to conform to any generalized understanding or to prosper under generalized treatment. The use of land cannot be both general and kindly. ... To treat every field, or every part of every field, with the same
consideration is not farming but industry. Kindly use depends upon intimate knowledge, the
most sensitive responsiveness and responsibility.371

I think the crucial line here is that “Kindly use depends upon intimate knowledge, the
most sensitive responsiveness and responsibility.” This is similar to Kompridis’ concept
of receptivity which I will discuss further in the next chapter.372 Such a concept has
some resemblance to Indigenous modes of responsiveness towards the land. In both
cases the land appears as an ethically - significant entity that can command
answerability. Kindly use is alert to the diverse needs that become evident only after
long periods of observation and interpretation. By modulating their use of the land,
stewards can improve their knowledge and responsiveness to the needs of
ecosystems. Kindly use requires practitioner engagement: both means and ends are
charged with significance and intrinsic value, rather than being reified.

Berry contests the epistemic commitments of mass production agriculture, arguing
that kindly use must respond to the specific qualities of land in which one lives and
works, rather than generalised universal maxims. To enable freedom of action, Berry
argues that use should be grounded in small economic units rather than large
institutions. Modern agriculture rests on knowledge conventions that affirm the
generalized and the standardized as more worthy of regard than knowledge that is
manifest and grounded in specific places. Such knowledge hierarchies judge that there
is little practical benefit in relations of intimacy and complexity: indeed such
complexity often is seen as an obstacle to efficiency through economies of scale,
standardized automated and machine-based intervention. Berry constructs a human

371 Berry, The Unsettling of America, 31.
archetype of capitalist modernity that he calls “the vagrant sovereign” who “does not know where he is morally,” and cannot observe limits, even those that to previous generations would have seemed to be *natural* and unchanging: “he assumes there is nothing he *can* do that he should not do, nothing that he *can* use that he should not use.” The geographical separation of home and work forged by the division of labour in modern human life breaks apart a basic intuition generated from our animal condition, embodied in the inclination to refrain from befouling one’s nest. Berry thus argues for the reunification of home and work, and for care towards landscapes in which one lives and works, “knowing where one is” and being responsible for the care of the places that surround us. The Rodale Institute, an organic agriculture research institution in the US, represents the benefits of regenerative agriculture in terms of widening circles, from “You and Your Farm” to “The Local Environment” to “The Community.”

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373 Ibid., 53.
374 Ibid., 51.
375 Ibid., 53.
They summarise benefits of regenerative agriculture thus:

**You and Your Farm**– By farming organically, you are regenerating the soil and returning it to its natural, healthy state. By farming without chemicals, you are also regenerating your health and your family's health.

**The Local Environment**– The wildlands, wetlands and the environment surrounding your farm are regenerated by your organic practices. Dangerous chemicals no longer wash out of your fields and beneficial birds and wildlife return to help you keep down insect pests.

**The Community**– the local community and the world beyond are also regenerated by your farm as you recycle natural waste products into your fields, reducing local pollution points. As people eat your organic food, they are being regenerated and made healthier. Your farm is helping to clean up the planet.377

While these are framed as ‘benefits’ of regenerative agriculture, they also become dimensions of responsibility affirmed and awakened through the practices of care

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377 Ibid.
involved in regenerating the land. Such beneficiaries are not portrayed as in
competition with each other, but rather as mutually benefiting. This invokes an
economic imaginary that is more than the “zero-sum” understandings that seem to
predominate in capitalist agriculture: one that utilises the efficiencies and resource
reuse capabilities of robust ecologies.

An important dimension of Berry’s critique is directed towards excessive scale and
overwork in agriculture: above a certain point, the quantity of work to be done
overwhelms a practitioner, and immunizes them, swamping their receptive
capabilities:

One way of describing the action of the industrial economy is to say that it comes between the
mind and its work. If a mind is to be on its work in such a way as to do it well and preserve in all
aspects the possibility of good work in the future, then obviously the amount of the work must
be limited. Given the right amount of work, the mind lives in its place, not merely as owner or
user, but as a fellow creature with the other creatures that belong there, the effective
husbander of both the agricultural and the natural households. A mind overloaded with work,
which in agriculture usually means too much acreage, covers the place like a stretched
membrane—too short in some places, broken by strain in others, too thin everywhere. The
overloaded mind tries to solve its problems by oversimplifying itself and its place— that is, by
industrialization. It ceases to work at the necessary likenesses between the processes of
farming and the processes of nature and begins to order the farm on the assumption that it
should and can be like a factory. It gives up diversity for monoculture. It gives up the complex
strategies of independence (the use of manure, of crop rotations, of solar and animal power,
etc.) for simple dependence on industrial suppliers (and on credit).378

378 Berry, The Unsettling of America, 23–4.
Here, Berry claims that the burdens of excessive scale “overload” the mind and make thought and this regard for other creatures difficult. In order “to work at the necessary likenesses between the processes of farming and the processes of nature,” farmers must have the time to reflect and respond adequately to the land.

4.8 Towards more just understandings of use?

The term “kindly” implies benevolence, and attentiveness, looking out for the land’s needs. Yet it also may also provoke the worry that not all actions done in the name of kindness are just. There is a long history of paternalistic charity that attests to this fact, in which donors give according to their beliefs about other people’s needs rather than listening and learning in an open minded way from the other. “Kindly” also accents the emotional or ethical state of the human user, which, while important, is not sufficient for ethical practice. Thus it seems that “kindly” is thus not an adequate modifier of the term “use” to ensure justice.

Yet there is one important dimension of the term “kindly” in “kindly use” that is significant for treatment of soil, and which should result in a better relationship with humans. “Kindness” is an attitude that only tends to be conferred upon the living. It does not make sense to be “kind” to a table. Thus the norm of “kindly use” of the land involves the acknowledgement of the status of the land as a living entity, and thus deserving of a certain level of respect. In the next chapter I will consider the ethics of acknowledgement in more depth.
Does our concept of use itself need to change? It could be problematic that Berry needs to employ qualifying adverbs to distinguish a more sustainable attitude towards the land rather than contesting and transforming the concept of use itself. Berry’s use of the adverb “kindly” renders use as an unmarked category, just like “master,” or “policeman”—this implies that unkind use is still the default, creating fuzziness between use and abuse. If we heed Michel Serres, this may mean we have adopted the ideology of the parasite: “In its very life and by its practices, the parasite routinely confuses use and abuse; it accords itself rights, which it exercises by harming its host, sometimes without any advantage for itself. The parasite would destroy the host without realising it.”

Serres goes on to argue that while the social contract – the foundation of the modern state, binds humans and their governments together in an obligatory relationship, a similar relationship of obligatory reciprocity has not been established between humans and nonhuman nature. A more transformative understanding of use can be found in Braungart and McDonough’s book Cradle to Cradle, in which they rethink production entirely to mimic nature and eliminate waste. Even the old idea of usufruct rights contains a central obligation which is relevant for rethinking use: u·su·fruct means use of the fruit: there is an obligation to maintain the source of generativity while having access to land that they you don’t own. Berry notes the literal meaning of usufruct, writing, “when a species or group exceeds the principle of usufruct (literally, the "use of the fruit"), it puts itself in danger,” thus we need to make sure we protect and nourish the source. While this

380 Braungart and McDonough, Cradle to Cradle.
381 Berry, The Unsettling of America, 47.
may seem obvious with maintaining the trees in an olive grove, it is less obvious when it comes to sustaining the soil that supports crops.

Perhaps what is needed is develop a less human-centred vocabulary of use to show the relational diversity in practices of use, just as notions of parasitism, mutualism, commensalism all specify types of symbiosis, and an indicative sense of the beneficial reciprocity or harm in that relationship. What is important here is that our language for practical action would no longer be one-way, invoking a singular imagined subject who benefits from an imagined object, as “use” can sometimes imply. It seems that public language to emphasise the use value of ecosystems is becoming even more one-sided than before, with the term “ecosystem services” invoking solely human beneficiaries and relying upon the erasure of the ecosystem worker perhaps more than the term “use” does. While we can minimise use of the term “ecosystem services,” we cannot eliminate the term “use” from our language since it is central to our practical vocabulary. At the same time, associating use with an interspecies conception of economy as “livelihood” may help enable a more reciprocal, interspecies and multidimensional, even affectively oriented understanding of the exchanges that sustain us through interdependence, in accord with Karl Polanyi’s substantive notion of economy.

There is a parallel between liberation and regenerative farming when it comes to freedom for nonhumans from overbearing power, which perhaps is inadequately

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382 A fascinating paper is by Markus J. Peterson, Damon M. Hall, Andrea M. Feldpausch-Parker and Tarla Rai Peterson, “Obscuring Ecosystem Function with Application of the Ecosystem Services Concept,” Conservation Biology 24, No. 1 (2009), 113-9. Several years ago I considered re-signifying the term “ecosystem services” to attempt to make it more reciprocal, and I gave up on this project, which was what led me to think about the concept of reciprocal use in the first place.

drawn out in the concept of “kindly use”. I briefly discussed this in chapter two in terms of the nature-inspired vision of liberation of the Frankfurt School. Industrial agriculture resembles feudalism, in its control-based relations forged between the farmer and the land (with the serfs fed with nutritionally inadequate payments of fertiliser and given little space with which to develop capabilities and relations of their own), while regenerative agriculture evokes an active, participatory form of democracy in its efforts to pursue free cooperation between land stewards and the land. Latour draws out a similar parallel in his *Politics of Nature*.\(^{384}\) In his 1997 book *Between Facts and Norms*, Habermas refers to “forcibly stabilized versus rationally legitimated orders,” a rhetorical contrast which he sees as less a description of political realities and more a legitimation discourse historically specific to the transitional period of early modernity,\(^{385}\) yet this distinction between persuasion, coaxing a will from within versus forcible ordering from without (leaving aside the reference to rationality) contains a parallel with the two paradigms of agriculture. Most industrial forms of agriculture attempt to forcibly stabilize nature in ways that undermine it through land degradation, leading to decreased capabilities and carrying capacity and a greater risk of epidemics such as Foot and Mouth Disease. Yet there is no discursively mediated sphere in which nonhumans, particularly nonhumans living in soil resemble anything like citizens in agriculture, despite the power of technological instruments to more powerfully indicate their needs. While there is a level of communication, this is different in kind rather than in degree to the communication necessary for a functional democracy.


While land stewards and the land do respond to each other, they do so in a manner that fails to bring about the mutual recognition necessary for humans and nonhumans to belong to the same polity, to have meaningful exchanges via language. There is inadequate shared communicative ground with which a continuous human-nonhuman relationship may be formed sufficient to enable the offering of promises or gestures of forgiveness in an interspecies domain that might enable us to begin anew together, to use the words of Arendt to describe important dimensions of purposive human action.

That said, I am very interested in the Deep Ecology “Council of all Beings” exercise and the Latourian vision of a democracy of hybrid collectives, both of which I think have greater commonality with anarchist spokes-council and direct democracy models rather than parliamentary modes of democracy from which Latour draws much of his imagery. Likewise, Nancy Fraser’s concept of a “subaltern counterpublic” which describes groups that emerge in contestation to exclusions within dominant publics, helping to expand discursive space, is also relevant to think about the hybrid, interspecies learning that informs the public conversation about soil. Fraser is critiquing Habermas’s view that a singular public sphere is preferable to the proliferation of many contesting groups. Counter publics can create resistant or healing worlds inside hegemonic worlds, spaces for different sorts of connections and articulations to become possible. Such counter publics build strength to a politics of recognition that is able to over time assert power over space and the imagination of the dominant culture. I will elaborate on this in the following chapter.

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4.9 Conclusion

Relationships of utility do not have to be entirely instrumental. While an instrumental stance is a necessary part of premeditated action, [finding means that suit desired ends is essential to goal-oriented activity], that is not all there is to practical activity, particularly if the practice involves capabilities of sensitivity and skill. Necessity is often an inaugurating force that initiates a relationship with the land. The question of instrumental reason is a question of when and how often to use it and towards what ends. Instrumentalism’s other, care, is of key importance, as it is a condition for the maintenance of healthy relationships. Without care, or ‘reproductive labour,’ ‘productive labour’ could not exist. If a practitioner is open, curious and caring enough, even with initially instrumentalist motivations, her/his practices may be transformed to care for the soil as an end—not just as an instrumentalised means, being taught by the organisms they are working with, as I shall discuss in the next chapter.

Transforming the relations between those who both instrumentalise and those who are instrumentalised requires long term effort. We as humans instrumentalise to a much greater extent than we can take ethical account of. Simply existing as a human being: eating food, pursuing any goal requires that we assemble nonhuman means to achieve those goals. We can minimise the negative impacts of instrumentalism by becoming sensitised to the nonhuman others in our midst that also have needs that we can learn about, that coexist with us on terms that are not adequately thought through and made just, and developing a conscious orientation towards these others.
as “matters of concern,” with options for transforming these ethically-charged relations preferably articulated through public debate and dialogue, as environmental politics at its best can do.

All work is multidimensional, and to the extent that the goal of efficiency in particular can be deflated in its importance, workers have greater freedom to appreciate and build a more respectful and reciprocal relationship with their environments, enabling a richer world of relational concern to emerge. Even initial motivations that are narrowly self-interested can become more complex as time proceeds, and as the enjoyment of the labour of *phronesis* and care takes over, instrumental reason is deflated and practices of use can become more responsive.

In summary, the challenge of the environmental crisis in the Anthropocene, as I see it, is not to eliminate instrumental activity as such but rather to reconceive such activity as open-ended: pursuing goals that can be modified over time through observation, reflection, and learning from context, being answerable to the needs of nonhuman others around us. When there is an implied opposition between land use and care, it may seem inevitable that use involves exploitation: care is viewed as only a remedial and occasional stance rather than a constant and productive practice, centrally linked to skillful stewardship. I believe it is possible and necessary to shift the frame in which land stewardship activity is understood, to develop a richer conception of use that

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388 An example of an intentional orientation to objects, technologies and practices of use can be found in the previous chapter in which I discuss Dreyfus and Spinosa’s reflection on the Japanese coexistence of the traditional and technological, in “Further Reflections,” 273.
centres upon an ethic of care: kindly use that is consonant with the worlds of craftspeople, farmers, hunter-gatherers and other skilled practitioners.
Chapter 5: Recognition of soil: overcoming reification

An ethic of care is central to successful regenerative farming. In this chapter I am interested in the necessary conditions for soil care, in a world in which soil is devalued. For soil to be even considerable as an object of respect and concern, it needs to be regarded in a certain way, as vulnerable and having a form that can be harmed, as able to communicate something, as able to respond to care.

For practitioners who experience soil in the course of their daily work, there needs to be an active relation to knowledge production in order to overcome the reifying perception that is common for workers to experience, as also discussed in chapter two. The kind of perception that is necessary to care for the land involves a sensitive relation to other forms of life, resembling listening more than looking. Over time, practitioners gain a mental picture of soil sensitivities, soil needs and the ways in which the use of machinery should be limited, and act accordingly.

Rather than accurate representation (while this may also be important), this kind of perception is about significance. The things we notice and those we ignore are impacted by socially constructed categories of value. There is also an embodied feedback loop that modifies our perception: we respond to objects in the world that we are affected by: noticing their distress or their thriving. Feminist care ethicists have thought in great depth about these issues, and I draw upon their expertise. I begin by reflecting on the film WALL-E, a fable about care for the earth (soil) as a synecdoche.
for the Earth (planet) in the aftermath of an Anthropocene in which human activity on planet Earth has so despoiled nonhuman life that human existence on Earth is no longer tenable. I weave this in to a discussion of reification and recognition as well as environmental justice. All of these help to develop a rich sense of the ethics that are needed to be a regenerative land steward, and to help soil support an ever more complex microbial, plant and invertebrate menagerie.

5.1 WALL-E and earth-care: overcoming Earth alienation.

The multiple academy award-winning Pixar film Wall-E [2008] is a fable of humanity’s relationship to the Earth in a future of environmental devastation, when Earth has greatly diminished life-supporting capabilities. Specifically it invites us to reflect upon what it would mean for humans to live without earth [soil] and Earth [the planet], highlighting the contributions of soil to human and nonhuman life.

Evacuating planet Earth when development, pollution and rubbish reached such an immense scale that plants were wiped out, humans have lived on a fleet of spaceships for 700 years, despite an initial intention for the exodus to be only a five-year voyage. The Axiom, the most luxurious space ship, regularly sends probes to Earth to detect signs of life: to obtain a plant specimen in order to prove a life-sustaining environment has been re-established, which is supposed to put Operation Recolonise in motion, a process of bringing the humans back to Earth. However a conspiracy has

389 WALL-E, directed by Andrew Stanton, (Emeryville, California, Pixar, 2008). DVD.
arisen in which Operation Recolonise has been overridden by an intelligent machine, 
*Auto*, outsmarting the humans who are now accustomed to life on the spaceship, with its microgravity as well as a sedentary and passive lifestyle.

Life on The Axiom is a synthetic mode of existence in which humans do not rely upon or cooperate with nonhuman organisms: no longer engaging with the grown, but only with the made: robots and other machines. Developing the capability to live apart from nonhuman companions and food sources, humans have also ceased to understand the ethical significance of caring for other life forms, as well as caring for their own common world. Humans no longer have embodied understandings of what it means to live on planet Earth: even everyday language has evolved to eliminate many earthly reference points. Collective practices of building and sustaining a common world through participating in a political public sphere are no longer part of everyday life or common memory. This can be seen as at the zenith of Hannah Arendt’s concepts of *Earth Alienation* and *World Alienation.*

> The most radical change in the human condition we can imagine would be an emigration of men from the earth to some other planet. Such an event, no longer totally impossible, would imply that man would have to live under man-made conditions, radically different from those the earth offers him. Neither labor nor work nor action, nor, indeed, thought as we know it would then make sense any longer.  

Back on Earth, WALL-E, a rubbish compactor, is initially depicted as the only one who maintains a meaningful world amid the waste of human society: distinct from Hal, the cockroach, and Eve, the probe droid who arrives from the Axiom, who is simply acting according to her programmed instructions. WALL-E unintentionally becomes the

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392 Ibid., 10.
messenger of a lost human worldhood, a carrier of human history and culture through his maintenance of a home on Earth, when he follows Eve to the Axiom.

The soporific holding pattern of human life in the spaceship is torn apart when Eve and WALL-E enter the spaceship and contaminate it with plant life and dirt. Dirt, in this fable, can be read as a symbol for the free, emergent life process of nature: a process that cannot be fully controlled. It is a source of both contamination and complex relations beyond human understanding.

WALL-E zigzags through the hallways, leaving a trail of dirt, not conforming to the predictable movements of the spaceship inhabitants. This prompts the quarantine–law enforcement robots to clean up after him. Following these movements, the robot M-O breaks from his linear path. The changed pattern of movement (and perhaps contact with the lively substance of dirt) prompts him to begin exercising independent judgement, and eventually to become an ally of WALL-E.

When the captain of The Axiom greets WALL-E with a handshake, he is left with grains of dirt in his hand. He stares at them in wonder, and begins to ask questions to his automated personal assistant, realising that WALL-E is from Planet Earth:

“Define dirt”
“Dirt: a three-phase system containing a combination of naturally derived solids-otherwise known as Earth.”

“Define Earth”
“The surface of the world as distinct from the sky or the sea.”

“Define Sea”

The captain’s curiosity regarding the dirt alerts him to his unknowing. This prompts a new process of inquiry, and an epiphany regarding the capabilities that have been lost
in giving up Earth as their home. For the duration of human existence on the space
ship, words used to define dirt have fallen into disuse, with no basis in experience, for
example, earth and sea. Pursuing the meanings of each of these words, the captain
realises that entire worlds have been lost that these words used to describe, and with
them, embodied and environmentally-enabled ways of life. The wonder born of the
captain’s seeing soil for the first time and having the Earth’s value disclosed by that
soil, is a powerful provocation for thinking about soil and nonhuman life. Humans need
Earth to know these dimensions of being human. After a struggle to retrieve the plant,
Eve brings it to the Captain, but it is drooping, with a leaf falling off. The captain is
moved: he waters the plant and realises that humans are needed to care for plants and
the Earth, and that they ought to move back to Earth in order to make amends for past
destruction. It is interesting that Eve’s name evokes the Abrahamic religion’s creation
story from Genesis, and humanity’s original mythical habitat, the Garden of Eden. This
allusion reinforces both the story of awakening that comes about as a consequence of
transgression, and foreshadows a possibility that humans will one day recreate a
beautiful garden on Earth, recognising a duty to “serve and preserve” the earth,393
coming to understand their co-implication with their nonhuman brothers and sisters.

Determined to guide the ship back to Earth, the captain first must struggle against the
computer Auto. He no longer accepts Auto's agenda as neutral. The struggle
inaugurates the use of human bodies in a new way, both physically and politically.
Changing course requires the Captain to wrestle Auto for the spaceship
controls, sending it off balance: a tilt which sends the flailing human bodies to fall off

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393 This is a translation that Daniel Hillel uses. In Symphony of the Soil, Hillel says: “Adam and Eve are
placed in the Garden of Eden, the garden of delight which is nature, and given an assignment: not
mastery, but a role, a task, “to serve and preserve,” it says in Hebrew. The King James version says “to
dress it and keep it,” but my translation says “to serve it and to preserve it.”
their hover chairs and pile up against one another. In the melee, the people and the robots unite to save the plant. The collective effort resists the machinery of Auto, the technologies that sustain the complacent unthinking existence that had kept the society suspended in space for so long. This chaos serves as a necessary part of a transition, as the people must learn to inhabit their bodies differently in order to live on Earth again. Bone density has been lost in the hundreds of years of life in the spaceship, and Earth gravity will press hard against them. While humans will lose the comfort and the familiarity of life in space, a life back on Earth is one that has the potential to find greater purpose and meaning.

During the final credits of the film, a song, *Down to Earth*, plays, which could be read as an ode to Planet Earth, and to an existence grounded in acknowledging limits, while working with natural forces, such as the breeze, and gravity:

"Down To Earth" by Peter Gabriel

Did you think that your feet had been bound
By what gravity brings to the ground?
Did you feel you were tricked
By the future you picked?
Well, come on down

All these rules don't apply
When you're high in the sky
So come on down
Come on down

We're coming down to the ground
There's no better place to go
We've got snow up on the mountains
We've got rivers down below

We're coming down to the ground
To hear the birds sing in the trees
And the land will be looked after
We send the seeds out in the breeze

... Like the fish in the ocean
We felt at home in the sea
We learned to live off the good land
We learned to climb up a tree
Then we got up on two legs
But we wanted to fly
Oh, when we messed up our homeland
And set sail for the sky

We’re coming down to the ground
There’s no better place to go
We’ve got snow upon the mountains
We got rivers down below

We’re coming down to the ground
We’ll hear the birds sing in the trees
And the land will be looked after
We send the seeds out in the breeze

We’re coming down
Comin’ down to earth
Like babies at birth
Comin’ down to earth
Redefine your priorities
These are extraordinary qualities... 394

For humans to ‘come down to the ground’ in this context is to find right relation
among the messiness and ecological devastation of Planet Earth, despite its difficulties:
to overcome our earth-alienation and denial. Whereas before, we “learned to live off
the good land,” now humans will “send the seeds out in the breeze,” trusting a
broader community of multitudinous capabilities beyond the human, with shared
livelihoods breaching the boundaries of a demarcated earth segregated for human
benefit alone.

In The Anthropocene, nonhumans and humans alike experience stunted capabilities.
Inserted into an old boot by WALL-E, the plant is contained in a similar way to how
nonhuman organisms are contained (and to a smaller extent enabled) by the human
ecological footprint in the Anthropocene. I am reminded of Nicholas Low and Brendan
Gleeson’s observation: "At the precise moment when it became clear that we humans

had this planet in the palm of our hand, it also became clear that we are likewise held by it. Just as we become free and separated from the earth we discovered the nature of our attachment to it.”

This articulates the tragic and hopeful dimensions of the Anthropocene, drawing out the paradoxes of human power and dependence on the earth disclosed particularly when ecological systems that support life break down: we can then see ever more clearly the ethical relationship between humans and the earth, particularly the soil, as a means of transformative contamination and an object of curiosity.

Modern humans, like those on The Axiom, have the rapidly growing technical capability to transcend at least some of our natural constraints, with some trans-humanist visions for robot, cyborg and genetically-modified existences now realisable. We have the ability to grow food crops entirely without the use of soil, which now can even be certified organic. Yet even if humanity reaches a state where we do not physically need other forms of life, (a possibility I am skeptical of, given the fact that human bodies contain as many microbial cells as human cells, but I am willing to entertain the thought), we would still have obligations, ethical ties to life on Earth, at least for the purpose of repairing the damage we have caused. Living in a way that is

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396 In the US there has been a policy change regarding the definition of “organic.” Eliot Coleman explains, “The original USDA definition of “organic” stressed “soil biological activity” as one of the processes enhanced by organic practices. But to many farmers’ dismay, the agency rewrote that definition in 2002 to remove any reference to the word soil,” in “Why You Can’t Have Organic Food Without Soil,” Civil Eats blog, 13 April 2015, Accessed 2 September 2016, http://civileats.com/2015/04/13/why-you-cant-have-organic-food-without-soil/.
397 The often-quoted claim that microbes outnumber human cells by a factor of 10 has been refuted in a 2015 study in PLOS Biology by Ron Sender, Shai Fuchs and Ron Milo. They revise the ratio to 1:1. This was reported by Alison Abbott, “Scientists bust myth that our bodies have more bacteria than human cells: Decades-old assumption about microbiota revisited,” Nature, 08 January 2016 http://www.nature.com/news/scientists-bust-myth-that-our-bodies-have-more-bacteria-than-human-cells-1.19136
released from the constraints of earthly life and environmental devastation may seem
liberating for some, but it is ultimately irresponsible: this negative freedom is obtained
through ignoring ecological relations that bind us or call us into care. The plant that
Eve obtains and brings back to the Axiom can be read as a synecdoche for the Earth.
When the captain recognises soil and realizes that plants need care from humans, he is
moved, and he also begins to grasp that human belonging to the Earth involves care
for the Earth.

Like the melancholic Once-ler in The Lorax, WALL-E, and in turn, the captain,
facilitate the practice of a new human relation to the world centred on earth repair,
kindling hope in a life-supporting future by providing and demonstrating the material
means of life’s reproduction: plants and soil. The film highlights the role that humans
could play in healing the Earth through cooperating with ecologies that invite our care
and respect, and inhabiting our bodies and machinery better to tread lightly on the
earth. In respecting such limits we can actually gain freedoms, exercising relationally-
enabled capabilities that are only possible on a planet that harbours healthy
ecosystems of diverse forms of life.

5.2 Seeing soil degradation, recognising the need for change

The tilling of soil is so deeply ingrained as a benign practice in popular consciousness
that even imagery purporting to illustrate sustainable agriculture unwittingly
reproduces the imagery of a tilled field. Two examples have stood out for me in the
past year. One is on a website for a bank, while another is an “inspirational” meme on

398 Seuss, The Lorax.
Facebook:


Figure 27: Facebook Inspirational meme, with critical comments. Source: Anne O’Brien 31 October 2017.
The pushback in the comments in the second image is interesting. While one comment likens the soil surface to human skin and advocates for no till methods with cover crops, another critiques the lack of biodiversity, arguing that reversing this situation is the only “potential” that should be seen in the picture.

In his foreword to Wes Jackson’s book *Nature as Measure*, Wendell Berry writes:

> to agree on what is best for nature is not difficult. The effects of abuse are usually visible or, if not visible, measurable. Soil loss at present rates is often too clearly visible and is accountable in tons per acre. Pollution of water and air, sometimes visible, is always detectable and measurable by reliable means. To disagree about such harms, or their importance, people must be willfully deaf and blind.³⁹⁹

In a similar register, David Montgomery writes in his book *Dirt: The Erosion of Civilizations*:

> Should we be shocked that we are skinning our planet? Perhaps, but the evidence is everywhere. We see it in brown streams bleeding off construction sites and in sediment-choked rivers downstream from clear-cut forests. We see it where farmers’ tractors detour around gullies, where mountain bikes jump deep ruts carved into dirt roads, and where new suburbs and strip malls pave fertile valleys. This problem is no secret.⁴⁰⁰

Given the two images shown above, it is clear that gaining widespread recognition of the problem of soil degradation is much harder than either Berry or Montgomery believe. Is degradation caused by willful deafness and blindness, or has our society failed to develop an adequately ethically-charged interpretive system to prompt us to see and value the soil? The fact that something is visible and/or measurable doesn't mean that it will be prioritised among the many things that emerge into our

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consciousness and/or realm of care. Berry comes closer to the nub of the problem in his earlier writing in *The Unsettling of America*: "we came with vision but not with sight. We came with visions of former places, but not the sight to see where we are," a relevant observation for Australia where European traditions of farming are often imposed with little sensitivity to context. The widespread use of ploughs, even in semi-arid regions, and the introduction of numerous animals and plants that became pests are good examples of insensitivity to context that has been common throughout the history of the Australian settler project.

When Berry talks about sight, he is also talking about insight, referring to the act of grasping a situation in its specificities at a particular time in such a way that an ethical call is perceived and received, a call to change the way that we act in and towards the world. This theme can be seen at work in the film *WALL-E*, in which a call to care for plants and soil is perceived and received by the Captain, reorienting his vision that had been conditioned by his passive existence on *The Axiom* spacecraft.

Berry’s use of the tropes of vision and sight in his critique of industrial agriculture evokes Jacques Ranciere’s argument, that “politics is aesthetic in principle”: as Kompridis writes, it is “irreducibly aesthetic in so far as it involves a distribution or partition of the “sensible”... what can be seen and heard and what can’t be seen and heard.” In other words, each particular way of representing and ordering the world places some things in the foreground and other things in the background, generating

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401 Berry, *The Unsettling of America*, 43.
402 Jacques Ranciere, *Disagreement*, translated by Julie Rose (Minneapolis, University of Minnesota Press, 1999), quoted in Kompridis, “Introduction” to *The Aesthetic Turn in Political Thought*.
political and ethical consequences. This is a point that Heidegger, and Heideggerians have thought in depth about. Kompridis writes about disclosure in terms of this participative and care-infused involvement in the world:

prior to establishing explicit epistemic relations to the world “out there,” our theoretical understanding of the world always refers back to, as much as it draws upon, a concerned practical involvement with what we encounter in the world—a world we do not “constitute,” but into which we are “thrown.” The notion of disclosure refers, in part, to this ontological “pre understanding” of the world—or understanding of “being.”

...in one sense, the world is pre-reflectively disclosed to us, yet, in another, the world is disclosed through us: it is we who make its disclosure possible.... Thus disclosure involves both receptivity and activity, both openness to and engagement with, what is disclosed. What is disclosed may concern the background structures or conditions of intelligibility necessary to any world- or self-understanding, which I’ll refer to as pre reflective disclosure (Heidegger called them Existenzialen); or it may concern the ways in which these background structures of intelligibility are reopened and transformed through novel interpretations and cultural practices, which I’ll refer to as reflective disclosure (or redisclosure).

Nikolas Kompridis writes about how in recognition failures we encounter the limits of our epistemological and ethical understanding, necessitating a new orientation to the object of concern as well as ourselves: “to speak meaningfully of a recognition failure we would have to be dealing with a situation in which demands were being made of us, demands whose intelligibility and answerability require some form of recognition of the demands these are and of those who are making them.” He argues that interpretive uncertainty regarding the needs of others can provide resources for transformation, calling individuals towards a stance of receptivity. In Kompridis’s

Kompridis, *Critique and Disclosure*: 33.

Ibid., 34.

Ibid., 5-6.
discussion of recognition and receptivity in Coetzee’s *The Lives of Animals*, the struggle to make sense of normative calls coming from the nonhuman realm in a publicly accessible language renders the main subject, Elizabeth Costello, seemingly mad: “At a crucial, defining moment at the end of the text, his mother breaks down, declaring that she is helplessly lost to herself, unable to speak the words she aches to speak, unable to face what she most fears, unable to avoid a question she can’t answer.”

To give ourselves over to being unsettled regarding how to respond requires a particular kind of openness, combined with the resoluteness to undergo a process of change in which we are directed by those others that are calling us to respond, reconstituting ourselves to become different in the light of the challenge given to us by the experience. Facing this uncertainty, individuals can become answerable to yet-to-be-established standards.

Kompridis develops the concept of receptivity from Heidegger’s concept of *disclosure*, arguing that it is a sensitive and responsive stance towards the world that leaves ourselves open to being moved, or unsettled by the world, which may prompt a reflective process and an event in which we are transformed:

> …*Entschlossenheit* [Heidegger’s term, translated as disclosure] involves finding oneself in one’s situation as if for the first time: it involves *resituating* oneself. To resituate oneself, one must reorient oneself in light of the new understanding of one’s situation, making it possible to “go on” differently. *Entschlossenheit* then requires getting oriented to the call of conscience, and as such, it is a complex act of disclosure, since both the “call” and “response” are a single, continuous act of disclosure, a single, continuous act of making sense of one’s possibilities. It is a way of making sense of oneself that will require both a break with the self one was, and a

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reflective integration of the self one was with the self one can be.\textsuperscript{408}

Here, situational elements combine to call a person towards a different stance. These include the affective environment and the nonhumans present in it. Thus our ethical universe involves a sensuous interaction with all levels of materiality, living and non-living, and our susceptibility and sensitivity to perceive and become answerable to such concerns, is the degree of our ethical participation in the nonhuman world.

Nonhumans can help to bring new disclosures into the world, and help to renew an ethical stance to that world.

\textbf{5.3 Overcoming alienation through empowered action}

Even prior to our recognition of an environmental object, we need both to see it as significant and we also need to understand the signs that indicate when the object is healthy or in a condition of distress. Significance is often learned through praxis, through concerned practical action. The division of labour between the sciences and agriculture often separates means of detection of a problem and means of response. Those who can respond can’t recognize, and vice versa. There is also an added problem with soil that many of the active components are not visible to the human eye.

Andrew Campbell, a former national facilitator of Landcare, articulates this point when he notes how seeing, understanding and addressing problems of land degradation are very much bound up with active involvement in land-based knowledge production:

\textsuperscript{408} Kompridis, \textit{Critique and Disclosure}, 60. Emphasis in original.
Many of the most important land degradation problems in Australia are complex, insidious, and not visually obvious. For land degradation problems, it is wise to assume that prevention is cheaper and more effective than cure. But it is difficult to get people excited about prevention, if they cannot see or appreciate the problem...People involved in gathering information are more interested in finding what it means and taking it seriously. They develop ownership of this information, commitment to dealing with its implications, and are less overawed by the language and the aura of science and bureaucracy, enabling them to formulate much more acute questions for scientists and regulators.409

Thus understanding the significance of certain problems on the land requires an active involvement in knowledge generation. Land stewards can be de-skilled and demoralised by the agricultural division of labour especially when standardized and decontextualised ‘paint by numbers’ approaches become the norm. In such working environments, their contextual judgement is not nurtured and thus the development of craft-based expertise is foregone in favour of a much more passive orientation to tools and the land.410

Steven Vogel touches on these themes when he draws a link between disempowerment, alienation and misrecognition in relation to environmental degradation: “Alienation, I am suggesting, arises not from our transformation of the world but from our failure to recognize ourselves in the world we have transformed—a failure, that is, to acknowledge responsibility for what we have done and built.”411 The symptom of alienation is a passive relationship to the world, when we don’t recognise

410 I am thinking of the theorization of craft undertaken by theorists such as Sennett in his book The Craftsman.
its contingency. Failing to see the human reflection in the altered natures that surround us, we then cannot act effectively, because we have neither recognized nor articulated environmental degradation as an object of public concern: “The environment, I have argued, is "constructed" by our social practices. But due to alienation those social practices look to those who engage in them like a series of individual and private ones and so the environment doesn't appear as "our" social product at all. We shape the world, but not in a way we have chosen.”

Thus environmental problems are depoliticised and rendered seemingly natural. Turning the problem of the Tragedy of the Commons on its head, Vogel argues: “The problem [of the tragedy of the commons] isn't [the graziers'] greed, it's their isolation: unable to act together for the goal they all desire, they are forced to act separately and thereby produce a result none of them want.”

Private property can atomise responsibility, putting great burdens on individual landholders to 'solve' problems of land degradation alone, problems that are symptoms of a dysfunctional social order. Despite the ways in which land degradation is socially mediated, land degradation is mostly seen to be a problem of the individual landowner despite its broader consequences.

In tracing the beginnings of Landcare in Australia as an organisation and a movement, Campbell points to the issue of dry land salinity as a major issue extending beyond farm boundaries and dramatically affecting farm health and economic productivity. As he outlines:

> When you have a rising tide of salty groundwater beneath your farm, it is obvious that (a) you

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412 Ibid., 309.
413 Ibid., 308.
need to act, and (b) you cannot solve the problem unless other people also act, so that cooperative efforts at a catchment or district level are essential. This awareness tended to reinforce the development of farm and catchment planning processes, which also occurred from the mid-1980s, in parallel with the emergence of voluntary groups.\footnote{Campbell, \textit{Landcare: Communities Shaping the Land and the Future} (St Leonards, N.S.W., Allen & Unwin, 1994) 29.}

I read recently about a farmer reminiscing about the early days of Landcare, wishing that salinity could come back because it would renew motivation and a visceral sense of common interest! The problem with this mode of action is that environmental problems only become matters of public concern after an event of system breakdown, in which negative effects overflow the container created by private property. Amid crises, civil society groups often facilitate media attention, moving the state to step in and fund or coordinate a response. Until that point, much of our so-called environment is part of the taken for granted ‘background’ conditions that are treated thoughtlessly, as long as land users adhere to private property conventions and widely acknowledged laws.

\section*{5.4 Recognition versus Reification}

An ethical relation to the world is a responsive relation. Puig de la Bellacasa writes of the connection between care and knowledge, “the embeddedness of thought in the worlds one cares for.”\footnote{Puig de la Bellacasa, “‘Nothing comes without its world’: thinking with care,” \textit{The Sociological Review} 60, No. 2 (2012) 202.} In contrast, according to Axel Honneth, a stance of reification is a “distorted, atrophied form of praxis,”\footnote{Axel Honneth, \textit{Reification: A new look at an old idea}, (Oxford, Oxford University Press, 2008), 26; in Simon Hailwood, “Estrangement, nature and ‘the flesh’,” \textit{Ethical Theory and Moral Practice}, 17 (2014): 73.} “in which one’s natural surroundings, social environment and personal characteristics come to be apprehended in a
detached and emotionless manner.” It blunts the attention and intrinsic motivation required for care to be possible. This can have serious ethical consequences for human relationship with the environment. Simon Hailwood writes,

In ‘genuine’ praxis, subjects experience the world directly in an engaged way, as ‘cooperative.’

Honneth notes similarities here to Heidegger’s notion of ‘care’ and Dewey’s notion of ‘interaction’. For those thinkers humans are always already involved in a world of existential significance, from which the perspective of the ‘neutral observer’ is a distorting abstraction.

Drawing from and critiquing Lukacs, who sees reification as adequately explained by capitalist social relations, Honneth locates the cause of reification in both commodification and reductive knowledge regimes such as quantitative analysis, which often coincide:

In the constantly expanding sphere of commodity exchange, subjects are compelled to behave as detached observers, rather than as active participants in social life, because their reciprocal calculation of the benefits that others might yield for their own profit demands a purely rational and emotionless stance. At the same time, this shift of perspective is accompanied by a “reifying” perception of all relevant situational elements, since the objects to be exchanged, the exchanging partners, and finally one’s own personal talents may be appraised only in accordance with how their quantitative characteristics might make them useful for the pursuit of profit.

Reification correspondingly flattens our perception, disenchanting the world and decreasing our capacity for engagement. Honneth explains that reification involves the forgetting of the animated engagement with the world and the relationships that accompany moments of insight:

It is this element of forgetting, of amnesia, that I would like to establish as the cornerstone for a redefinition of the concept of “reification.” To the extent to which in our acts of cognition we lose

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417 Ibid., 25, in Hailwood, “Estrangement, nature and ‘the flesh’”, 73.
418 Hailwood, “Estrangement, nature and ‘the flesh’”, 73. Emphasis in original.
sight of the fact that these acts owe their existence to our having taken up an antecedent recognitional stance, we develop a tendency to perceive other persons as mere insensate objects. By speaking here of mere objects or “things,” I mean that in this kind of amnesia we lose the ability to understand immediately the behavioral expressions of other persons as making claims on us—as demanding that we react in an appropriate way.... our social surroundings appear here... as a totality of merely observable objects lacking all psychic impulse or emotion.420

Vitalised and contextual practice that produces knowledge is a key element of the creation of meaningful worlds, the inverse of alienation and reification. In his lecture, Honneth contrasts reification with recognition, broadening his concept of recognition to apply both to humans and nonhumans,421 and relating this to a more ethically-charged understanding of reification to that developed by Lukacs.

We similarly find in the work of Paul Ricoeur an articulation of a recognitional stance as central to knowledge production. This involves embodied participation in the world, rather than objectification and reification. Julie Connolly outlines Ricoeur’s epistemic approach to recognition thus: “Recognition is central to the way that we think; thought would become impossible if we were unable to recognize its subject. Indeed, recognition is practically ubiquitous to inquiry and reflection, not to mention communication.”422 Proceeding from the ordinary language meanings of the verb “to recognize,” Ricoeur distinguishes 23 different usages of the term,423 in three main

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420 Ibid., 129.
421 Honneth had previously insisted upon a more mutualistic, human-focused concept of recognition, which he later found wanting. For example, in 2007 Julie Connolly wrote the following “In [Honneth’s] work recognition is invariably preceded by the word social and is largely mediated by institutions, like the state, which structure and regulate patterns of public recognition. In Honneth’s analysis the term is sequestered from epistemology, or at least the recognition of non-sentient objects. This, however, is not so in Ricoeur.” Julie Connolly, “Charting a course for recognition: a review essay,” History of the Human Sciences 20, No. 1 (2007): 134.
422 Ibid.
senses: “identifying objects, attesting to one’s own capacity for responsible agency and establishing mutual understanding in social relationships.”⁴²⁴ Through recognition, we have the ability to gain insight, and establish relations to the world based on spontaneity, responsiveness, skill and poeisis rather than standardized procedures or “going through the motions.”

⁴²⁴ Julie Connolly, “Charting a course for recognition” 134.
5.5 Identification with soil

A strategy used by many who emphasise the aliveness of soil: educators, nature writers and TV presenters, is personification, to encourage identification with soil life. I ask my friend Jacob who manages municipal composting and educates the public on compost production how he tells the story of compost. He says, “I use the narrative of looking after workers: so, good composting is about meeting the needs of workers for shelter, air, water, food. These workers are living things: we don't leave them in a big dry pile to bake in the sun. Like us, they want to have enough food in their pantry.”

Patricia Q. Richardson of the University of Texas uses melodrama and microscopic videography to highlight how difference in size renders humans ridiculously clumsy giants, in comparison to microbes. In her video Soil Critters: Life in the Great Underneath, she makes light of her own attempts to initiate relationship: "I the lumbering oaf have as delicately as possible spread the soil apart, causing gigantic earthquakes to their world... the slow death of the pupa [caused by her own impact] becomes a metamorphic milkshake for the mites". In the light of the mismatch in size and the technological mediation of human relationships with soil, it is difficult to avoid restricting the capabilities of soil organisms which we cannot see: there is an epistemic problem, we barely even understand what various species in the soil are, let alone what they do, what they need and how to form a relationship with them.

Inaccurate interpretation of signals given by other organisms is an inevitable reality of

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425 Jacob’s name has been changed in accordance with my Human Research Ethics protocol.
our lack of a shared language, thus learning to work with them is a frustrating and messy process. Projection is an aspect of this problem: it is certainly a major part of human-human misunderstanding, and also in misunderstanding of nonhumans. But perhaps we need to accept a degree of projection, as the price paid for a closer relationship between humans and nonhumans. While personification runs the risk of blindness through projection and wishful thinking, projection is part of what it means to be human: we cannot completely avoid it, we can only acknowledge it and minimise its impact, trying to be as faithful as possible to the objects of our concern.

In a very interesting TED talk, “How the teddy bear taught us compassion,” Jon Mooallem traces the history of how wild bears in North America were transformed into cuddly soft toys for children to play with, in part through the American public’s identification with its hunting-enthusiast president at the time, Theodore “Teddy” Roosevelt. He points out that this transition occurred at a period in which wild bears were rapidly diminishing in number, and thus their threat to humans was dramatically reducing. Thus it became possible to see bears in a newly “cute” way, and to be disarmed by such representations. This ‘cuteness’ is used by conservation organisations and websites in highlighting the vulnerability of the polar bear when faced with climate change. We can see a strong “teddy bear” aesthetic in the following image of a baby polar bear:

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The same website has a page dedicated to Knut, the polar bear born in captivity at Berlin Zoological Garden, who was also the subject of children’s toys. The website states, “Knut the polar bear become a mass media phenomenon across the globe and lead [sic] to the making of toys, media specials, DVDs and books. His image became one of environmentalism and was said to be able to have the ability to draw peoples attention to environmental issues in a nice way rather than a aggressive way.”

Today we see even beetles made into plush toys:

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There is a problem with the strategy of identification, as it involves projection of our own wishful thinking and idealisation on to the object of our attention, misrecognising it, through failing to see the ways in which it does not conform to our idea of it. Identification often privileges those dimensions of a thing that resemble ourselves, assimilating the thing with us, rather than enabling the recognition of difference. It also assumes that we already understand, rather than encouraging a more humble stance of questioning and listening. If we instead acknowledge that there will always be dimensions of another: human or nonhuman, that we will never understand: their
alterity, that we will never be able to assimilate into our schemas, we will be able to respect that other’s freedom more fully. Learning from Emmanuel Levinas, we might respect soil for its alterity, the dimensions that we cannot identify with, control or know.431

While both soil and humans contain multitudes of organisms that manifest emergent properties, soil does not manifest coherence as a singular entity in the same way that a human does (despite the vocabulary of a soil body that is sometimes used in soil science).432 Therefore the question of our relationship to soil can often seem abstract. Soil manifests the unknown: not even scientists can control soil in such a way that it behaves in a predictable manner.

Can a suffering nature make a claim on us? Is it possible to then empathise with it? Alphonso Lingis, engaging with the work of Levinas, writes, “The surfaces of the other, surfaces of suffering, that face me appeal to me and make demands on me.”433 Lingis is interested in heterogeneous connection, at such an absolute level that he seeks to create “a community that has nothing in common,” as the title of his book has it: that is, a community that does not require identification with the other, or any commonality among members in order to maintain itself. I like Lingis’s use of the term ‘surfaces’, because it allows for a broader range of things to be engaged with, beyond the criteria of a face. Lingis also challenges the anthropocentrism implicit in Levinas’s phenomenological ethics, centred upon the human face as the locus of the ethical

demand:

the want exposed to us in the face and on the skin of another commands us. A want is an appeal because it puts demands on us. Someone facing us in exposing his sensibility and susceptibility and also gives its vocative and imperative force to a question put to us that asks for a veridical response...Does not a like imperative make itself known to us in our dealing with other living beings not of our species, and with things? They do not lie about us simply as substances and elements exposed for our enjoyment and usage. To deal with them is to see what we have to do. We do not see a deer caught in the branches of a tree in the flooding river without envisioning how it could be freed and how we could free it...We do not see the mountain spring without seeing how plastic bags which the wind has blown into it are choking it.434

Lingis is claiming that such imperatives of care towards nonhuman life face us as part of ordinary human experience. In a recent blog post, Deborah Bird Rose reflects on the work of Levinas and the debate in environmental ethics regarding the question of whether nonhuman organisms have the equivalent to a face that calls humans into an ethical relationship:

The great continental philosopher Emmanuel Levinas wrote of the ‘face’ as that which interrupts my self-absorption and calls me into ethical responsibility. There has been a lot of discussion in recent years as to whether the face means ‘a human face’. What about other animals? What about trees? What about understory? The definition of face that I find most inspiring treats it as a form of action. Here face is something one does rather than something one has: ‘facing is being confronted with, turned toward, facing up to, being judged and being called’.

The living world is filled with facings – to be alive is to live among faces, many of which are noisy and interruptive. This is good. This is life in the mode of ethics. At this time, this is also tough. There are so many facings, and often one feels so helpless.435

Thinking from Joel Salatin's Polyface Farm, Romand Coles broadens Levinasian ethics beyond the human, thinking about interspecies mimesis and “preconscious apprehensions of otherness that are readily imbued with ethical sensibilities”436 which move us out of an egocentric register into “eccentric... ethical-corporeal movements.”437 Coles finds Salatin’s embodied mimicry exemplary, as Salatin lies on his belly in close connection to the grass and invites others to do the same.

Coles theorises a “polyface ethos” that focuses on decentralised interdependent relationships rather than individuals in its vision of the good. Seeking to support the dynamism of the ecosystem, practitioners learn to care through “mimicking natural processes,” which “precedes science,” undertaking practices prior to understanding them in terms of explanatory frameworks.438 “Those who “practice complexity” tend to imagine what they are doing in terms of “respect”— even if it is far from Kantian in its genesis and tendencies, and far from the “respect” of power-maximising governmentality.”439 This reminds me of the approach of Jackie French, who learns from following a wombat:

I think it was a wombat that taught me how to garden. His name was Smudge...I spent my days and most of my nights wandering around the bush, following him... I saw how fertility recycled,

437 Ibid.
438 Ibid., 97. Here Coles explains that Joel Salatin draws from the philosophy of Albert Howard, who, he notes, also influenced Berry. I also discuss this in chapter three.
439 Ibid., 97.
how nature balanced out the pest outbreaks, how the bush could stop a weed invading. I saw how plants survived in tiny microclimates where climactic lore said they should have died of heat or cold... I watched an apple seedling in the bush outside my garden fence shoot and flourish and bear in almost half the time the pruned and fertilised and weeded ones did in my orchard... I learnt to watch, and learn from what was around me.440

Like an ecosystem and like French’s method of gardening, Polyface Farm is open not only to human visitors, but also to emergent processes, working with the flows visited upon it in the behavior of the animals and plants that depend upon each other for their sustenance. In order to have an open orientation to the world, the boundaries of the farm are modified to become more dynamic and responsive:

Polyface Farm does indeed have fences, but these fences— as well as much of the rest of the farm’s built world— are themselves in frequent motion, conducting the movements of cows, chickens, pigs, as well as humans tending to them, in ways that are responsive to the diverse needs, propensities, health, and flourishing of myriad beings, and the sustainable flourishing of the pasture. Receptive mobility is the central motif here.441

Coles thinks of the flows in play on Polyface Farm as undermining centralized governmentality and instead supporting diverse and de-centred forms of flourishing that involve the sharing of goods:

Where governmentality is driven by an imperative to maximize power, and “respects” other realms only insofar as these contribute to its ambition, a polyface ethos begins from, intertwines with, and advances with the diverse flourishing of a vast network of beings. Indeed, it senses and understands its own flourishing not in terms of a locus of power (e.g., corporate, state) that enters into flows in order to maximize itself, but rather as an intensification whose modes, sensibilities, and orientations are transformed by, as well as transformative of, the vaster network.442

440 French, The Wilderness Garden, 2.
441 Coles, Visionary Pragmatism, 97.
442 Ibid., 100.
Here, Coles draws attention to patterns of circulation of power, contrasting centralized and fast flows that serve governmental structures, which he portrays as “a malignant root clod of circulatory power”\(^{443}\) with the Slow Food Movement, where there is a depth to practice which yields “attentiveness” and “carefulness.”\(^{444}\) He contrasts a narrow view of economistic self-interest with mutualistic interactions: “the rootings/routings of the blue stem grass clod”\(^{445}\) that are open to circumstance and unexpected arrivals.

### 5.7 Justice to soil: recognition

So far I have written about practitioner misrecognition of soil as part of a disenchanted knowledge relation with the world. I have also critiqued the well-intentioned but caricatured strategies of identification. There is much to draw from the conception of recognition as it has been theorized in political theory as a dimension of justice, beginning from Charles Taylor, in an extended debate throughout the 1990s. Taylor theorized recognition in terms of the duties we owe to our fellow humans:

> The importance of recognition is now universally acknowledged in one form or another; on an intimate plane, we are all aware of how identity can be formed or malformed through the course of our contact with significant others... The projection of an inferior or demeaning image on another can actually distort and oppress, to the extent that the image is internalized. Not only contemporary feminism but also race relations and discussions of multiculturalism are undergirded by the premise that the withholding of recognition can be a form of oppression.\(^ {446}\)

To the extent that political recognition is intersubjective, built from the interactions

\(^{443}\) Ibid., 101.
between a self-reflexive identity and the public sphere and mediated through language and image, it is not a transferable concept for nonhuman others. Plants and soils are indifferent to these symbolic, psychological and interpersonal dimensions because their interiority does not include the capacity to constitute a self, and to self-reflect.

Emilian Kavalski and Magdalena Zolkos develop a useful conceptual framework for thinking about recognition and justice towards nonhumans in the Anthropocene, distinguishing three broad categories of recognition of nature that could potentially overcome anthropocentrism in international relations. The first concerns on the one hand the recognition of vulnerability and resilience of human and non-human systems and life forms, in which they consider both the validation of nature as a subject of mourning, grievable, to use Judith Butler’s term, and on the other, the recognition of nature’s resilience, constituting itself through interspecies interactions and through the exercise of traditional ecological knowledge, named as an asset in adapting to climate change in the pacific atolls. The second theme of recognition they discuss concerns recognition as respect: “in line with the Hegelian tradition of recognition, the respect for cultural difference can be extended to include respect for the irreducible uniqueness and specificity of diverse life forms.” Among the main questions in this realm is the question of to what degree must entities be similar [to humans] in order to be respected? While some writers draw upon Levinas to argue that difference, or alterity constitutes an important basis for respect, others argue on the basis of

448 Ibid., 148.
similarity to humans, most notably on the basis of *sentience*. The 2010 Declaration of Rights for Cetaceans is cited as an example of recognition on the basis of similarity to humans, with rights very similar to human rights claimed. The third theme is recognition and mutuality, a theme which is the most difficult to incorporate into a non-anthropocentric ontology because the Hegelian tradition posits, “human beings acquire social existence intersubjectively and dialogically.” This notion of recognition concerns the relationality of emancipation as well as the exercise of freedom and autonomy. For their purpose of reworking international relations, they affirm the “human-in-ecosystem” perspective, which begins from the interdependence of social and ecological processes rather than dealing with them as “linked but separate domains.”

David Schlosberg develops a concept of environmental justice as ecological recognition, using Nancy Fraser’s work to focus upon those dimensions of political recognition that are relevant to nonhumans. Fraser uses a status concept of recognition, rather than focusing on identity, with particular emphasis on the subordination of groups or individuals. Aspects of nature that should be better recognised include “sentience, needs, agency, or integrity in nature.” The strength

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449 Peter Singer, “Fish: the forgotten victims on our plate” *The Guardian*, 14 September 2010. Singer draws the line for ethical line of non-killing at fish on the basis of their capacity, like us to feel pain. According to a framework of recognising the pain of sentient creatures, individual soil organisms are less worthy of concern on the basis of their death, than more complex multicellular organisms that have complex nervous systems. However recent studies notably outlined in the book *The Hidden Life of Trees* give evidence for a nervous-system-like network in tree roots (linked by mycorrhizal fungi) capable of perceiving the pressure of footfalls and the impact of damage to an individual part of the network, which is bringing new dimensions to debates on sentience. [https://www.theguardian.com/commentisfree/cif-green/2010/sep/14/fish-forgotten-victims](https://www.theguardian.com/commentisfree/cif-green/2010/sep/14/fish-forgotten-victims) Also see Peter Wohlleben, *The Hidden Life of Trees: What They Feel, How They Communicate—Discoveries from a Secret World*. (Carlton, Vic, Black Inc. 2015), 10.

450 Kavalski and Zolkos, “The Recognition of Nature,” 150. Here they cite Fraser and Honneth, 2003 as well as McQueen, 2011.

451 Ibid., 151. Here they cite Davidson-Hunt and Berkes 2003:54.

of Fraser's framework is that “We can see nature injured, its interests ignored, autonomy dismissed or its integrity damaged without resorting to ... psychological language or conceptions.”

Status injuries can come in three main forms, according to Fraser:

(a) A general practice of cultural domination,
(b) A pattern of nonrecognition, equivalent to being made invisible, and
(c) Disrespect, or being routinely maligned or disparaged in stereotypic public and cultural representations.

All three of these forms of status injury can be clearly found in the treatment of soil - and its inhabitants- in both farming and mainstream culture. This is in part because soil is intimately bound up in human life, and in economic activity, yet it is dominated and rendered insignificant and undesirable in various ways. Agricultural and geological sciences have represented soil as a substrate or a residue, a medium for something else, rather than an object of concern, a cultural object, a site of activity and relationship. Soil is also used as an archetypal image of decay, moral decline, economic decline and lack of hygiene.

Nonrecognition has consequences for all objects, but particularly living objects. The most basic aspect of recognition is the ability of humans to notice, to recognise an object and abstract it from its background. It takes extra sensitivity to act appropriately so as to respect and not to damage that object. In the Anthropocene, ecological recognition is crucial, because the capitalist and human chauvinist modes of ordering, occupying, influencing and using space are powerful and pervasive - often the violence

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454 Ibid., 140.
that precedes such ordering breaks down ecological relationships, yet is hidden, and automated through habit or machine assemblage—particularly through the operation of the global economy. It is difficult for humans to occupy space without altering or harming ecosystem functioning—yet this skill is crucial to the future of complex life on Earth.

Schlosberg sees the concept of ‘ecological integrity’ as equivalent to the norm of dignity or individual flourishing. In order to flourish as a healthy ecosystem, the integrity of processes that produce and maintain clean air, clean water, pollination, seed dispersal, availability of appropriate nutrients, and soil organic matter need to be in order, and in the Anthropocene, must be protected. In his discussion of recognition and ecological justice, Schlosberg argues that the recognition of physical integrity is an aspect of human rights that is transferable to nature. Discussing the work of Honneth, he states: “Clearly, we can expand the notion of the recognition of physical integrity to nature, so that an abuse of that integrity, or a harm to the ‘body’ of nature, is an element of disrespect and malrecognition. Interestingly, we can also refer to this as a respect for dignity.”455 In cases where ecological integrity is declining, the focus of concern is on “deconstructing the impediments to nature’s own capabilities to fully and continually function.”456 These impediments constitute “moment[s] of injustice...where nature is robbed of its capability to reach its functioning.”457

Schlosberg develops a multi-faceted approach of justice to nature, drawing upon Martha Nussbaum and Amartya Sen’s capabilities approach to justice. This goes

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455 Schlosberg, Defining Environmental Justice, 138.
456 Ibid., 150
457 Ibid.
beyond distributive justice, which has been a major concern of theorists of environmental justice. While Nussbaum's understanding of capability is less anthropocentric than Sen’s, having explicitly addressed justice to animals in her 2007 book *Frontiers of Justice*, the domain of her concern is still quite individually oriented. The social and environmental are considered but only insofar as they matter for the individual’s realization of capabilities.

Schlosberg articulates a more relational and ecological view of animal flourishing:

“almost all individual animals -- human and nonhuman-- need not just some others of their own species, but a full environment, including non sentient life and ecosystem relations, as part of their capability set in order to flourish.” He sees the capabilities approach as based in wanting “to see each thing flourish as the sort of thing it is.”

This implies that wellness and capability involves some kind of authenticity to a particular species pattern of behaviour, including the latitude and freedom to act according to inclinations, within an environment that contains the affordances to support such action. A similar ideal is articulated by Joel Salatin, who stresses the importance of enabling the inclinations of plants and animals on a farm: "Plants and animals should be provided a habitat that allows them to express their physiological distinctiveness. Respecting and honoring the pigness of the pig is a foundation for societal health.”

Guiding principles of accommodating difference and satisfying needs are at work here: creating and maintaining space for organisms to pursue their

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458 Nussbaum, *Frontiers of Justice*.
own distinct modes of flourishing.

5.8 Distributive Justice towards soil

In order to distribute resources to organisms, a practitioner must first recognise them as having needs, and understand what kinds of needs they might have. Thus recognition is a more primary dimension of justice (or necessary condition) than distributive justice. That said, an adequate distribution of resources such as nutrients can be the difference between flourishing and degradation, especially where natural sources of nourishment of soil have been depleted.

Distributive justice is a key aspect of caring for the Earth in an era of human dominance, in which immense production chains channel resources towards human consumers and then discard them in concentrated and contaminated forms in rubbish and sewerage networks in a manner that is now almost by remote control.\textsuperscript{462} The diversion of resources from and the concentration of environmental hazards in particular places where marginalised humans and nonhumans suffer as a result is a crucial issue. Nicholas Low and Brendan Gleeson write:

\begin{quote}
Distributional questions are fundamental to the politics of the environment. The question of justice within the environment is enfolded in the question of justice to the environment. All the actors involved have interests in pieces of the environment. Proximity is at the heart of the
\end{quote}

struggle... Environments overlap and are unavoidably shared. The sharing extends both to the 'goods' and the 'bads' they contain.  

If viewed from the perspective of permaculture, distributive justice to soil can be seen as pertaining to the two overlapping ethics of “earth care” and “fair share”:

![Overlapping permaculture ethics](image)

**Figure 30: Overlapping permaculture ethics. Source: Adapted from Richard Telford, Permacultureprinciples.com**

Environmental ‘goods’ and ‘bads’ range from specific goods for one species, which can be enjoyed in a particular ecosystem niche [e.g. the mistletoe bird eats the berries of the mistletoe, which in turn lives parasitically on specific trees], to common goods that need to be available to the many [e.g. clean water]. Furthermore, these ‘goods’ and ‘bads’ do not exist in static quantities that must be divided between competitors in a ‘zero sum’ way. They are often made available through biotic interactions [e.g. oxygen in the atmosphere, or nitrogen in the bacterially-inhabited nodules of legumes, or water held in organic matter in the soil].

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The possibility of distribution through biotic interactions is often foreclosed in modern agriculture, through the widespread use of biocides, which have a particularly damaging effect upon soil distribution in their curtailment of mycorrhizal fungi and worm proliferation. This is an important issue to emphasise. Sometimes resources such as sunlight are abundant however soil microbes still cannot access the products of photosynthesis due to curtailment of conduits and plant cover. Thus a physical obstruction or elimination leads to a distributional problem. We see this issue also in relation to soil access to water. It is a common feature of modern land use that soil porosity is destroyed, either through building impervious surfaces from asphalt and concrete, or through soil compaction. Thus rain cannot replenish groundwater, plants and soil life cannot access adequate water, and soil’s role in holding and distributing water, mitigating floods and droughts, is curtailed.

While soil organic matter is a common good for a wide range of plants, supporting increased “carrying capacity” of the land (though its benefits are not universal), abundant soil nutrients are not as widely beneficial: many Australian plant families such as the Proteaceae, Rutaceae, some Fabaceae and many Mimosaceae are adapted to growing in low Phosphorus soils\textsuperscript{465}: “develop[ing] mechanisms to extract otherwise unavailable P. When presented with abundant P they cannot prevent excessive uptake… upsetting their metabolism.”\textsuperscript{466} Likewise, many Australian earthworm species probably “cannot stomach the richer diet in improved soils,” and disappear when native grasses and other native plants are replaced by crops or “improved pastures.”\textsuperscript{467}

\textsuperscript{466} Ibid.
\textsuperscript{467} Murphy, \textit{Earthworms in Australia}, 36.
Note the language of “improvement” connotes that these particular plants are better than the native grasslands, a claim that is now increasingly questioned by practitioners who have learned to farm native grassland pastures, such as those connected with the Stipa Native Grasses Association.\(^{468}\) Soils in Australia are often labelled deficient in numerous minerals and trace elements, yet this makes sense only if the purpose of the land is understood as growing the standard staple crops of the industrialised West for the current tastes of mass markets. Some Australian native bush foods which thrive in Australian natural soils are suitable for modern cultivation: the education of consumers to familiarize them with the uses and tastes of these foods is proceeding apace, with the popularity of these foods increasing faster than demand in some parts of Australia.\(^{469}\)

In order to ‘give back’ to ecosystems that support us, we need to first understand them in their concrete relations, as vulnerable and contingently constructed, and having specific needs. Regenerating soil is a rapidly evolving domain of practice in which people are learning to engage in relations of reciprocity with the land, particularly practitioners who depend on the soil in their work. Bob Cannard, a farmer from California interviewed in Symphony of the Soil, explains his approach of feeding the soil with cover crops beautifully:

> In my gardens I grow two things all the time- 50% for people - which is the potato in this case, and 50% for nature- the soil improvement cycling crops. Very important- without a balance between the two, things will collapse. In my gardens and in the gardens of the future I believe,


we need to recognise and feed nature as we feed humanity. And so I grow this mixed crop of soil improvement plants— you can call them weeds— they’re mustards and vetches and clovers and a wide range of different plants in here— as well as potatoes— there are no bugs, there are no disorders of any kind out here. It all transpires. And the potato plant has not yet come to bloom its immature at this time of the year, but we will examine it to see what it looks like. We see large masses of fibrous root systems. We see nice soft crumbly soils, that have good aggregation to them held together by yeast and moulds, and bacterial colonies filled with fibrous root systems.470

This description suggests a commitment to distributive justice towards the soil, and the other organisms that depend on soil in terms of broadening the goals of the farm so that the crops grown both feed humans and nonhumans. This is made possible through ensuring that the soil surface is never bare: not all the crops are planted in order to provide harvests for humans, but some are specifically intended to nourish soil ecosystems. Artificial chemical use is also limited to avoid their impact in inhibiting the flourishing of soil microbes and thereby foreclosing the potential for the plants to build symbiotic relationships with those organisms.

This type of reciprocity is asymmetrical, directed towards the diverse aspects of the system that serve life— indicators of ecosystem integrity which may be the presence of ‘keystone species’ or the presence of ‘vital signs.’ These indicators of ecosystem health are taught, debated and critically analysed by communities of practice, in consultation with data gathered through work. If agroecosystems are dynamic, relational, porously bounded and internally differentiated biological systems, we might understand that ‘giving back’ is not as simple as performing a mirror image of ‘taking from.’ When

chemistry alone is the frame in which the land is understood, it might seem that way, but when biology is taken into account, things become more complex. We may not even give back to the tree that gave us the apple, but maybe to an area uphill of that tree, as Peter Andrews does (in depositing trimmings of plants to decompose at the tops of his hills, so that their nutrients are redistributed to the land below through the flow of water). As the food for a tree is digested by the soil, it could be helpful to provide compost material at the root zone, or plant a herbaceous perennial close to the apple tree to encourage fungal growth and thus improve the nutrient uptake of the apple tree, as Michelle and Chris McColl are shown to do on a recent episode of *Gardening Australia*.  

The work of regeneration is not just enacted by humans directly, but is carried out indirectly across interfaces between various nonhuman species, invigorating a meshwork of relations. This is about improving soil architecture, biodiversity and transport pathways between plants and diverse soil organisms. Soil can then perform functions for many species. Jackie French gives a beautiful model of providing for other species in her efforts to build a “wilderness garden:” “Our garden feeds us, the birds, three wombats, two echidnas, a mob of visiting kangaroos, seven possums and about 40 000 other species.”

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http://iview.abc.net.au/programs/gardening-australia/FA1505V018S00  
5.9 Ethics of care, dependence, autonomy

In Nel Noddings' 1984 book, *Caring: A Feminine Approach to Ethics and Moral Education*, Noddings makes a distinction between caring for and caring about. Whereas the first type of care allows for what she calls 'completion' in the other, the second does not. Whereas the first involves reciprocity and responsiveness, however asymmetrical and faltering, the second is more abstract, a feeling towards a generalised other:

But we have already seen that our obligation to summon the caring attitude is limited by the possibility of reciprocity. We are not obliged to act as one- caring if there is no possibility of completion in the other. We must ask then about the possibility of reciprocity in our relations with animals. It seems obvious that animals cannot be ones- caring in relation to human beings but, perhaps, they can in some sense be genuine cared-fors. Is the form of their responsiveness sufficiently similar to that of the cared-for to require our adoption of an ethical attitude toward them?

As we discuss our relationships to animals, plants, things, and ideas, we shall observe a shading-off from the ethical into the sensitive and aesthetic. We shall see again that ethical caring is anchored in the feeling and recognition of relations that are integral to natural caring, but we shall see the role of choice and commitment emphasised.\(^{475}\)

According to Noddings, care develops through reciprocity, and necessarily involves 'completion in the other', as well as engrossment and motivational displacement by the carer.\(^{476}\) Gardening and agriculture can involve sensitivity and aesthetic sensibility, but not ethical caring. Noddings emphasizes the intentional stance of commitment,

\(^{475}\) Nel Noddings, *Caring: A Feminine Approach to Ethics and Moral Education* (Berkeley and Los Angeles, University of California Press, 1984), 149.

\(^{476}\) Ibid., 150.
which distinguishes inter-human relationships of care from other relations of care, as well as the inter-subjective quality of these relations, with a subject being perceived even in relationships with infant humans, altering the ethical quality of those relations.

In recent decades, a non-individualistic notion of interdependent autonomy, rooted in care relations, has been theorised by Western philosophers and feminists. Using Martha Nussbaum’s ‘capabilities’ approach, particularly her treatment of animal wellbeing in *Frontiers of Justice*[^477] as well as the work of Alasdair Macintyre, and feminists such as Joan Tronto and Donna Haraway in their analysis of this problematic, Keulartz and Swart develop an argument for relationally-enabled autonomy for animals, considering the human virtues required to facilitate animal flourishing in an era of rapid global change.[^478]

They distinguish types of care according to the level of domestication and integration animals have with human lives: arranging them on a continuum, from nonspecific care, towards species-specific care and finally individual care, arguing that in each case, freedom of the animal need not diminish with domestication and with closer levels of attachment to humans. They argue “Our obligations of care should vary depending on the direction of transition along this continuum from wildness to domesticity.”[^479]

Drawing upon the work of Tronto, they show how even wild animals require care: “[a] lack of direct or indirect relationships between humans and wild animals does not imply the absence of ethical obligations towards wild animals, because the act of

[^477]: Nussbaum, *Frontiers of Justice*.
[^479]: Keulartz and Swart, “Animal Flourishing and Capabilities”, 130.
caring should include caring “for the environment, as well as for others.””

Ensuring autonomy means maintaining a dynamic relationship between animals and their environments, even if that environment involves captivity: “What matters to the welfare of animals is the presence of sufficient opportunities to employ their natural capabilities, not the naturalness of the environment.” Furthermore, it is the ability to perform the most important capabilities without assistance that is considered key: “Part of what it is to flourish as a creature, ‘is to settle certain very important matters on its own, without human intervention, even of a benevolent sort.’”

In situations concerning wild animals in which habitats and sources of food are rapidly diminishing, but populations are relatively robust, Keulartz and Swart argue that humans should establish wildlife parks in a move to extend 'non-specific care' to them. They quote Nussbaum thus: "Even a person who wanted to deny that we had responsibilities to animals in the 'wild' before this century ought to grant that our pervasive involvement with the conditions of animal flourishing gives us such responsibilities now." Where entire species are facing extinction they argue for species-specific care such as breeding programs in zoos, exploring ways that animals may be given training as well as challenges in captivity that provide replacements for or similar development of the skills they develop in the wild, for example, the Bronx Zoo give the captive tigers a large ball on a rope as an object to wrestle with, “whose resistance and weight symbolize [a] gazelle,” rather giving an actual gazelle which

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483 Ibid., 374.
requires no challenge to eat as opposed to the wild. This generates more stimulation and skill-development than a gazelle.

Finally, they consider individual care, particularly the care of animals in work relations with humans. Drawing upon Haraway’s analysis of certain animal trainers’ work, they outline how skilled horses and riders can develop such an intimate reciprocal communication and inter-corporeal understanding that they “embody each other's mind.” They argue that is not necessarily the case that animal enrolment in human projects through work compromises sovereignty. If the work is carried out in a mutualistically responsive way based on clear communication in which the human strives to faithfully represent the needs of the animal, the human and the animal might become ‘significant others’ to each other. This Haraway terms ‘co-domestication’, a process of becoming increasingly attuned to one another, and in which the human carefully records the actual likes and dislikes of the animal, rather than assuming based on the breed, or based on a human projection of their own selfish desires.

Haraway’s analysis affirms that some form of recognition of animals, as beings deserving of having their needs and desires more or less met is a requisite factor in their successful training. This is always going to be an iterative, imperfect process. Vinciane Despret, a Belgian philosopher who Haraway draws upon, reframes domestication as a mutualistic process, claiming that the moral acceptability of

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individual-specific care “depends on the animal’s possibilities of "resistance" when its
wishes fall on deaf ears and it is forced to compliance and docility.” Humans cannot
determine conclusively what an organism’s needs are: these signals of health or
distress can only loosely provide confirmation or dissention with a given action. Even
our own needs are often not transparent to us, and are only learned in the wisdom of
hindsight. Thus coming to know our needs is a slow learning process of reflection upon
trial and error. Keulartz and Swart note, “Responsibility for animals in working
relations should be considered--to use Haraway’s phrase- as "response-ability," the
ability to listen to other creatures and to meet their needs.” Haraway argues that if
certain conditions are met, animal–human work relations need not compromise the
sovereignty of animals. The work must be carried out in a mutualistically responsive
way based on efforts of clarification in which the human does not misrepresent the
needs of the animal. Discussing the work of animal trainer Susan Garrett, Haraway
writes:

Garrett directs the human to make careful lists of what the dog actually likes; and she instructs
people how to play with their companions in a way the dogs enjoy, instead of shutting dogs
down by mechanical human ball tosses or intimidating over-exuberance. Besides all that, the
human must actually enjoy playing in doggishly appropriate ways, or they will be found out....
Her pedagogy of positive bondage makes a serious, historically specific kind of freedom
possible, i.e., the freedom to live safely in multi-species, urban and sub-urban environments
with very little physical restraint and no corporal punishment while getting to play a demanding
sport with every evidence of self-actualizing motivation.

488 Ibid.
This means that we should resist acting according to pre-existing assumptions that inform, for example, our reified and projection-based ‘idea of a dog’ versus the actual concrete preferences of this dog. I have been disappointed when my brother’s dog Rosie doesn’t want to play fetch. I gave up on playing because she seemed no fun. Perhaps my problem was that I didn’t know what Rosie would find fun. It’s the difference between my idea of a dog and the actual needs of this dog here and now.

Attending both closely and methodically to the habits and preferences of other creatures, trainers develop practices of observation in which their judgement can be improved over time. The increased understanding gained does not depend directly on language for its realization. Rather it depends upon an embodied and relational process of building trust through offering and accepting care, assistance, play, food, in which over time a trainer can come to know the preferences of an animal. In this way, the human and the animal might build trust through non-coercive responsiveness and thereby become ‘significant others’ to each other.

Building on Haraway’s insights, Thom Van Dooren unsettles both a clean divide between domestication and evolution of agricultural crops, and between the active human and the passive plant in processes of knowledge production, seeing how the human is also co-constituted through ecological give and take, being educated by plants in the process.\textsuperscript{490} He uses Haraway’s term ‘co-domestication’ in his analysis of human evolutionary interdependence with plants through the development of agricultural crops and human societies over thousands of years.\textsuperscript{491}

\textsuperscript{490} Thom Van Dooren, “Wild Seed, Domesticated Seed: Companion species and the emergence of agriculture”, \textit{PAN: Philosophy, Activism, Nature} 9 (2012): 22.
\textsuperscript{491} Ibid., 22-8.
Within this context the human invention of agriculture might be rethought in a way that also acknowledges the teaching of agriculture to humans by plants. It is quite likely, for example, that the first patches of edible plants that grew up around human communities came from our rubbish tips (where some seeds and spoiled food were discarded) or from our latrines and spittoons. These are processes of “domiculture”, in which plants (and people) spread through their use of one another.⁴⁹²

Van Dooren details some changes in shape and habit that plants have developed over thousands of years of domestication with humans. Seeds gathered by humans—particularly grains, have become fatter, with thinner husks and clustered in terminal bunches. This is because they no longer have to direct resources to protection from herbivores. Co-domestication involves a process of increasing mutual vulnerability and mutual reliance, increasing closeness between humans and formerly wild species, in a way that each accommodates the other, and the risks one previously posed to the other is reduced.

5.10 Interpretation without shared language

Latour raises a concern about misrecognition of nonhumans when he provocatively critiques “modernism’s basic defect, its penchant for composing the whole without the explicit will of those humans and nonhumans who find themselves collected, or composed in it.”⁴⁹³ Latour seeks to distribute the “powers to take into account” and the “power to put in order”⁴⁹⁴ such that the humans that perform these functions can

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⁴⁹² Ibid., 25.
⁴⁹⁴ Ibid.
test for responses: becoming sensitive to indications that there is a problem, where nonhumans are misrecognized or violated in the ways they are understood and ordered by humans. Yet while I can’t think of a signal that would indicate the “explicit will” of a nonhuman inhabitant of soil, I can think of many signals that indicate its opposite, resistance, thus the praxis of working with soil organism tends to be one of proceeding through excluding options. Companion animals on the other hand can make their will known, which is a large part of the trust-building process between humans and those animals.

When humans do not share a common language with their nonhuman companions, and cannot even be sure whether the other registers their presence, the asymmetry of their relations is quite extreme. While animals can perform both communicative acts and proto-illocutionary acts, they cannot perform illocutionary acts, because these typically require intentionality, responsibility and conceptual understanding for their moral force and transformative capability. Soil creatures are even less able to indicate their situation: it is often their abundance alone that serves as a proxy sign of wellbeing.

While some nonhuman organisms can both indicate that they are hungry, and even sometimes use words to do so, these words are not brought together in a way that constitutes speech, taking into account the way syntax changes meaning. In his book on the ethics of speech, Terence Cuneo writes: “To effectively communicate information and coordinate activities, then, we need to not only choose to implement

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496 Ibid., 74.
different arrangements that are in effect, but also commit ourselves to certain of their uses, laying ourselves open to appropriate correction in the process.” Thus effective communication, from this perspective, presupposes that interaction occurs between humans, because it includes the proviso that partners in the communication be accountable to their words, particularly those words that constitute speech-acts.

Yet despite our linguistic divides, an interlocutory stance with nature is common in the West. Larry Lohmann points out that it is politically important to acknowledge this because this breaks down the supposed divide between the West and the non-west in the prevalence of animistic orientations to nature: an epistemological hierarchy that serves as justification for neo-colonial technocratic knowledge regimes and conservation policies. Sometimes for a beneficial effect in hobbies such as gardening, it is enough to simply regard nonhumans as if they were capable of responding in kind:

Genteel rose hobbyists, like farmers, hunters and gathers who depend for their lives on commons of land or water, usually grasp that an interlocutory stance is likely to get better results than a resource stance. No less than hunters in the forest, the more successful will probably be the ones who have developed the most extensive intentional vocabulary for understanding the subjects of their interest. To at least this extent, the notion that nature/society divides somehow operate “in the West but not the rest” – or, equally, that pachamama-esque conceptions only operate “in the rest but not the West” – proves, again, to be a bit of an Orientalist fantasy.498

Lohmann sees interlocutory orientations as displacing the dominance of a reified resources stance. He is optimistic about the ‘rights of nature’ discourse and in the personification of nature in Indigenous social movements’ claims for the rights of rivers

497 Ibid., 75.
Iris Marion Young proposes a vision of human communicative action as asymmetrical reciprocity, using the work of Luce Irigaray to challenge the assumption that we must identify with the other and establish a mirroring, complementary relationship in order to engender appropriate responses. Young instead elaborates on asymmetrical reciprocity as a descriptor of the effort to understand across difference—a process that will never be complete, as there will always be parts of the other's experience that do not resonate with our own. She discusses Habermas's theory of communicative action, which builds on Austin's speech-act framework:

> According to Habermas, the social bond produced by communication occurs not through the locutionary content of what is said, but through the illocutionary acts that accompany that substance. Every speech act that aims at understanding entails an *offer* by the speaker to make good on its meaning, and the understanding of the speech act entails an *acceptance* of that offer by a listener. These illocutionary gestures of offering and accepting meanings create and sustain the social bond. I suggest we interpret this structure of reciprocity in communicative action as asymmetrical in the same way as gift giving. The listener who has understood and accepted the meaning of a speaker responds appropriately. This appropriate response, however, cannot usually be seen as symmetrical with the first speaker's speech. I respond to your statement not by saying the same thing back to you, but by making another, different move in our language game. 499

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In human relations with nonhumans, this is also a relevant concept, although the asymmetry exists at an additional level, in that there is only mutual offering and accepting of meaning in a thin sense: the linguistically mediated universes of meaning that humans inhabit are different to the worlds that animals and plants inhabit.\textsuperscript{500} Thus the theories of Irigaray, Habermas and Austin do not apply to the nonhuman realm. Young emphasizes the importance of attending to questions in engaging with the other: “a theory of communicative action that gave more attention to the asymmetry of speakers [than Habermas’ theory], to the ways in which there are always excesses and resistances despite overlaps in the speakers’ interests and understandings, would attend more to questions as uniquely important communicative acts.”\textsuperscript{501}

### 5.11 Learning responsiveness

The call of an ecosystem often does not emanate from a face, as is the case with Levinas and Buber’s Thou but often rather from an interface or an absence: when a creature disappears or when its structure breaks down, which provokes questioning. Rather than a charismatic creature ‘like us’ presenting emotion in face and body, an environmental problem often calls to us as a lack rather than a presence: in the silence of the Spring to use Rachel Carson’s book title. An important skill is being aware not just of what is happening, but also what is not happening. The negative spaces, the non-events, the surprise no-shows. Many environmental signals manifest temporally in

\textsuperscript{500} While Heidegger claimed that nonhumans are ‘world-poor’, I would leave the question of nonhuman worlds open.

\textsuperscript{501} Young, “Asymmetrical Reciprocity,” 55.
a changed rhythm, an altered, and perhaps lost synchronicity, a changed growth pattern.

The sociality of human relations to soil is a step removed to companion animals: it relies on seeing, smelling and touching proxies for individual organisms, which correspond to the conditions of growth rather than the individual needs of an organism. Because soil is so complex, we often cannot single out organisms to deal with them individually or as a species, but rather our actions are received by the whole soil ecosystem, as non-specific care theorized by Keulartz and Swart. Thus observation over long periods of time is necessary in order to gain local knowledge. The absences that are particular to soil ecosystems are difficult to detect for many people working on the land today, as many have never seen soil that was not managed using the conventions that have become standard since the Green Revolution, thus imaginations of what is ecologically possible can be limited.

One proxy for soil health is plant health. When a plant indicates that it is in distress, land stewards might intervene to try to understand and alleviate the problem. They might notice a proliferation of sap sucking insects, and spray the plant with white oil or with another pesticide, or attract predators to the land so that they can be controlled biologically. Or they might notice a lack of vigour, amending the soil with manure to add nitrogen, or touching the soil, squeezing it to test the structure, noticing its texture and crumb attachment, indicating a surplus or absence of water, or a lack of organic matter.
While soil has no capacity to respond in kind to human relationship, some of the principles that guide ethical working relationships across the species divide are relevant for ethical treatment of soil. In particular, paying close attention to signs indicating preferences and needs through making careful observations and documenting those observations is relevant for care of soil macrofauna or microorganisms viewed under microscope. When there is no obvious emotion or expression (as there is with an animal such as a dog), our inclination as humans is to look for cause and effect relations as the basis for our judgement. Sign interpretation with plants often fits a pattern of experimental diagnosis and questioning. In gardening, signs given by the plant might lead us to make a certain intervention - more nitrogen fertilizer in response to yellowing leaves - for example, and the plant’s response several days later may indicate whether what we have given is compatible with their needs. With worms, we notice behaviour and tinker accordingly.

Abrahamsson and Bertoni write of this process thus:

this knowing takes the shape of a co-constructed, mutual, on-going and dynamic effort to attune your caring with the activities of the worms. Still, one that is not reciprocal in any egalitarian way, but rather sensitive to differences. ‘Learning to speak worm,’ here, means learning to become attuned to the subtleties of the worms’ relation with the wormery, with the food, with the bedding, with their environment. And food is a language that worms understand. It is a ‘language,’ but one that is not inflected in words, sentences and grammar, but in the utterance of practices, in the less codified tinkering of everyday life.502

Here, they claim that what is shared is a certain embodied type of language, in line with the Wittgensteinian notion of language as a game.

In discussing an example of a 'longitudinal' wine tasting “that allows you...to acquire a nose and a palate,” Latour argues for a technologically-enhanced learning process of registering distinctions. He celebrates various technological means that enable humans to register subtleties in appreciating things. Sensitive representation can help us to 'register worlds'.

thanks to the multiplication of instruments, we have become capable of registering new distinctions... The more instruments proliferate, the more the arrangement is artificial, the more capable we become at registering worlds. Artifice and reality are in the same positive column, whereas something entirely different from work is inscribed on the debit side: what we have there now is insensitivity.

Latour is enrolling the resources of both aesthetically and technologically modified representation in the service of cultivating sensitivity. Tools that enable new ‘ways of seeing’ as well as the attunement of sensitivities prompt different forms of spatial and bodily understanding and assist with the development and habituation of new practices. Through the assistance of aesthetically enhanced and modified science, we can ‘learn to be affected.’ As Gustavo Esteva and Madhu Suri Prakash write:

In Latin, cognoscere is "to know by the senses," and its implicit meaning is familiarity, experience, communion, recognition; scire is "to know by the mind," and its implicit meaning is separating, dividing, splitting. To know, conocer, or knowledge, conocimiento, in English and Spanish, come from cognoscere. That original meaning, however, has almost disappeared and the content of scire, "to know by the mind," now predominates.

In an interview with Acres Magazine USA, Christine Jones describes healthy soil texture as ‘fragrant’ and with an appearance like ‘chocolate cake’. Similarly, David

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504 Ibid., 85.
506 Frisch, “SOS: Save our Soils,” 4. The term ‘healthy’ as used here is not without its problems. It is meant as soil ecosystem that supports both vigorous plant crops for human consumption as well as a
Montgomery writes “Fertile soil crumbles and slides right off a shovel. Look closely and you find a whole world of life eating life, a biological orgy recycling the dead back into new life. Healthy soil has an enticing and wholesome aroma—the smell of life itself.”

Correspondingly, a foul odour can be an indicator of ill health. When brewing *actively aerated compost tea* according to the *Soil Food Web Institute*’s methods, a pungent and revolting odour is a sign of an anaerobic brew: indicating that the aerating motor has probably broken down, leading to the proliferation of anaerobic microbes. In general, if we are wanting symbiotic beneficial fungi and bacteria and other organisms to proliferate, we need to ensure the brew is evenly aerated, as well as protected from the deleterious anti-microbial powers of chlorinated water and preservatives.

The practitioner’s commitment to learning and providing for the *needs* of the plant and the soil distinguishes a stance of care. Many of our beliefs about plants’ needs are informed by textbooks, websites and growing instruction tags, however, each application of this advice is provisional, applied more as a question than an answer, with the answer given by the response of the plant, the worm, or whatever proxies for soil health the practitioner is monitoring. At each of these moments, their understanding of the plant is tested. Instead of a reified picture, they respond to *this plant, this soil, here and now*, which involves extending species-specific care to the plant, as well as non-specific care to the soil ecosystem. If the land steward is working in a holistic way, he/she is not only responding to discrete problems, but also

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biodiverse soil ecosystem, that is able to exercise other ecological capabilities such as holding and sequestering carbon and laterally transporting water through the pores of the soil. If we were to adopt a less anthropocentric framework, we would consider certain anaerobic and less biodiverse microbial ecosystems to be also ‘healthy’ if they had a certain integrity that enabled them to manifest emergent properties.

interpreting the broader causes that might have made such problems emerge. If the practitioner is being *regenerative*, they are seeking to improve the self-sustaining capabilities of the land, and to integrate flows of matter so that *waste becomes food.*\(^{509}\) This may include finding appropriate combinations of species that will satisfy the agroecosystem’s needs; for example, a legume cover crop provides nitrogen to the soil, through its accommodation of bacteria in root nodules that fix nitrogen from the air. It also provides energy (through distributing the products of photosynthesis via the roots) and conserves water (through covering the soil surface). We might assist the soil ecosystem by making interventions that for example improve the efficacy of nutrient cycling or increase organic matter.

Non-specific care can make diverse habitats, affordances and foods available, aiming towards increasing the ecosystem integrity so that individual species have adequate environments in which to exercise their capabilities. While some farmers try to encourage specific strains of fungi, or a certain ratio of bacteria to fungi, overall their stance is by necessity one in which it is more about action and facilitation of other entities’ action at a distance, which is an imprecise craft.

Revisiting Honneth’s lecture, we misrecognize others when we fail to take them on their own terms, and instead contrive rigid representations without allowing for those objects to surprise us and challenge our preconceived notions of them:

> The things we encounter in our everyday dealings with the world must also [in addition to humans] be regarded as entities to which we relate in an inappropriate way *when we apprehend them merely neutrally and according to external criteria.* It is therefore not difficult

\(^{509}\) Braungart and McDonough, *Cradle to Cradle.*
to see that this intuition confronts me with a problem that is partly due to the narrow basis of my talk of “recognition.”

So to invert the italicized sentence, can we treat things in such a way that we apprehend them in a committed manner, according to internal criteria? I would say yes to the first but no to the second. The concern regarding external criteria points to an imposition from the outside without subsequent reformulation in light of insights gained through engaging with that thing. The criteria we use to understand a thing should always be up for negotiation, and yet humans cannot enter into an explicit conversation with nonhumans themselves, thus the terms by which we understand them will always be human constructs, but should be open to modification as further understanding arises.

Interpreting the meaning of signals given by nonhumans is part of the day-to-day repertoires of many Indigenous cultures. Deborah Bird Rose’s anthropological work with Aboriginal people of the Northern Territory and the Kimberley has enabled her to learn about their relational environmental ethos. Rose also beautifully portrays the relationship between human and world, attributing motivating properties to the world. As she writes:

A great deal of the literature on human ecological activities in contemporary Western practice—primarily resource use and resource management—assumes the priority of human knowledge and human intentional action. My work with Aboriginal people indicates an alternative. Rather than humans deciding autonomously to act in the world, humans are called into action by the world.

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The term “call” connotes ambiguity regarding the level of agency and articulation of the nonhuman world that prompts human action. Isabelle Stengers even attributes to nonhuman materiality an ability to ‘propose.’ She puts it this way: “We could say that the environment proposes but the being disposes, gives or refuses to give that proposal an ethological signification.”\textsuperscript{512} As such, the environment furnishes possibilities as well as provoking certain active orientations to those possibilities.

In this context, acknowledgement is a relevant concept for a lexicon of ethical human relationships with nonhuman worlds. Acknowledgement plays a role in the development of practices of care. Stanley Cavell explores the ethical dimensions of acknowledgement in our relationship with the world thus:

...the concept of acknowledgement is evidenced equally by its failure as by its success. It is not a description of a given response but a category in terms of which a given response is evaluated.... A “failure to know” might just mean a piece of ignorance, a blank. A “failure to acknowledge” is the presence of something, a confusion, an indifference, a callousness, an exhaustion, a coldness. Spiritual emptiness is not a blank. –Just as, to say that behavior is expressive is not to say that the man impaled upon his sensation must express it in his behavior; it is to say that in order not to express it he must suppress the behavior, or twist it. And if he twists it far or often enough, he may lose possession of the region of the mind which that behavior is expressing.\textsuperscript{513}

Acknowledgement involves accepting a moral dimension to a phenomenon. Blocking the pathway of acknowledgement can have ongoing negative psychological consequences, in the bottling up and displacement of emotion on to objects distinct


from those that gave rise to it. An example of a failure of acknowledgement is the 2008 dust storm, which was publicly interpreted as a natural phenomenon, rather than a problem with farming practices, thus there was no accountability. The storm’s human causes were only identified several years later in an obscure academic paper. While Isabelle Stengers doesn’t use the concept of acknowledgement, she implies it in her claim, “We don’t know what a researcher who today affirms the legitimacy or even the necessity of experiments on animals is capable of becoming in an oikos that demands that he or she think “in the presence of” the victims of his or her decision.”

Akeel Bilgrami finds an alternative to Bennett and Latour’s focus on distributed agency, by arguing that there are value properties in the world that are necessary for human agency, that move us into action. It is through our engagement in the world that certain desires are cultivated. He asks, “what must the world contain, such that it moves us to such practical engagement, over and above detached observation and study?” He answers that it “must contain elements over and above those we observe and study from a detached point of view.” In this sense, he is challenging a naturalistic and objectivist interpretation of human experiential relations with the world, which can be seen as partly to blame for the environmental crisis. If we can describe ourselves both in the first-person practical, agentive point of view (I intend to...) and the third person, detached and objectified observational point of view (I predict I will...) [a distinction first made by Spinoza], then it is also possible to describe

514 Isabelle Stengers, “The cosmopolitical proposal,” 997.
516 Ibid.
our environments in both an objectifying and an active way. As Bilgrami writes, “On this conception of agency... desires (including those desires that are loftier and amount to moral sentiments) are not self-standing but rather are responses to things in the world which have whatever it takes (evaluative properties) that prompt their activation.”

Knowing how to respond takes experience, environmental and cultural conditioning: to understand that there is a problem, acknowledge and diagnose the problem, and to intervene effectively:

The relations between the human subject and the world (including nature) he inhabits have a history and tradition within which his perceptions of the value properties in the world and nature at any given time speak to him and make normative demands. They will necessarily speak therefore in terms that are contaminated (I use a strong term such as that here to mark how much the point is supposed to exceed the acknowledgement of the mere theory-ladenness of observation in general) by a much richer set of background assumptions, and may well therefore speak differentially to subjects in different social and cultural contexts.

When we see litter in bush land and get angry about it, or when we see that there is asbestos dumped illegally in a playground, when we see a plant that has yellowing leaves, there is a call to respond, if our individual and culturally-specific values are such that we are outraged or disturbed by seeing these objects positioned in these ways. While we may perceive a call, we may receive it in numerous different ways. We may be troubled by it, or show indifference. We may ignore it, even while being affected by it. Or we may be moved to respond.

While many in the environmental humanities insist that rejecting human exceptionalism must involve recognising that all entities – human and nonhuman,
living and nonliving—have agency and even subjectivity, I worry about the flattening of distinction that this entails, and the loss of language to articulate that which humans share, our potentialities and the specific responsibilities we are burdened with particularly in the Anthropocene. At the same time, I am sympathetic to David Abram’s call to recognise the interiority of nonhumans:

We define nature not as a community of living subjects held together by an intricate gift economy (wherein each being, each life is nourished by a host of others, and gives of itself in return), rather we speak of the nature around us as an almost random concatenation of passive things, not a community of living subjects but a conglomeration of objects and automatic processes, void of all interiority, lacking all spontaneity, without any active agency—merely a stockpile of resources waiting to be requisitioned by us.

But how can one practice reciprocity with an inert or determinate object? How can one enter into relationship with something that has no life, no interiority, no active agency of its own?

... ethics emerges as the practice of right relationship within human society. Presumably, the rest of nature cannot reciprocate our attentions. Reciprocity can emerge only if there is some common ground, some common medium through which a mutual exchange can unfold.

By attributing agency to those organisms and entities, making more visible the processes that they make possible and participate in, the claim is that we will reciprocate with these organisms more, rather than instrumentalising them as readily, subjecting our actions to more scrutiny, becoming receptive and being willing to perceive whether or not our actions were well received. Abram argues that the Cartesian dualism and academic distinction between the ‘subjective’ and the ‘objective’, between the ‘human’ and the quantifiable world of external nature can

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521 Ibid., 83.
prevent us from seeing our exchanges with nature as commensurable and in a common ethical universe in which reciprocity is possible.

Recognising our fellow nonhumans as deserving of justice and a decent life, should incline us towards attending to the needs of soil ecosystems, and enabling the expression of contingent but beneficial soil ecological capabilities. Yet unlike Abram, Margulis, and many of the New Materialists, I am wary of using language that levels the agentive capacities of humans and nonhumans, as a vehicle towards recognition of the nonhumans in soil, because I don’t think it is necessary for an adequate change. I also want to protect the specific meaning of the language of subjectivity in particular and its significance for humanistic inquiry. Ella Myers summarises these issues very well:

While it is true, as Latour and Bennett insist, that the power to build the world does not belong to humans alone, it would be a mistake for this insight to cover over meaningful differences in the agentic capacities of entities. For this reason I do not take up the vocabulary of actants and assemblages, preferring to mark a distinction between the human power to shape existential conditions, whether for good or ill, and the contributions made by other bodies, matter, or energy. ... Refusing to equalize all actants need not mean attributing potency to humans alone or sanctioning a settled hierarchy of being. Singling out the human capacity to collaboratively shape the world is valid and important because humans are capable of exercising care in ways that other actants are not. They are able to coordinate with one another through joint action that strives to shape social conditions. This capacity is integral to democratic citizenship. That this ability to engage in reflective, purposeful collective projects can lead to disaster is no reason to deny the specifically human capacity to shape the world by collapsing it into the
Like Myers I am committed to carefully restricted use of languages of human qualities and agency in order to maintain the specificity of their meaning. While I am on board to developing an inclusive democratic language that brings concerns regarding nonhumans to a central focus, this does not include nonhumans being democratic agents exercising subjectivity. Paulo Friere’s existential goal in his liberatory pedagogy to “become more fully human” is one that involves struggle and political awakening in human collectives, an ideal I strongly endorse. Yet “humanity” itself is relationally achieved, requiring nonhumans for the actualisation of its material and its moral meanings. Furthermore, consciousness and a full sense of human agency is only possible as an emergent property of healthy material relations, such as the “transitional objects” that Donald Winnicott theorises in child development and which Bonnie Honig extends to democracy and the public sphere, as well as a healthy nonhuman biological environment, as the film WALL-E suggests. In these ways, nonhumans are part of the disclosive capabilities of humans. David Abram says, “We are human only in contact, and conviviality, with what is not human.” What this means is that the particular kind of creative consciousness that is specific to the human is highly contingent, and not essential. At a time when all life on earth faces a more

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uncertain future, human consciousness must be devoted more wholeheartedly to the wellbeing of ecologies if it is to be more than a tiny blip on a geological timescale of Earth history.

5.12 Enshrining obligations towards soil?

While allocating environmental resources to nonhumans on farms can be a practice that is meaningful, enjoyable and economically beneficial for farmers, the reality is that they also involve a material redistribution of environmental resources from humans to nonhumans. This means that if more broadly implemented by farmers or enshrined in government policies, some economic interests would benefit and others would lose out. Numerous farmers and political interest groups bitterly resisted the buying up of water licenses and reallocation of environmental flows to ecologically sensitive areas as part of the Murray Darling Plan, for example. So what would be the best way to enshrine or institutionalise obligations to soil?

Michel Serres makes an extended argument for reconstructing human relations with the Earth on an obligatory reciprocal basis, a “natural contract,” to rival the “social contract” as a foundational imaginary for a peaceful human society in this era. In doing so Serres anticipates many of the themes that are now lively debates in new materialism and discussions of The Anthropocene. Reminding us that “the old social contract... was unspoken and unwritten,” Serres argues that the impetus for forging a natural contract will come from recognition that modern humanity has been

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engaged in an ‘objective war’ with nature, with serious consequences for life on earth, as well as the recognition of society’s vulnerability with regard to both nature’s extremes and with regard to our world-shaking technological power in the nuclear age. He claims that such a contract is possible if we think outside language: “the Earth speaks to us in terms of forces, bonds, and interactions, and that’s enough to make a contract.”  

Serres points to a different mode of relation with the material world in the example of sailors on the open seas: this example models an adequate sense of vulnerability and thus deference with regard to nature. He is particularly interested in the example of Odysseus’ crew in Homer’s epic, who, he claims, had an adequate awareness of their obligation to be responsive to the conditions of the sea, adjusting the ship’s course and their own behavior accordingly, suppressing interpersonal conflict for the broader purpose of surviving together on the sea: a similar kind of pragmatic social peace to the social contract. This reinforces Serres’ sense of a ‘contract’ in the sense of unwritten rules or norms, rather than legal transformation (though it does not preclude law). In a similar way we might imagine a social situation where treating the land carelessly would attract social sanction.

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528 Ibid.
529 Ibid., 34.
Aldo Leopold’s *Land Ethic* argues for something similar: social change at the level of norms, which would elevate environmental obligations to extend “social conscience from people to land.”

When one asks why no rules have been written, one is told that the community is not yet ready to support them; education must precede rules. But the education actually in progress makes no mention of obligations to land over and above those dictated by self-interest. The net result is that we have more education but less soil, fewer healthy woods, and as many floods as in 1937.

The puzzling aspect of such situations is that the existence of obligations over and above self-interest is taken for granted in such rural community enterprises as the betterment of roads, schools, churches, and baseball teams. Their existence is not taken for granted, nor as yet seriously discussed, in bettering the behavior of the water that falls on the land, or in the preserving of the beauty or diversity of the farm landscape. Land-use ethics are still governed wholly by economic self-interest, just as social ethics were a century ago.

To sum up: we asked the farmer to do what he conveniently could to save his soil, and he has done just that, and only that. The farmer who clears the woods off a 75 per cent slope, turns his cows into the clearing, and dumps its rainfall, rocks, and soil into the community creek, is still (if otherwise decent) a respected member of society. If he puts lime on his fields and plants his crops on contour, he is still entitled to all the privileges and emoluments of his Soil Conservation District. The District is a beautiful piece of social machinery, but it is coughing along on two cylinders because we have been too timid, and too anxious for quick success, to tell the farmer the true magnitude of his obligations. Obligations have no meaning without conscience, and the problem we face is the extension of the social conscience from people to land.530

Here, Leopold decries an inadequately robust set of social expectations, failing to bind farmers to treat the land well. He also questions education detached from social

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responsibility, which alone focuses on “the facts” rather than informing normative reflection to develop an ethos by which it informs practice with regard to the land. He wonders at the mismatch between the widespread public recognition of duties to social infrastructure and community organisations, and the lack of a corresponding recognition of duties to soil. If treatment of the land became ethically charged, a matter of social conscience, this would require that the wellbeing of land and soil, particularly land on private property, became a matter of public concern.

This is a matter of normativity because it concerns the social prioritization of particular values above others, and some potential recipients of care above others. There are disputes over the meaning of normativity, but my understanding is that normativity pertains to all matters of concern, and is a necessary, but often implicit element of human purposive action in the world, rather than pertaining to coercive authoritarian morality or prevailing social expectations (the more common understandings of the word).

Leopold fails to recognise the possibility of public normative transformation via intentional volition, public debate and critical reflection, arguing instead that ethics evolve with objective factors such as increasing community complexity, interdependence, and in synchrony with social skills. This homology he expresses thus: "An ethic, philosophically, is a differentiation of social from anti-social conduct."

Leopold views politics and economics somewhat naturalistically “as advanced symbioses in which the original free-for-all competition has been replaced, in part, by

co-operative mechanisms with an ethical content.” Leopold is optimistic about the movement of history in which the human capacity to incrementally become ethically sensitised to others can advance. He conceptualises such a process as an “ethical sequence,” which he sees as “actually a process in ecological evolution.” Leopold sees these as developing automatically “with population density, and with the efficiency of tools.” Yet Leopold’s words reveal a performative contradiction, as they simultaneously seek to convince people of an idea while claiming that that idea is inevitable [and thus people need not be convinced]! This naturalistic account of ethical development is not self-conscious enough: it does not take adequate account of the ways in which our relationship to the land is a social one, mediated in part by language, which in turn is formed in the public sphere, with meaning changing along with social processes, informed through public conversation.

Naturalistic accounts of ethics that eschew any intentional orientation to norms appear in sciences such as neuroscience, but also in the ecological humanities and feminist care ethicists, among theorists who seek to derive ethics directly from the ontological fact of interconnection, of human relatedness to nature. Such ethics seek to resist universalist moralities but in doing so, in my view, fail to recognize that all ethics proceed from particular commitments which shape our normative stances towards the world. María Puig de la Bellacasa suggests that “permaculture do[es] not start from a normative morality,” pointing to its contextual ethics. She makes similar

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532 Ibid.
533 Ibid.
534 Ibid.
claims in her very interesting work on care. Yet this claim may commit the naturalistic fallacy in deriving the “ought” from the “is.” Puig de la Bellacasa writes:

Permaculture is extending through practice-sharing, teaching, community building and social activism, but many envision its effectiveness in the possibility of transforming people’s ethos in our everyday relations to the earth, to its inhabitants and its ‘resources’. In that sense—its ethical obligations and commitments do not start from a normative morality. These ethics, in discourse and practice, focus on concrete relationalities.

What I understand this to mean is that permaculture starts from a normative position that we should learn from our relations with nature: we ought to become more sensitive and attuned to the needs of the nonhumans around us, and adopt provisional stances that can be revised. This in itself is a normative standpoint, adopting a relationship of *answerability*, or *receptivity*. To be unwilling to specify and articulate which stance is adopted and why, doesn’t eliminate the existence of the “ought,” it just means that decisions about the “ought” will take place in a less transparent and intentional way.

Adequate support for care work is rarely forthcoming in a capitalist society that systematically devalues care labour and other things that are not immediately commodifiable. We face similar dilemmas to the feminist challenge to elevate care labour to an equal status with other jobs: if we support care work through public policy and/or create coercive institutions that oblige all people to perform some kind of care work, would this diminish the intrinsic motivation that seems essential for genuine

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536 Puig de la Bellacasa, “‘Nothing comes without its world’ 197-216
537 Puig de la Bellacasa, “Ethical doings”, 152.
care? My answer is not necessarily. If a social expectation is established across society for adults where every person must perform a minimum number of care work hours a week, which may include care to the environment, there would be increased public conversation encouraging engagement in care work as a meaningful part of life, which may build more intrinsic motivation for performing care work to soil. In this vein I endorse Jennifer Nedelsky’s “Part time work for all” proposal for such a universal care obligation.539

If we were to politicize and ethically charge the wellbeing of soil in the public sphere, we would highlight both the vulnerability of soil to everyday routine actions as well as highlight the necessity of soil in many of the ecological functions that humans and other organisms benefit from each day, targeting particular institutions that maintain regimes of cultivation that institutionalise soil degradation and loss. We might draw up a charter of obligations that landholders have to soil and water integrity, regulate soil erosion as a form of industrial pollution, or recognize legal rights of a river not to be polluted by soil, as the achievement of legal personhood of the Whanganui river in Aotearoa/ New Zealand may enable.540 Changing norms is a complex task: it requires making the implicit explicit, and engaging in public discussions and political mobilisation making the costs of holding on to widely held values, practices and understandings sharply evident. Then the question is posed whether we would prefer to endorse or prioritise a different approach, with the possibility of establishing institutions and/or laws to enforce this. In short, we need to de-naturalise the erosion

539 See: Jennifer Nedelsky, A Care Manifesto: Part time for all (Forthcoming, Oxford University Press 2018)
and degradation of soil, and instead view the land surface as precious, as we would the skin of a human or another animal, while building the institutions and norms that could help to support its protection across society.

5.13 Conclusion

Regenerative agriculture educators often place emphasis on the fact that healthy soil is brimming full of life, encouraging appreciation of soil’s complex relational qualities, against the dominant “dead soil paradigm.” Many also emphasise the plurality of functions that soil assemblages perform for humans and nonhumans when healthy: in addition to providing a yield or another specified outcome for humans. Others show how soil is surprising, exceeding the categories through which it is conventionally understood, drawing us towards its mysterious qualities, provoking wonder. These discourses complicate instrumental understandings and reductive physical or chemical models of soil’s functioning.

Caring for soil involves complex praxes of recognition and experimentation, with uncertainty and surprise sometimes helping to draw practitioners to become more receptive. Knowing how an organism behaves when it is well versus when it is unwell; when it is free versus when it is constrained is relatively straightforward when it is a mammal with similar needs to humans: we can diagnose problems via sympathy, or at least via analogy with ourselves. However this becomes more complex when we cannot draw a direct link between human physiology and the organism concerned.

541 This term is used particularly by Markus Reichstein and colleagues, for example see M. Reichstein, B. Ahrens, M. Braakhekke, N. Carvalhais, T. Wutzler, “Towards a better link between soil process models and experiments across spatial and temporal scales” American Geophysical Union, Fall Meeting 2011, abstract, available at http://adsabs.harvard.edu/abs/2011AGUFM.B33K_.02R
This is particularly the case with soil: we then must come to attend to the vulnerable interfaces of soil, and experiment with interventions to alleviate soil distress and to support processes that bring about soil health.

Attending, noticing and responding are practices of care. Through them we learn to be attuned to the calls of need as they emerge through either proxies or embodied behaviour of organisms themselves. This receptivity requires new forms of bodily awareness, habits, technologies and institutions, giving rise to what Haraway calls “co-domestication,” as well as interpretive moments of disclosure in which we receive and respond to calls from nonhumans to change our ethical stance towards the world. A similar call motivated the captain in WALL-E to literally steer human civilization back to earth, after life in Space apart from nonhuman life for 700 years. The captain received this call as he was moved by the drooping leaves of a single plant, clumsily embracing earthly stewardship responsibilities, and calling upon other humans to also attend to these tasks. This is instructive for us all: right relationship develops through an iterative process of coming to interdepend, a constant apprenticeship to nature, as well as articulating, enabling and justifying such practices of care in the public sphere.
Conclusion

The famous photograph of the Earth from Space, taken from the Apollo 17 spacecraft, conveys at once the vulnerability, the grandeur and the integrity of Earth, and soon after it was taken became a symbol of Environmental consciousness. The photograph came to evoke this meaning partly because of its timing, when the modern Western environmental movement was emerging along with societal anxieties about the wellbeing of planetary life support systems.

No single picture of soil has come to gain an iconic environmental status like that of the Earth from space. When images of microbes first entered widespread public circulation, they did so at a time when science’s ethical commitments were oriented more towards the sustenance of humans and the eradication of disease rather than the future of life on planet Earth. Themes that are writ large on the image of planet Earth [such as vulnerability, grandeur and integrity] can also be read into images of soil, but few people have learned to recognize soil distress as they have learned to recognise other forms of ecological disarray.

My fieldwork has highlighted the many ways in which land stewards, working with a world opened up to them by a microscope, or by other representations of soil ecology often adopt new understandings that reflect a paradigm shift towards a more integrative way of looking at their practice, and its ethical consequences, such that what previously was a means alone has gained new significance, also becoming an end
in itself. Lynn Margulis and Dorian Sagan argue for the important role of the microscope in ecological awareness thus:

The microscope has gradually exposed the vastness of the microcosm and is now giving us a startling view of our true place in nature. It now appears that microbes-- also called microorganisms, germs, bugs, protozoans, and bacteria, depending on the context-- are not only the building blocks of life, but occupy and are indispensable to every known living structure on the Earth today. From the paramecium to the human race, all life forms are meticulously organised, sophisticated aggregates of evolving microbial life. Far from leaving microorganisms behind on an evolutionary “ladder,” we are both surrounded by them and composed of them. Having survived in an unbroken line from the beginnings of life, all organisms today are equally evolved.⁵⁴²

While the microscope carries with it its own discursive sedimentations, particularly the reductionism of the pathogen matrix, it also offers a different point of view distinct from the perspective of the land gained from sitting at the helm of a tractor, necessitating “joined-up-thinking” which then produces a more complex picture of the world more compatible with what Arendt calls “enlarged thought:” thinking in terms of the common good. In this era of the Anthropocene, conventional anthropocentric understandings of “the common good” and even the individual good in agriculture can be revealed as shallow and narrow conceptions which have not served the long term flourishing of soil biodiversity. The goals of agriculture can be broadened and deepened through kindly use, through care for ecosystems that many forms of life depend upon.

Whether farmers prioritise insects, microbes, grass growth, soil aggregation or any of a whole multitude of ecological indicators, what matters is that they are attentive to life processes beyond what is completed in the harvest or the slaughter, with temporalities that cycle beyond the growing season or the fattening-up period, both reflecting and generating concerns for ecological wellbeing.

The recognition of soil as living, vulnerable, and contingent, and as something to care for and become answerable to, seems to be the most crucial realization involved in moving practitioners towards the care of soil. Many of the most commonplace and banal techniques of agriculture, parks management and civil engineering, replicated throughout the world in the name of the Green Revolution and the suburban lifestyle have closed down relations that promote soil flourishing throughout the world, leaving degraded land, erosion and aquatic ‘dead zones’ in their wake. These conventions have become ideologically sedimented in aesthetic templates and norms that modern humans have come to expect as signs of civilization: cut lawns, confined watercourses, concrete pathways, tamed weeds, parks cleared of rotting trunks, orderly bare soil, monocultural rows of plants, fast plant growth, efficient planting and harvesting, the elimination of insects and their predators, the use of heavy machinery and grazing animals in ways that compact and erode the soil. The net impact has been to degrade the “meshwork” structure and connectivity of soils, reducing ways in which nutrients, water and energy can be circulated in soils by life, particularly by fungal mycelia.

A current controversy that hinges upon the question of soil’s mattering among ecological values is whether or not hydroponic and aquaponic techniques – methods of growing food without the use of soil – should be certified organic. In November
2017, a decision by an advisory board to the U.S. Department of Agriculture voted to allow the majority of these operators to remain a part of the organic program. Yet opponents, many of whom were early champions of organic farming, argue that building soil health and thereby generating benefits to the broader environment is a necessary and key part of the ethos of organic agriculture. Some practitioners who prioritise building healthy soil now are contemplating distinguishing themselves by using a new “regenerative organic” label for their produce, a label that is now being launched by the Rodale Institute. One wonders whether the same controversy will face the UK Soil Association, which also certifies organic produce, but maintains a central focus upon soil in its name. What is at stake in this debate, and in other similar labelling debates such as “fair trade” and “forest stewardship council” certification is the question of whether companies should gain credibility for being less exploitative than others, or whether such labels should attempt to institutionalise a different paradigm, one in which productive activity involves care for producers and the world.

Being “equally evolved” with soil microorganisms, as Margulis and Sagan say, means that we have come a long way together. It does not mean that we as humans are ethical counterparts to soil, but it means that soil deserves respect and wonder in the course of our everyday work with it. Such respect should incline us towards recognizing soil, its needs, and enabling the expression of contingent but beneficial soil ecological capabilities. Broadening the goals of land stewardship, workers also gain a

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richer picture of the significance of their work, and a greater sense of purpose in that work. Recognising soil as essential parts of our own and other species’ livelihoods does not have to involve solely instrumentalist calculation of interests, or monetary valuation of ecosystem services. Instead it can form part of a new public ethos through which foreground the fact that we are mutually entangled and infinitely indebted to organisms on and in the land. Through such an ethos, grounded in the widespread adoption of practices of soil care, we might also regain a more animated, meaningful and lively sense of being in the world.
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### Appendix 1: Field work

The following table shows a summary of the people cited in this thesis who were interviewed, and what type of farming or other activity they are engaged in:

<table>
<thead>
<tr>
<th>Practitioner names</th>
<th>Interview date</th>
<th>Occupation</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Phil” and “Tom”</td>
<td>19 June 2013</td>
<td>Golf course owner and Golf course superintendent</td>
<td>Raymond Terrace, NSW</td>
</tr>
<tr>
<td>“Trevor”</td>
<td>6 June 2013</td>
<td>Owner of a gardening business</td>
<td>Sydney, NSW</td>
</tr>
<tr>
<td>“Jan”</td>
<td>3 July 2013</td>
<td>Soil scientist and farmer educator</td>
<td>Perth, WA</td>
</tr>
<tr>
<td>“Marie”</td>
<td>5 July 2013</td>
<td>Mixed sheep and wheat farmer</td>
<td>Wyalkatchem, WA</td>
</tr>
<tr>
<td>“Peter” and “Sam”</td>
<td>20 April 2014</td>
<td>Mixed chickens (eggs) and cropping</td>
<td>Quirindi, NSW</td>
</tr>
<tr>
<td>“Liam”</td>
<td>20 November 2014</td>
<td>Artist</td>
<td>Parramatta, NSW</td>
</tr>
<tr>
<td>“Jacob”</td>
<td>8 October 2015</td>
<td>Council worker</td>
<td>Sydney, NSW</td>
</tr>
</tbody>
</table>
Other learning activities and field trips:

Australian National Field Days, Borenore, near Orange, 16 - 18 October 2011 (helping an ANU PhD student survey farmers regarding tree crops).


“Real Food Forum,” with Joel Salatin at Sydney Town Hall, 16 February 2013.

Soil Food Web Institute Training, Lismore, 12-14 March 2013.

Watershed Landcare/ Mudgee Microscope Group Field trip, Winona, [with Colin Seis], 20 March 2013.

Australian Institute of Landscape Architects guided tour of The Ponds housing development, 10 April 2013.

Allan Savory Public Lecture, Sydney, hosted by RegenAg and Milkwood Permaculture, 16 August 2013.

Open Gardens Australia, Jackie French’s garden tour and public lecture. 10 November 2013.

Appendix 2: Ethics Approvals

Our Reference: 13/002294 | H10090

HUMAN RESEARCH ETHICS COMMITTEE

11 March 2013

Professor Katherine Gibson
School of Humanities and Communication Arts

Dear Katherine

HREC Registration Number H10090 titled: “Distributed agency, land ethics and multi-species community economies: Social structure that support the beneficial ‘labour’ of soil microorganisms in agriculture”

This application names: Katherine Gibson, Anne O'Brien

The Human Research Ethics Committee has reviewed your proposal and in order for an ethics protocol approval to be issued, please provide the following information:

5.3.0 This question refers to whether the research involves a practice which is alternative to normal practice, not the practice of the research participants. Researcher to consider revision to ‘no’.

5.3.4 Researcher to consider revision to “no” as the risk is no more than inconvenience.

6.1.1 Note to researcher: Given the age range provided for participants, the research should specifically exclude children.

8.3.2 Please revise answer. Data is to be stored on UWS premises. Location to be specified. (Note: This could consist of a copy of the data being provided on a memory stick which is locked in supervisor’s office.)

8.3.6 Researcher to clarify that data will be stored for a minimum of five years.

8.3.7 Please revise answer. Current answer does not address the event that engagement with UWS ceases within the period mentioned in 8.3.6.

Attachments:
Information Sheet – Please remove “This and tools” at the end of the “What is the study about?” section

Please note that your application will remain open for a period of three (3) months from the date of this letter, pending receipt of your revised ethics application. If your revised application is not received within that period, your application will lapse.
Please forward your revisions with a summary of changes made to humanethics@uws.edu.au.

Please quote the registration number and titled as indicated above in the subject line on all future correspondence related to this project.

Yours sincerely

[Signature]

Associate Professor Anne Abraham
Chair, Human Researcher Ethics Committee
30 October 2014

Dear Nikolas,

Principal Investigator: Prof Nikolas Kompridis
Student Researcher: Anne O'Brien
Ethics Register Number: 2014 288N
Project Title: Distributed agency, land ethics and multi-species community economies: Social structures that support the beneficial 'labour' of soil microorganisms in agriculture
Risk Level: Low Risk
Date Approved: 30/10/2014
Ethics Clearance End Date: 31/12/2014

The ACU HREC has considered your application for ethics transfer 2014 288N title Distributed agency, land ethics and multi-species community economies: Social structures that support the beneficial 'labour' of soil microorganisms in agriculture.

As this application has already been ethically reviewed by University of Western Sydney, ACU HREC accepts the approval and has noted that no adverse events have occurred during the conduct of the project whilst UWS has been responsible for the project. This project has now been recorded as an ACU project for which ACU is responsible. Please ensure that annual progress reports are submitted to ACU on the anniversary of the end date. A reminder will be sent by Research Services.

*** If data collection is still in progress please ensure that the information letters are amended to ACU letterhead and please follow ACU's recommended information letter and consent form format. The template is available for download from: http://www.acu.edu.au/research/support_for_researchers/human_ethics.

This project has been awarded ethical clearance until 31/12/2014. In order to comply with the National Statement on Ethical Conduct in Human Research, progress reports are to be submitted on an annual basis. If an extension of time is required researchers must submit a progress report.

Whilst the data collection of your project has received ethical clearance, the decision and authority to commence may be dependent on factors beyond the remit of the ethics review process. The Chief Investigator is responsible for ensuring that appropriate permission letters are obtained, if relevant, and a copy forwarded to ACU HREC before any data collection can occur at the specified organisation. Failure to provide permission letters to ACU HREC before data collection commences is in breach of the National Statement on Ethical Conduct in Human Research and the Australian Code for the Responsible Conduct of Research.
If you require a formal approval certificate, please respond via reply email and one will be issued.

Decisions related to low risk ethical review are subject to ratification at the next available Committee meeting. You will only be contacted again in relation to this matter if the Committee raises any additional questions or concerns.

Researchers who fail to submit an appropriate progress report may have their ethical clearance revoked and/or the ethical clearances of other projects suspended. When your project has been completed please complete and submit a progress/final report form and advise us by email at your earliest convenience. The information researchers provide on the security of records, compliance with approval consent procedures and documentation and responses to special conditions is reported to the NHMRC on an annual basis. In accordance with NHMRC the ACU HREC may undertake annual audits of any projects considered to be of more than low risk.

It is the Principal Investigators / Supervisors responsibility to ensure that:
1. All serious and unexpected adverse events should be reported to the HREC with 72 hours.
2. Any changes to the protocol must be approved by the HREC by submitting a Modification Form prior to the research commencing or continuing.
3. All research participants are to be provided with a Participant Information Letter and consent form, unless otherwise agreed by the Committee.

For progress and/or final reports, please complete and submit a Progress / Final Report form:

For modifications to your project, please complete and submit a Modification form:

Researchers must immediately report to HREC any matter that might affect the ethical acceptability of the protocol eg: changes to protocols or unforeseen circumstances or adverse effects on participants.

Please do not hesitate to contact the office if you have any queries.

We wish you well in this research project.

Regards,

Kylie Pashley
Ethics Officer | Research Services
Office of the Deputy Vice Chancellor (Research)
res.ethics@acu.edu.au
23 August 2016

Dear Nikolas,

Ethics Register Number : 2014 288N
Project Title : Distributed agency, land ethics and multi-species community
economies: Social structures that support the beneficial 'labour' of soil
microorganisms in agriculture
Data Collection Date Extended: 31/12/2016

Thank you for returning the Ethics Progress Report for your project.

The Deputy Chair of the Human Research Ethics Committee has approved your
request to extend the project. The new expiry date for the project is the
31/12/2016.

We wish you well in this ongoing project.

Kind regards,
Ms Pratigya Pozniak

Ethics Officer | Research Services
Office of the Deputy Vice Chancellor (Research)