Down to the Soil: Developing a Latourian 'Terrestrial' Account of Soil

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Vienna, 31st of October 2025

Liadh Faragó

DECLARATION OF GENERATIVE AI

To the best of my knowledge, generative artificial intelligence (GenAI) was not used in this work. I, the author, take full responsibility for the content, claims, and references.

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Abstract:

The world's soils are one of the most important parts of the natural environment to the maintenance of human life, and they are also one of the most threatened by the contemporary environmental crisis. In this thesis I will discuss Bruno Latour's arguments about escaping from the problematic worldview that he thinks led to the current environmental crisis, and investigate its applicability to soils in particular. Latour argues that as a result of globalisation and modernism, we have found ourselves in the problematic position of viewing 'nature' through a dualistic and mechanistic lens; which has resulted in the unfortunate political and environmental situation we are in today. Latour's solution is a shift in perspective; from viewing humans and 'nature' as separate and viewing 'nature' as passive and lacking agency, to seeing everything that creates and causes change on earth (human and nonhuman) as interconnected and capable of some degree of agency. This perspective is called "terrestrial" in Latour's terminology. To the best of my knowledge there is currently no scholarly work that either lays out in detail what a "terrestrial" approach to any given aspect of 'nature' might be, or that applies Latour's concept of terrestrialism (and actor-network-theory, which I will draw on later) to soils and soil systems. This is the gap that this thesis is attempting to fill.

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1. Introduction

The world's soils are one of the most important parts of the natural environment to the maintenance of human life, and they are also one of the most threatened by the contemporary environmental crisis. In this thesis I will discuss Bruno Latour's arguments about escaping from the problematic worldview that he thinks led to the current environmental crisis, and investigate its applicability to soils in particular. Latour argues that as a result of globalisation and modernism, we have found ourselves in the problematic position of viewing 'nature' through a dualistic and mechanistic lens; which has resulted in the unfortunate political and environmental situation we are in today. Latour's solution is a shift in perspective; from viewing humans and 'nature' as separate and viewing 'nature' as passive and lacking agency, to seeing everything that creates and causes change on earth (human and nonhuman) as interconnected and capable of some degree of agency. This perspective is called "terrestrial" in Latour's terminology. To the best of my knowledge there is currently no scholarly work that either lays out in detail what a "terrestrial" approach to any given aspect of 'nature' might be, or that applies Latour's concept of terrestrialism (and actor-network-theory, which I will draw on later) to soils and soil systems. This is the gap that this thesis is attempting to fill. Because of the relatively unusual subject matter for a philosophy thesis – soil – which is rather under-studied in philosophy; this thesis will draw from many bodies of literature. This includes soil science, anthropology, ecology and philosophy.

In particular in the first part of the thesis I will lay out Latour's arguments for adopting a so-called terrestrial perspective, and give some context for the 'problematic' dualism and mechanism that Latour positions terrestrialism in opposition to. I then will lay out three arguments for why I believe soil to be a good case study for Latour's terrestrialism, drawing in this section particularly on the work of soil scientists, anthropologists and ecological scholars. I will then briefly lay out some of the most prevalent different meanings, definitions and conceptions of soil that are commonly used in soil science, agriculture and everyday parlance. Following this, I will explain my choice to develop a terrestrial account of soil that is based on certain elements of Latour's other work, specifically his actor-network-theory and, to a lesser extent, his rejection of not only nature-society dualism, but also the usefulness of 'nature' and 'society' as separate categories at all. I will then lay out the relevant aspects of Latour's actor-network-theory and his rejection of nature-society dualism, and I will thereby finally develop a Latourian terrestrial account of soil. I will then argue that this terrestrial account has the benefit of being able to take into account the many different meanings, definitions and conceptions of soil that are important to our complex understandings and interdependencies with soil. Finally I will consider some objections to the usefulness of actor-network-theory-based accounts to addressing concrete environmental problems from the eco-marxist scholar Andreas Malm. It is important to remember that Latour's terrestrialism is politically motivated and framed by him as an important step in solving today's climate and environmental crisis, so I will take these objections very seriously and use them to demonstrate both some further benefits and some serious limitations of a Latourian terrestrial perspective of soil. I will then conclude by arguing that although there are good reasons to believe that a terrestrial approach to soil would be helpful in informing and inspiring useful approaches to understanding, relating to and working with soils; Malm's objections do highlight some significant weaknesses in a Latourian terrestrial approach. I will

therefore conclude that the best approach to theorising about soils and soil-related problems is not a wholesale adoption of Latourian terrestrialism; but rather a methodological pluralism that allows for actor-network-theory-based approaches, but also allows for more traditional critique that is based on a different non-Latourian ontological framework, specifically with regard to categories of ‘nature’ and ‘society’ and the concept of agency.

2. Latour's Terrestrialism And The Value Of Soil As A Case Study

2.1 Latour's Terrestrialism

Bruno Latour (2018) argues in *Down to Earth: Politics in the New Climatic Regime* that the climate crisis has brought about a particularly dangerous political situation in which most people are drawn towards viewing the world through one of two problematic viewpoints; and he argues that we have to move towards a third "terrestrial" view of the world. He calls these problematic viewpoints "globalization minus", which entails cultural homogenization and disconnection from nonhuman nature; and "local minus", which entails attaching oneself to a particular area of land, tradition and identity (Latour, 2018, pp. 17-19). Latour thinks that both of these ways of thinking prevent us from "cherishing a maximum number of alternative ways of belonging to the world" (Latour, 2018, p. 19). He claims that the solution is for us to move away from these problematic viewpoints and to see ourselves as what he calls "terrestrials" (Latour, 2018, p. 74). Adopting a Latourian terrestrial perspective – which I will refer to as Latour's terrestrialism – means seeing humans as one of the many types of beings (terrestrials) living on the thin upper crust of the planet that hosts all life on Earth.

The Latourian terrestrial view is a rejection of a certain traditional (dualistic) view of nature and society, which involves a mechanistic view of nature, and a view of nature and society as separate. Latour argues that the mechanistic view of nature, which sees nature through the metaphor of the machine and therefore conceives of it as *inert matter that is moved only by*

external forces, is a key component of the problematic viewpoints that he sees terrestrialism as the solution for. The mechanistic view of nature, simply put, is a worldview that treats the natural world as a machine that is passive, inert, and devoid of liveliness and agency, and therefore subject to human control and exploitation. Latour characterises the mechanistic view as the belief that everything in nature must be viewed as if from far away in space; because we *can* see the Earth as a "falling body among other falling bodies in the infinite universe…it is *necessary* to occupy, virtually, *the vantage point of the universe* to understand what is happening on this planet" (Latour, 2018, p. 60). Latour thinks that this mechanistic view of the world causes us to "forget that seeing the earth from [afar] is only a tiny part – even if the infinite universe is involved – of what we have the right to know positively" (Latour, 2018, p. 62); and creates a problematic "ideology of "nature"" (Latour, 2018, p. 58) that ignores much of the action and the capacity for reaction that is actually present in nonhuman nature; and *obfuscates our similarities, connections and interdependencies and allyships with it*.

Although Latour's characterisation of this 'traditional' view is not comprehensive and at times seems to flatten modern western thought into a single way of viewing the world; there is certainly a history of dualistic thinking about nature and society, paired with a mechanistic view of nature as passive, in western philosophical thought, which is still prevalent today. In her 1980 book *The Death of Nature,* Carolyn Merchant maps the history of the mechanistic worldview, tracing its origins to the 16th and 17th centuries and the shift towards rationalism. She highlights the shift from a conceptualisation of nature as "an active teacher and parent [to] a mindless, submissive body" (p. 190), and with it the development of a nature-culture dualism that she claims has been a "key factor in Western civilisations's advance at the expense of nature" (p. 143); and that has been become deeply ingrained in mainstream

Western thought. For Merchant, the view of nature as passive and the ontological separation of culture from nature via a dualistic mode of thinking has provided justification for the exploitation and manipulation of nature, and has been an important tool to the development of commercial capitalism (p. 193).

Furthermore, Plumwood points out that the nature-human dualism that has developed in tandem with the mechanistic worldview is one of many "interrelated and mutually reinforcing dualisms which permeate western culture" (Plumwood, 1993, chapter 2, p. 2). She argues that, like all dualisms, this one is closely associated with structures of domination. Human dependency on nature is denied; and the human is construed as superior and is defined by the capacity for reason and *in opposition to* nature, which is defined as mechanistic "non-agentic, as passive, non-creative and inert" (Plumwood, 1993, chapter 4, p. 5). Plumwood goes on to demonstrate that there is "a close connection between giving such an account of nature as empty and viewing it in instrumentalist terms as available without constraint for annexation and normalisation to fit human needs, as a mere thing for human use" (Plumwood, 1993, chapter 4, p. 5); and (like Merchant) points out the connection between human-nature[1] dualisms and the mechanistic view of nature; and the development of capitalism and the acceleration of the extraction of natural 'resources'. It is important here to highlight that the nature-culture dualism that Latour's terrestrialism is responding to is not merely an abstract ontological issue. As Merchant and Plumwood both point out, this traditional view of nature as passive and separate has been key to the development of a perspective on the world and prevalent set of attitudes that has led to the very real and now very urgent issue of environmental damage and climate change. Latour's argument for terrestrialism is, at its core,

[1] Merchant focuses her discussion on the construal of the relationship between western culture and society, and nature; whereas Plumwood focuses more so on the construal of the human itself in relation to nature. Despite this difference in focus, they are both responding to the mechanistic view of nature that Latour references, and the dualisms between the human and the nonhuman 'natural' sphere.

an attempt to resolve political and practical problems associated with this history of nature-culture dualism as well as the problematic global and local perspectives that he believes to have developed alongside it.

For Latour, the terrestrial viewpoint is a way of conceptualising the world we live in. The "Terrestrial" is in his terminology both a concept and a political actor (Latour, 2018, p. 39); it is the world that we exist in, conceptualised as an agent itself that "participates fully in public life" (Latour, 2018, p. 39). For Latour, seeing ourselves as terrestrial beings means that we do not see ourselves as being 'in' nature and separate from it; nature and natural entities cease to be the framework for human action, instead they *participate* in that action (Latour, 2018, p. 40). Put simply, the terrestrial viewpoint sees (nonhuman) nature and the world we live in as active; it reacts to us and it has a form of agency. The Terrestrial is Latour's term for a specific conceptualisation of the world, and adopting this view means conceptualising of ourselves and all other beings who share this world with us as terrestrials; all of whom participate in action and have agency.

Although Latour is not particularly clear in *Down to Earth* about exactly how he thinks agency in nature is distributed, he writes that

> Humans have always modified their environment, of course, but the term designated only their surroundings, that which, precisely, encircled them. They remained the central figures, only modifying the decor of their dramas around the edges. Today, the decor, the wings, the background, the whole building have come on stage and are competing with the actors for the principal role. This changes all the scripts, suggests other endings. Humans are no longer the only actors, even though they still see themselves entrusted with a role that is much too important for them.
>
> (Latour, 2018, p. 41)

This is Latour's understanding of what the climate crisis has made incredibly clear; we can

no longer pretend that we are the only actors and that nature is passive. Instead, we must open our eyes to the active world that is the Terrestrial. We must realise that the nonhuman world is reacting to us and creating change. A wolf, an economy, an individual, an ecosystem, and even the Terrestrial world itself are all capable of *reacting* and causing change – they are all actors. Being terrestrial in the Latourian sense means more than simply seeing ourselves as a part of nature and natural systems, it also means breaking from the view that humans are the only actors, and instead adopting a view of agency as *distributed* among humans and nonhumans alike.

Furthermore, as I have already mentioned, the Latourian terrestrial view entails a departure from the traditional dualist idea of nature and society (or culture) as two separate categories. As Latour puts it, "the Terrestrial is literally drawing another world, as different from "nature" as from what used to be called the "human world" or "society." (Latour, 2018, p. 70). The Terrestrial is not the same thing as "nature" or as "society", it is a completely different way of seeing the world. There is no longer a social realm that is full of agency on one side and a purely natural realm in which it operates on the other, we are not just members of human society, "we are terrestrials amid terrestrials" (Latour, 2018, p. 70). The Latourian terrestrial viewpoint is a completely different way of conceptualising the world and our place in it, and it is a direct response to and rejection of the aforementioned historically prevalent mechanistic worldview.

2.2 Soil as a Case Study

In this thesis I will generate a Latourian terrestrial account of soil, drawing on Latour's hybridism and primarily his actor-network-theory. For Latour, the terrestrial viewpoint has both political and ontological consequences. Becoming terrestrial leads to a different politics

(Latour, 2018, p. 74), a different way of positioning (many of) the sciences (Latour, 2018, p. 64), and a different view of the world. I will focus on the ontological aspects of Latour's terrestrialism. I have already pointed out that the Latourian terrestrial view requires us to break from the historically prevalent idea of nature as passive and without any kind of agency, and to reject the traditionally prevalent idea of separation between 'nature' and 'society'. In the rest of this thesis I will lay the foundations for a terrestrial account of soil, by drawing primarily on Latour's actor-network-theory (his theory about the distribution of agency and action) in his 2005 book *Reassembling the Social: An Introduction to Actor-Network-Theory.* I will use soil as a case study to test the viability of a terrestrial approach. Latour does not give concrete examples of what a terrestrial approach would actually look like in practice, but he claims that by situating ourselves as terrestrial beings, we can finally construct institutions and practices that align with ecological realities rather than trying to escape them; and this is our best option to competently react to the climate crisis. A discussion of the *specific* institutional and political changes that a terrestrial view of soil would allow us to bring about lies outside the scope of this thesis, but may be an interesting avenue for further research.

In the following I will lay out three reasons I have chosen soil specifically as a case study for Latour's terrestrialism, and in doing so I will establish some important ideas about soils and soil systems – drawing primarily on the work of soil scientists and soil researchers – that I will make use of later in the thesis. Firstly, soil is one of the major points of interaction between humans and nonhumans. We build our infrastructure and we live our lives on top of soils and due to soils' central importance to farming, as well as the important ecosystem services they provide, we depend on them for survival. Soil is perhaps one of the clearest examples of humanity's entanglement with nonhuman nature, as "the large majority of

human interaction with [land-based] ecosystems consists of managing plants for food, wood, fiber, and increasingly fuel" (Lynch, 2021, p. 415). Essentially all of the plants we use come from soils; *managing plants means managing soils* – and the modern day destruction of the world's topsoils poses *enormous danger* to human beings (Lynch, 2021, p. 416). Soil scientists Hartemink and McBratney (2025) point out that soils play a critical role in planetary functioning by regulating essential ecological processes, including nutrient cycling, carbon sequestration and regulating water quality and quantity; and they also highlight the fact that the soil mantle is "fundamentally tied to human existence... Soils support agriculture, providing the foundation for food production, fiber, and fuel that sustain human populations… [and] they also underwrite numerous ecosystem services that are critical to human livelihoods" (p. 3).

It is no accident that Latour's book in which he argues for the terrestrial viewpoint is called *Down to Earth*, Latour is arguing for a shift in how we understand our interdependence and entanglement with nonhuman aspects of 'nature'. Clearly soil, a nonhuman thing in 'nature' that we depend on for survival, and that is essential to *the large majority of human interaction with land-based ecosystems* is an essential part of that shift in understanding. For Latour, in order to properly adopt a terrestrial view, we must be able to generate a terrestrially informed redescription of our "dwelling places" (Latour, 2018, p. 80). He defines dwelling places as "that on which a terrestrial *depends for its survival* [emphasis added]." (Latour, 2018, p. 80) and is consequently willing to defend. This may include the plants, the animals, the ecological, technical and social systems, the objects, even the bacteria, and the geographical area that the terrestrial depends on for survival. In order to replace the conceptual separation of the human and the nonhuman and the idea of nature as passive and lacking any kind of agency with Latourian terrestrialism, we have to reinterpret the dependencies and

cohabitations that exist between us and others (human and nonhuman alike) in our everyday lives. In order to become truly terrestrial in the Latourian sense, and in order to come up with a comprehensive terrestrial description of our dwelling places, I would argue that it is clear that we must first have a terrestrially informed description of soil and the soil-human relationship. A full discussion of Latour's notion of and politics of dwelling places is beyond the scope of the argument in this thesis; but it is interesting to note that Latour's ideas about dwelling places and the interdependence of terrestrial actors – and therefore the soil-related interdependencies that I discuss in this thesis – have significance for the philosophical analysis of the concept of territory. For example, Gonin et al. (2024) draw on Latour's terrestrialism to discuss the idea that territories must always be conceived and studied *in relation to* planetary biogeochemical processes and the activity of all sorts of terrestrial beings.

The second reason I am focusing on soil as a case study for Latour's terrestrialism is because movement, change and process are always present in soils. As I have already highlighted, Latour's terrestrialism entails a rejection of a passive mechanistic view of nature. Instead, Latour argues that nature is filled with various nonhuman actors and agencies, and he argues that the traditional mechanistic view has made us "see less and less of what is happening on Earth" (Latour, 2018, p. 62) *because it makes us disregard the action and agency inherent in ecological processes and in the activity of living beings.* In order to move towards a Latourian terrestrial perspective, we have to change the way we understand movement and change on Earth. As I discussed earlier, Latour claims that the mechanistic view of nature leads to all of the movement on Earth being reduced to "the falling of bodies", grasped as if from a far away star (Latour, 2018, p. 60), and he argues that this has made it more difficult to gain knowledge about many different kinds of movements – "a whole range of transformations:

genesis, birth, growth, life, death, decay, metamorphoses" (Latour, 2018, p. 60). Key to Latour's terrestrialism is the idea that the cause of action is distributed throughout participants (human and nonhuman alike) in the various movements, processes and changes that occur within the Terrestrial.

As anthropologist and soil researcher Germain Meulemans points out, reporting on his work with soil ecologists, the *continuous interaction* of organisms, chemical processes and physical processes are *essential* to soil (Meulemans, 2020, p. 11). Meulamans notes that in just one lump of soil

> …one could see minerals, organic matter, water, worms digging their way and digesting soil particles, organic matter degraded by microorganisms, plants pumping water, and their roots exploring every cavity of stones and pebbles. All of these are tangled in intra-active relatings, in which they are constantly transforming each other into something else.
>
> (Meulemans, 2020, p.12)

Action is everywhere in soil, because the soil is never not being formed and being altered. There is no such thing as a still soil, and as a result Meulemans actually argues that soils should be thought of primarily as complex processes. The activity of soil biota and the fact of constant bioturbation (the moving and reworking of soils and sediments by animals or plants) were recorded as early as in Darwin's time (Johnson and Schaetzl, 2015). Soil scientists Sposito and Reginato (1992) describe soil as a "*biologically active*, structured porous medium that has developed below the continental land surface on our planet" (p. 3). Soils and soil-related systems cannot be comprehensively analysed without taking into account the action that is inherent to soils. Furthermore, as I mentioned above, soils play a hugely important role in regulating essential ecological *processes*. Movement, change and process are essentially linked to soils and soil systems; soils are necessarily sites of change and

movement, and they are also ‘components’ of broader ecological systems. The primary ontological shift that Latour is arguing for is a shift away from seeing ‘nature’ as passive and *towards* a worldview in which many types of movement and transformation are understood to be caused by many different (human and nonhuman) agencies. I argue that soils make an excellent case study for Latour’s terrestrialism precisely because the complex interconnected web of movement and change that involves soils allows us to create an in-depth snapshot of what a terrestrial worldview looks like, without losing the notions of activity, distributed agency and interconnectedness that are essential to the Terrestrial. A terrestrial view of soil requires us to reinterpret all of the activity in soil systems, seeing them as non-passive and full of action, and therefore entails a radical departure from a mechanistic view of nonhuman nature.

The final reason that I have chosen to use soil as a case study for Latour’s terrestrialism is because, I argue, there is good reason to believe that the way soil has traditionally been thought of and studied is rooted in and informed by mechanism. Therefore, moving toward a terrestrial account of soil might have the potential to significantly impact how we understand soil and even how we approach soil science. This possibility is especially significant because how we interact with soil and soil systems are of huge significance in our response to the climate crisis (Granjou and Salazar, 2019). Although a certain amount of complexity in soil processes has been known and acknowledged for a long time, the historically prevalent attitude towards soils has been to think of them either as “a production factor or medium for crop production that needed to be understood before it could be improved or… [simply] as disintegrated rocks mixed with organic matter” (Hartemink and McBratney, 2025, p. 2). As transdisciplinary Professor of Human-Environment relations Anna Krzywoszynska points out, the ‘needs’ of soil have been marginalised and often forgotten about, as soils have been

thought of more and more in chemical terms. The idea that soil fertility can be controlled by humans by putting certain chemicals (primarily nitrogen, phosphorus, and potassium) into soils, which in turn goes into the plants, gained traction due in large part to Justus von Liebig's work on soil fertility in the mid 19th century and the dramatic increase of chemical fertilisers after World War II (Krzywoszynska, 2019, p. 7). Krzywoszynska highlights the fact that the history of treating soil as a resource that can be used, and *ought to be be controlled and harnessed* – rather than as complex networks of organic and inorganic materials, biota, ecosystems and processes *on which we depend* – and the use of artificial fertilisers which now dominates agriculture, has led to a commonplace view of soil as a primarily physical material which we can put a certain chemical input into and get a certain output (Krzywoszynska, 2019, 2024). Krzywoszynska explains, drawing on Star (1999) and Puig de la Bellacasa (2014), that the activity of soil biota and the complex processes, changes and movements in soils have therefore historically been made invisible in much of mainstream thought as soils "assumed the status of infrastructure, the "invisible ... background for other kinds of work" (Krzywoszynska, 2019, p. 7).

It is no surprise that this view of soil is very much in line with the previously discussed mechanistic view of nature that Latour's terrestrialism is responding to. Human interaction with soil is one of the most prominent and important examples of human dependence on nonhuman nature, and as Merchant explains in detail, how we view nature shapes our economic, agricultural and social practices, which in turn shape how we view nature (Merchant, 1980). The prevailing attitude towards nature in the mechanistic worldview is the idea that it is to be controlled and fixed when it breaks down. Natural systems are to be treated as machines, matter is inert and "change [is] simply the rearrangement of particles as motion [is] transmitted from one part to another in a causal nexus" (Merchant, 1980, p. 103).

Humans can therefore understand and take control of natural processes because the motion and change in nature is seen as the workings of a complex machine that we can study, harness, improve and control. I argue that this is exactly the paradigm in which the aforementioned traditional understandings of soil and soil-management have operated. Soil has historically been thought of as a type of matter that is useful, that contains biota that add to or even guarantee its usefulness, that we can use for farming, as a carbon sink (Granjou and Salazar, 2019) and as an environmental regulator; in summary, it has been viewed primarily as a complex but passive resource for us to control. Today there is an emerging body of literature that questions the aforementioned traditional conceptions about soil (Bellacasa (2019), Krzywoszynska (2019), Meulemans (2020), to name a few) but to the best of my knowledge there is as of yet no scholarly work examining what a Latourian terrestrial conception of soils and soil systems might be, or even an exploration of what a concrete Terrestrial approach to some aspect of 'nature' might be.

One of the most important political aspects of Latour's terrestrialism is a call to reshape and rethink scientific investigation of the 'Critical Zone' (the relatively thin layer of the Earth's surface on which all life depends). He argues that scientific progress that is informed by the mechanistic view of nature, which he takes to be the prevalent worldview today, is very different from scientific progress that is informed by a terrestrial perspective. As he puts it "in both cases, it is a matter of positive bodies of knowledge, and yet these do not involve the same scientific adventures, the same laboratories, the same instruments, the same investigations" (Latour, 2018, p. 70). Assuming that Latour is right that a terrestrially informed science is better equipped to deal with the issues of today's environmental crisis; and if I am right that interrogating our view of soil is essential to adopting a terrestrial worldview because it is such an essential site of interaction between human and nonhuman

'nature'; if I am right that soil is a good example of something that would be viewed very differently from a terrestrial as opposed to a mechanistic perspective because it is inherently tied to and full of movement, change and complex processes; and if I am right that the way soil has traditionally been thought of *is* mechanistic – then we have good reason to investigate what a terrestrial account of soil might look like.

2.2 The importance of varied definitions and conceptualisations of soil.

In this brief section I will give a quick overview of some remaining important things to know about soils and soil systems that I have not yet laid out. Soil has a number of 'roles' and significances in human culture, economic systems (primarily by way of agriculture); it is thought of and in fact defined in many different ways in different contexts. Because Latourian terrestrialism entails a shift in how we see not only nature and the nonhuman elements it contains, but also our interdependence with it; it is important that a terrestrial account of soil is able to account for the complex and varied ways that soil and soil-related movement, change, genesis and interdependence manifests in the world. For Latour it is exactly the movement, action and genesis in nature – the ecological changes in states of affairs that are not wholly or directly caused by humans – that need to be understood differently in order for us to become terrestrials (Latour, 2018, pp. 57-68), so it is important to begin an investigation of a terrestrial account of soil with an understanding of soil that is neither unscientific nor an impoverished mechanistic account of the kind I discussed above. As Latour argues

> To be knowledgeable in scientific terms, it does not help to be beamed up to Sirius. It is not necessary, either, to shun rationality in order to add feelings to cold knowledge. It is essential to acquire as much cold-blooded knowledge as possible about the heated activity of an Earth finally grasped from up close.
>
> (Latour, 2018, p. 65)

Therefore, in order to avoid an impoverished or unscientific account of soil in this thesis, I will not select a single definition of what soil *is,* I will merely highlight some of the most common and significant definitions, drawing from soil science, dictionaries and gardening books. I will then lay out a few established interdependences between humans and soil and soil systems that are important to keep in mind. I will also assume that it is a strength of any account of soil if it can incorporate insights from all the various definitions, significances and 'roles' that soils seem to have, and later I will argue that a Latourian terrestrial account can do just that.

Some of the commonplace definitions of soil that are used in soil science and in everyday use are as follows. Cambridge dictionary defines soil as "the upper layer of the earth, in which plants grow" (Cambridge University Press). Gardening books describe the soil as, for example, combinations of "broken down rock particles…organic matter… water and air…(which provides a home for) millions of organisms" (Hamilton, 1993, 12). Soil scientists Sposito and Reginato describe soil as a "life sustaining" and "biologically active, structured porous medium that has developed below the continental land surface on our planet" (Sposito and Reginato, 1992, p. 3). They highlight the fact that soils are "dynamic open habitats that provide plants with physical support, water, nutrients, and even air (and)... sustain an enormous population of microorganisms", which also serve "as the material on which to place structures and highways" (p. 5). Different definitions of soil highlight different aspects of it, depending on the purpose of the definition; as Catherine Kendig (2024) points out, "whatever soil is thought to be is informed by historical, cultural, and technological

interactions which reciprocally shape both soil and humans over generations" (p. 81). There is no single broadly accepted set of necessary and sufficient conditions for what soil is. Soil researcher and anthropologist Gemaine Meluemans argues that soils can be *made* in a lab (Meulemans, 2020) (which seems to contradict Sposito and Reginato's definition) and some soil experts argue that soil itself is alive (Bellacasa, 2019), while others, like Hamilton, claim that it is the material in which life resides, but it is not itself alive. In soil science literature there is "some ambiguity as to whether soils are the 'background' for worms or their 'product'" (Meulemans, 2020, p. 104). There is also an argument that soils can be viewed as 'Gaia'-like systems; that they can be viewed as natural bodies that develop as a result of a coupled feedback system of soil biota and the soil environment (Breemen, 1992). Soils are also understood differently in different cultures, they have different significances and they are evaluated differently (Kendig, 2024). Many soil scientists use the metaphor of soil as the 'skin' of the planet (Kutílek and Nielsen, 2015) because it makes up the top layer of the Earth and it provides 'services' that are essential for most life on Earth today. The Earth's soils are therefore also sometimes conceptualised as a regulatory system of sorts, or as collectively playing a particular role.

Soils are also deeply intertwined with human behaviour. I already discussed the important ecosystem functions that soils have, that humans (and many nonhumans) depend on, but it is also important to note that soils are remarkably impacted by human behaviour. Today, human behaviour affects every aspect of soil formation. In pedology (the study of soil formation), there are five main 'natural' factors of soil formation (climate, organisms, relief, parent material and time) that are taken into account, and human beings have been shown to affect all five of them (Richter, 2020, p. 7). Soils also profoundly affect how we live our lives; soil affects our health and what nutrients we get (Pepper, 2013), what types of infrastructure we

create, and how our economies are organised (because of our dependence on soils for farming and because we build on them). Differing soil quality leads to different agricultural as well as architectural possibilities (Montgomery et al., 2016). We eat, we breathe, we farm and we build; and these things are all directly or indirectly linked to soil processes and they affect how we interpret, control and affect ourselves and each other. Soil can also inspire us and become an object of care and love. Puig de la Bellacasa has shown that the human-soil relationship can become a caring and affectionate relationship, one that is enabled through new ways of thinking about soil and new technoscientific imaginaries of soil (2019). She demonstrates that soil itself can inspire us, move us, and give us new ways of looking at the environment.

3. A Latourian Terrestrial Account of Soil

Now that I have established the basic idea of Latour's terrestrialism and argued for why soil is such an important aspect of adopting this worldview, and pointed out some of the most important features of how we understand, define and are interdependent with soil; I will turn to the question of exactly how to conceptualise soils if we adopt a Latourian terrestrial perspective. Latour does not lay out the details of what a terrestrial perspective actually looks like in *Down to Earth,* he just sets it up as an alternative to a mechanistic and "modern" worldview (Latour, 2018). However, in his 2005 book *Reassembling the Social: An Introduction to Actor-Network-Theory* in which he discusses his actor-network theory he explains what his conception of action, change and the non-passivity of nonhumans is; and in his 1993 book *We Have Never Been Modern* he lays out the details of his rejection of a nature-society dualism. In this section I will explain the relevant details of Latour's actor-network theory, based on which I will develop a terrestrial account of soil-related action, and I will therefore develop a terrestrial account of soils and soil systems. I will then briefly explain Latour's way of rejecting nature-society dualism, and I will lay out how this applies to the terrestrial account of soil that I have developed. I will then argue that this terrestrial account of soils has the benefit of being able to incorporate insights from the various conceptions of soils I discussed in the previous section. It is important to note that it is possible that there are other theoretical approaches that are compatible with Latour's terrestrialism but not with his actor-network-theory and not with his rather radical way of rejecting the idea of a nature-society dualism. However, in this thesis I am focusing on

developing and testing the viability of a Latourian terrestrial account that is compatible with these aspects of his other work[2], and so due to a lack of space in this thesis, I will not consider other possible versions of terrestrialism.

3.1 Latour's Actor-Network-theory

To provide some context for Latour's actor-network-theory, it is useful to note that Latour did not develop his actor-network-theory in a vacuum; it has significance in (and draws from) a number of different fields, including philosophy, anthropology and sociology.

Actor-network-theory (henceforth ANT) is generally associated with the broader trend of new materialism (and the work of scholars like Jane Bennett, Donna Haraway, and Isabelle Stengers), which is a complex variety of theoretical perspectives that are generally characterised by a rejection of dualisms that have historically been prominent in Western thought, including nature-society, human-nonhuman and subject-object dualisms. ANT also has significance in sociological debates, as Latour explicitly positions it as a rejection of the methods of what he calls classical sociology because he rejects the notions "at the heart of basically all of modern social science" (Schinkel, 2007, p. 708). ANT brings together ontological claims about how, and by *what*, action is caused, with methodological claims about how sociological and anthropological investigations should be conducted. However, the focus of this thesis will only be Latour's ontological claims about the nature and cause of action. Particularly relevant to this thesis is the debate between eco-marxists thinkers such as Andreas Malm and Alf Hornborg, who argue that we need to maintain an analytic divide between the concepts of nature and society (which they take to be quite clear and distinct) –

[2] I am not claiming that the account of soil I am developing is compatible with *all* of Latour's vast and complex body of work, rather I am attempting to develop the strongest terrestrial account of soil that is derived from his ontological claims about the Terrestrial, and his other work that I argue support these claims specifically.

and the proponents of new materialism and ANT who want to stop using the concepts of ‘nature’ and ‘society’ as distinguishing categories altogether; which I will discuss in the final section of this thesis.

Latour’s ANT is basically a rejection of the idea that the world is made up of clearly delineated agents that act, and objects that do not; it argues that there is not one agent that causes any given action, but rather an interconnected series of ‘actants’. An actant is Latour’s term for any entity that is “something that acts or to which activity is granted by others. It implies no special motivation of human… [actors]. An actant can literally be anything provided it is granted to be the source of an action.” (Latour, 1996, p. 373). An actant can be human, nonhuman, an object, an imagined entity, a collection; any entity at all that is granted to be the source of action. For Latour, there is “hardly any doubt that kettles ‘boil’ water, knifes ‘cut’ meat, baskets ‘hold’ provisions… schedules ‘list’ class sessions, prize tags ‘help’ people calculating, and so on.” (Latour, 2005, p. 71). Any entity at all that makes some difference to some states of affairs can be granted to be the source of action; for Latour since the presence of my chair makes a great difference to whether I am sitting at my desk or not, my chair can and should be described as an actant. However, my body, the deadline I am working towards, the landlady who chose to rent this apartment to me, the contract I signed, the laptop I am writing on and everything that goes into the internet connection I am using all also make some difference to the state of affairs of me sitting at my desk at this moment. Therefore, these are all also actants with regard to this particular action. Since seemingly everything that exists makes some difference in some way to some state of affairs, as Zielke concisely puts it, “actant is Latour’s metaphysical term for any entity” (Zielke, 2023, p. 630) and “an actant is only insofar as it modifies other entities …If it does not do something to others or make a difference to them …then it is not an actant and so not an entity in Latour’s

thought" (Zielke, 2023, pp. 630-635). In ANT there is no single source of action, no *individual* agent or actor that directly causes anything else. Instead there are complex networks of actants, each affecting states of affairs, as well as each other, in their own way.

In Latour's ANT, when we *give an account* of some action, although we

> …never know for sure who and what is making us act, we can define a list of features which are always present in competing arguments about what has happened: agencies are part of an account; they are given a figure of some sort; they are opposed to other competing agencies; and, finally, they are accompanied by some explicit theory of action.
>
> (Latour, 2005, p. 52)

Put simply, for Latour, when we give an account of action we delineate some sort of actor and we assign agency to that actor. To take a very simple example, if one footballer claims their goal went in because God heard their prayer, and another says it was all on her own merit; the players are giving competing accounts of the same action. They endow different entities (God, humans) with agency and in doing so they exclude other entities from designation as agential, and they implicitly generate a theory of what kinds of entities cause action. Therefore, "accounts of agency will constantly add new entities while withdrawing others as illegitimate" (Latour, 2005, p. 56). It is important here to note that an ANT account still maintains that no matter the account, the cause of the action is actually distributed among all the actants that affected it – every entity, physical or non-physical.

Delineating an actor is what Latour refers to as an act of "figuration" (Latour, 2005, p. 53). Latour uses the word actor purposefully, attempting to evoke the idea of an actor on a stage who may initially seem like an individual agent, but whose performance cannot be credited only to him, but also to the playwright, the director, the technicians and so forth. Taking an

example from Inglis and Almila, since the scholarly character of Latour himself is “an entity made up of many parts; as an assemblage of human and non-human elements, a thing made up of flesh-and-blood and of literary texts, among other things” (Inglis and Almila, 2023, p 1148), actions taken by the ‘actor’ Latour are really actions that are caused by an interconnected series of actants; and of course, the entity that is Latour would also be an actant.

Furthermore, Latour argues that actants should be seen as what he refers to as mediators; “mediators transform, translate, distort, and modify the meaning or the elements they are supposed to carry” (Latour, 2005, p. 39). Each actant affects the others in its own way; when I turn on the TV there is a complex interconnected series of actants participating in the action, but they are not all fully enrolled by me into accomplishing my goal. I turn on the TV but for Latour “when a force manipulates another, it does not mean that it is a cause generating effects; it can also be an occasion for other things to start acting” (Latour, 2005, p. 59). For Latour, the TV remote and the cable network affect me just as I affect them; I may be pressing a button with a certain goal but in my interaction with other actants my goal may be distorted or changed – the remote might ‘start acting’ and its specific properties may affect what I was going to do. I am not fully controlling the other actants and they are not fully controlling me. For Latour, a good ANT account does not come from choosing one figuration over another, but from increasing the number of mediators in that account (Latour, 2005, p. 61). A good ANT account takes the mediation of a vast array of actants (human and nonhuman) into consideration. Harris gives a very useful summary of the idea of mediation in ANT, in her account of how the use of any sort of technology entails the ‘recruitment’ of complex chains of mediators;

> The production of more developed techniques involves the recruitment not only of technical means …but also of a range of individuals with differing competencies and aims, all of whom must be allied if the technology in question is to be successfully realised. The original goal will be displaced or 'detoured' as a result of the elements necessary for its realization and the technological act in question is itself altered. It is no longer an individual or group with a single goal that acts but rather a composite entity, made up of the aims and properties of all the enlisted actants and the strategies and negations involved in making them behave as one.
>
> (Harris, 2005. p. 166)

Therefore, in actor-network-theory, the world is not made up of a few individual agencies that cause long and complex chains of direct consequences, instead it is "made of concatenations of mediators where each point can be said to fully act" (Latour, 2005, p. 59). The world is populated by actants, human and nonhuman alike, who affect, influence and recruit one another in various different ways.

3.2 Establishing a Terrestrial view of soil

As I already argued, developing a Latourian terrestrial account of soil requires rejecting the mechanistic view of passive nature. If we replace the previously discussed widespread views of soil – that seem to be (at least somewhat) continuous with mechanism – by adopting an ANT-derived account of soil; then soil goes from being seen as a resource that individual or human actors or agents can control, to being seen to some degree as a source and site of a wide range of action. As I discussed earlier, soil is a site of a profound amount of movement, change, genesis and transformation; all of which Latour would call action (Latour, 2005). This action includes the movement of biota, chemical and physical processes that take place *within* the soil, as well as local and global ecological processes. Furthermore, soil-action affects human health and nutrition, and economical, agricultural, infrastructural and cultural boundaries systems and processes; because, as I already pointed out, the fertility, level of

contamination and structure of soil affect what can grow in a given area, what can be built on it and how ecosystems and food chains in any given area function. Fertility and soil structure are in turn dependent on the movement and processes that take place within the soil.

On an ANT account, any given area of soil, every soil organism, the rain, water and minerals in the soil, humus, and even every pebble, should be thought of as actant. Furthermore, humans, machinery, social groups and even theories and books about soil management, agriculture, ecology and land; are all actants with regard to action that takes place in or includes soil and soil-related systems. These entities all make some difference to some states of affairs, and some action would be different if not for their movement or properties. Importantly, these entities all also affect each other. To take one example; worms create aggregates (which are clumps of soil particles) by their eating, digesting and displacing soil; human beings affect local and global food chains, weather and landscapes, and therefore affect worm populations; and pebbles and air pockets affect where worms can go. In turn, worms affect farming outcomes and other soil biota, pebbles are moved by worms but also by grazing herds of animals and machinery that compact the soil, ideas about soil-management are affected by the observation of soil processes and biota, and so on. Therefore, these are all Latourian actants that each affect each other in complex networks. Every action is the result of these complex interactions, no one entity has the agency on its own that causes some specific result.

Furthermore, when we interact in some way with the soil, for example if a farmer decides to plough a field she must (as Harris reminds us) recruit a whole range of actants in order to achieve her goal. But these actants are all mediators themselves, they therefore affect the other actants, including the farmer. The original goal of the farmer may be affected or

detoured by the other actants, the rust on the plough or the rain or the rocky nature of the soil may affect her approach to ploughing. Similarly, the worm is affected by the pebble, the water in the soil is affected by the permeability of the soil, and so on. As Inglis and Almila. remind us, for Latour, each actant is the way it is because of its relations to the other actants, every actant is co-constructed by itself and the mediators that create, define, transform, translate and modify it (Inglis and Almila, 2023) . When a crop grows or when soil aggregates form or when we utilise soil to store carbon, a good ANT account sees the mediation of as many actants as possible. It tracks the ways in which objects, organisms, systems, processes and ideas all affect one another, altering the course of action and the possibilities that can be realised. An ANT-based terrestrial approach to soil is therefore one that encourages the mediation of as many actants as possible to be taken into account. This terrestrial approach sees soil as a site and source of action, as always the coproduction of human and nonhuman actants, each of which affects the other and modifies, transforms, translates or distorts goals and actions that we may see ourselves as individually realising.

3.3 A quick note on Latour's hybridism[3].

In laying out the basic ontological ideas behind Latour's terrestrialism, I pointed out that it also entails a break from nature-society dualism. In light of his treating human and object causation and agency as ontologically the same, it should come as no surprise that Latour rejects any kind of nature-culture dualism. Latour lays out his claims about the relationship between 'nature' and 'society'[4] most clearly in his 1993 book *We Have Never Been Modern*.

[3] The term 'hybridism' is originally Andreas Malm's (2018) term for Latour's theory about hybrids, I am using it here for its conciseness

[4] Latour often uses the words culture and society or 'the social' interchangeably, references to secondary literature might therefore contain either term.

Latour argues that modernism, which he tracks as roughly beginning with the enlightenment (Harris, 2005, p. 172), has been characterised by two contradictory occurrences. Firstly, moderns attempt to "purify" entities, dividing them and their properties into two separate categories; 'nature' and 'society' (Latour, 1993, p. 35). Latour argues that the moderns see that which is natural as being independent of human concepts; it has an objective inherent nature that always remains the same, no matter how or in what context it is viewed. In direct opposition to this, the social is taken by the moderns to be entirely dependent on human interpretation or construction. However, in contradiction with the practice of purification, and with the development of more and more advanced technology; modernism has caused an explosion and proliferation of what Latour calls hybrids (Latour, 1993, pp. 49-51). The proliferation of hybrids is the second occurrence that characterises modernism for Latour. These are entities that cannot be categorised as belonging to either the natural or social category. It is easy to see that my smartphone, for example, is what Latour would call a hybrid. It cannot be understood only by its social properties, or its inherent natural properties. It is a device I am addicted to, the thing that keeps me connected with my family abroad, and the thing that answers many of my questions – if society was different but my phone was physically the exact same, this description might no longer apply. However, even my addiction to my phone is the result of chemical processes in my brain, the lights and sounds that come from it, and of course the physical presence of it beside my bed and in my pocket.

What's more, hybrids, as Zielke aptly explains "are not to be explained by the mixture of two pre-given, purified realms – nature and culture... Rather, there have only ever been hybrids or things co-produced by both human and nonhuman actants" (Zielke, 2022, p. 634). For Latour, although hybrids have become more obvious in today's world, throughout human history there have never been things that we interact with that are purely natural or purely social.

This is because, for Latour, everything exists in networks in which each actant affects other actants and thereby *acts as a mediato*r. Every act of mediation translates, transforms, distorts or modifies; every entity the moderns attempt to categorise as being purely social or purely natural is coproduced by human and nonhuman actants, where each point in the network modifies some other point. In Latour's ontology, no entity can be attributed only to human construction, and there is no way for humans to describe, study, investigate or interact with an object without being mediators; changing or constructing the object in some way, enrolling it in certain goals and activities and thereby altering it (Latour, 1993, pp. 15-29).

Since every entity is coproduced by human and nonhuman actants, every actant is a hybrid. For Latour, we have always been completely surrounded by natural-social hybrids, and so "Nature and Society have no more existence than West and East." (Latour, 1993, p. 85); and the proliferation of hybrids has finally made it impossible to ignore this fact. According to Latour's hybridism, nothing is just social, nothing is just natural, and therefore nothing can be a combination of such pure elements.

A terrestrial account of soil that is continuous with Latour's idea about 'nature' and 'society' therefore sees soil and soil-related actants (including humans) as hybrid entities constructed by the coproduction of human and nonhuman actants who each affect one another in turn. Soils, soil processes and soil-related ecological systems are not part of 'nature' (and therefore in a separate category to human systems, institutions and meanings). Furthermore, on this account, throughout the history of human civilization, soils have never been 'natural'. Even before human behaviour had the profound effect on the Earth's ecological systems that it has been shown to have today; as long as humans have interacted with soil – this terrestrial view of soil entails that human, soils, soil biota and everything else involved in the interaction have

changed or constructed each other, enrolled each other into certain goals and activities and thereby altered and affected each other through their properties, thoughts, movements or actions.

3.4 The Terrestrial account I have laid out can incorporate insights from multiple conceptions of soil

Earlier I laid out a number of different definitions, significances and 'roles' that soils are often taken to have, and I assumed that it is a benefit of an account of soil if it can capture insights gained from all of these varied and occasionally somewhat contradictory ways of understanding soils and soil systems. I argue that an ANT-based terrestrial perspective on soil can do exactly that by accounting for all of the effects of all of the soil-related entities that these various conceptions highlight.

I argue that, from an ANT and hybridist perspective, when soils are defined, conceptualised and talked about, there is usually some figuration of action going on. In the previous section I laid out a number of different definitions and conceptions of soil, and since movement, growth and change in the form of the growing of plants, ecological services, bioturbation, decomposition, and so forth – what Latour would call action – are so inherently linked to soils; soil definitions seem to generally provide some sort of account of (soil-related) action. Even the conceptions of soil that I argued come from the mechanistic view of the world highlight the fact that plants grow in soil, and that the movement within the soil is an

important aspect of it. No conception of soil that I have come across sees it as still. These definitions and conceptions of soil figure the actors that cause, control and affect soil-related action, and agency is endowed on these figured actors. A mechanistic chemical and resource-based view of soil that sees humans as controlling soil fertility by controlling what nutrients and minerals are taken in and put back into the soil excludes the possibility of assigning agency to soil biota (and their movement is seen as similar to the turning of cogs in a complex and perhaps unpredictable machine), a view of worms as coworkers (which certain organic farmers have been found to have (Krzywoszynska, 2019, p. 9)) excludes the possibility of assigning full and complete agency in soil-action to human soil cultivators. In contrast, Bellacasa's (2019) alive and spirited soils seem to entail a figuration of soils themselves as actors.

Unlike a mechanistic view of soil like the kind I discussed in the previous section (which is the primary target of Latour's terrestrialism), an ANT-based terrestrial account does not commit to any single definition of soil. Instead, it sees soils, soil-systems, soil biota, humans, farms, machinery, theories and so forth as actants. This terrestrial perspective has no problem taking into account the affective effects of 'soil spirits' on us, or the chemical effects of artificial fertiliser, or the co-operation between farmers and worms in managing the soil in a field. Anyone with a terrestrial perspective of this kind is open to tracking all of these effects, and many more. Instead of committing to any idea of who or what sort of entities can be a cause of action, as Zielke points out, Latour's "metaphysics of action [resists] strong explanatory frameworks about what action consists of (e.g., physical force, will, intentionality, supernatural creation, etc.)" (Zielke, 2020, p. 634). This is because ANT commits to not deciding which figurations are or are not correct, but rather increasing the number of mediators that are taken into account for any given action (Latour, 2005, p. 61).

This is why, for Latour "if there is one thing not to set up at the onset, it is the choice of a privileged locus where action is said to be more abundant" (Latour, 2005, pp. 61-62). For this reason, an ANT-based terrestrialism is capable of meaningfully engaging with the effects of all soil-related entities. As opposed to an impoverished mechanistic view of soil that cannot account for the full effects of, for example, Bellacasa's living soils, ANT-based terrestrialism can meaningfully speak about the effects of soil, chemicals, humans, biota – every actant. ANT-based terrestrialism can learn from each conception of soil, as they highlight important aspects of the actants they draw attention to.

4. Objections

This brings us to the issues raised by Andreas Malm in his critique of Latour and new materialist ontology in *The Progress of this Storm.* Latour's hybridism and ANT are major targets of Malm's criticisms, as he argues they are antithetical to addressing the problem of climate change and environmental destruction. For Malm a philosophical stance that treats human and object agency as ontologically the same obfuscates the true *cause* of climate change, which is conscious and agential *human action.* In this section I will lay out the aspects of Malm's lengthy criticism of new materialism that I take to be relevant to the terrestrial account of soil I have developed in this thesis. I will then argue that although Malm demonstrates some significant shortcomings of ANT and hybridist approaches, this does not render the terrestrial account of soil that I have developed useless. I will outline what I believe the terrestrial approach to soil has the potential to be very useful for, in addressing soil-related environmental problems, as well as its major shortcomings. Drawing on Skiveren's (2023) argument about the value of methodological pluralism and new materialist ontology, I will argue that there is good reason to adopt a pluralist approach to addressing soil-related problems of climate change and environmental destruction. I will therefore conclude that there is good reason to believe that a terrestrial account of soil of the kind that I have developed in this thesis, that is compatible with Latour's ontological stance on agency and action, provides a potentially very useful description of soil; but does have significant limitations.

4.1 Malm's issues with Latour's Hybridism and Actor-Network-Theory

The first main issue that Malm takes with Latour and new materialist philosophers is that their complete rejection of any kind of separation between 'nature' and 'society' hinders our ability to identify what is and is not in our control, and thereby hinders our ability to competently address concrete climate related issues. It is important here to remember that Latour's terrestrialism is politically motivated, he sets it up as a *solution*, a way of addressing climate change and environmental destruction. Therefore, if Malm's criticisms are correct, they represent grave issues for Latourian terrestrialism. Malm argues that one can conceive of nature and society as being "of the same substance" but still with "some highly distinctive properties" (Malm, 2018, p. 41). He therefore argues for what he refers to as "substance monist property dualism" about nature[5] and society (Malm, 2018, p. 41). For Malm, nature and society are both material substances, but they can easily be distinguished from one another by their unique properties. Society, for Malm, has grown out of nature and is dependent on it and the "entwinement of social and natural relations [that Latour highlights in his argument for hybridism] is made not only possible but inevitable, given that the two are continuous parts of the material world 'rather than utterly distinct orders of being'" (Malm, 2018, p. 45). Malm argues that there is an easy test by which we can determine what is natural and what is social. Something is social for Malm if it has been "constructed by humans… [and has] arisen through relations between humans as they have changed over time… and it can also, in principle, be dismantled by their actions" (Malm, 2018, p. 45). In direct opposition to this, something is seen as natural if it is "not a humanly created product

[5] I am dropping the inverted commas around the words nature and society in my discussion of Malm's arguments, because Malm provides quite a clear definition for these terms.

but rather a set of forces and causal powers independent of [human] agency, and hence it cannot be so disassembled" (Malm, 2018, p. 45).

Malm argues that it is essential to keep an analytic distinction between social and natural properties, because we need to be able to distinguish what people create (and therefore can dismantle), and what is fully outside of their control. For example, carbon dioxide and its effect on global warming has clearly distinguishable social and natural properties for Malm. The chemical composition of carbon dioxide is a natural property (no matter how hard we try we cannot make it be composed any differently), and the mass burning of fossil fuels is social because we could simply stop. This distinction is essential for Malm because there is no point in us attempting to make carbon dioxide have different natural properties; we cannot stop it from being a greenhouse gas, but we can try to change its social properties by reducing the amount of it that gets released into the atmosphere by our actions. For Malm it is incredibly worrisome that Latourian hybridism and ANT denies that UN climate negotiations are created (entirely) by humans and are in their control, and denies a qualitative difference between it and something like the process of photosynthesis (Malm, 2018, p. 54). Malm argues that we should not do away with the analytic tools we use to separate what in the world is caused by human action and can be influenced by us, and what is independent of us, otherwise we would fall into a sort of "hybridist paralysis" (Malm, 2018, p. 46). in which it would be impossible to actually fix problems and impossible to hold the right groups to account. It is pointless to try to prevent trees from photosynthesising in normal conditions; it is not pointless to try and affect the outcome of climate negotiations, or to blame Trump for pulling out of the Paris agreement. It is pointless to try to make my body not react to the flu, but it is not pointless for me to choose to get vaccinated, or to campaign against anti-vax rhetoric. For Malm, if we cannot differentiate between the social and the natural, we cannot

clearly pin down which people and groups are responsible for climate-related problems. This is essential for Malm because he conceptualises climate change as an undoubtedly bad thing that is currently happening, that human beings have caused, are responsible for and could fix.

Furthermore, Malm argues that it is essential to remember that the climate crisis is caused by a specific type of *society*; the fossil fuel economy ((Malm, 2018, p. 55). He argues that it is essential not to ignore the fact that climate change is being *caused* by humans, and that not every societal structure *would cause* this level of environmental damage. For Malm, the fossil fuel economy is to blame and therefore needs to be stopped, and *it is of great political importance that we do not ignore this fact*. It is not hard to see that this line of thinking contradicts Latour's hybridism and ANT, as it is based on the idea that there are easily identifiable and singularly human causes that have created the warming condition of the world. Alf Hornborg (2021) makes a similar argument against new materialist rejections of the nature-society divide, arguing that "the abandonment of this distinction… has significant ideological implications in terms of relinquishing human accountability" because it *obfuscates the roles humans play in climate change* (Hornborg, 2021, p. 755).

Relatedly, Malm argues that Latour's ANT also deprives us of a second important analytical tool in its rejection of individual human agency. Malm argues that we need the concept of an agent as a "special sort of difference maker" (Malm, 2018, p. 69) that has the capacity to make intentional interventions, as opposed to a non-agential entity with a causal profile. Otherwise, he argues that we are left with a concept of agency that can not really be differentiated from the property of just existing, because it is hard to see how any entity could exist but not have some sort of causal profile. Malm therefore takes Latour's definition of agency to be "utterly minimal" (Malm, 2018, p. 65) and essentially useless because it shuts

down attention to what Malm thinks is a very important human property – the capacity for intentional interventions which cause both intended and unintended consequences. Malm thinks we need this concept of agency in order to address environmental issues because we have to be able to differentiate between what is caused by human decision making and what is caused by other forces. Malm points out that climate activism uses "the landscape of intentionality to set its compass" (Malm, 2018, p. 77); it identifies the enemy that it sees as the responsible intentional human agency that causes a particular problem, and it attempts to dissuade, disempower or dethrone that enemy. As Malm tells it, climate activists do not target carbon dioxide, they do not target oil or coal; they target the people and groups responsible for emitting, extracting and burning these passive objects – and it would be nonsensical for them to do otherwise.

4.1.1 Malm's Concept of Causality

I argue that Malm's criticisms of Latour hinge primarily on his insistence that we need a concept of causation that is linked to what is within human control. Malm and Latour are using different notions of causation, and each seems to believe that their use of the term highlights something important about 'nature'. For Latour, the acknowledgement of the distribution of the cause of action among interconnected networks of actants can finally release us from the idea of human control over nature, and it will allow us to acknowledge, discover and ally with various different nonhuman agencies; which now more than ever is of great importance (Latour, 2018, pp. 57-58). In contrast, Malm's notion of causation seems to be what Collingwood (1937) refers to as sense II of causation, where

> ..the word cause expresses an idea relative to human action… In this sense, the "cause" of an event in nature is the handle, so to speak, by which we can manipulate it. If we want to produce or to prevent such a thing, and cannot produce or prevent it immediately (as we can produce or prevent certain movements of our own bodies), we set about looking for its "cause." The question "what is the cause of an event y?" means in this case "how can we produce or prevent y at will?"
>
> (Collingwood, 1937, p. 89)

This meaning of causation, Collingwood argues, is the meaning used by practical science (Collingwood, 1937, p. 90). If we want to solve a problem we must identify the thing that we can interfere with in order to prevent the issue. This is exactly what Malm thinks is an essential task in the response to the environmental crisis. He identifies intentional human agency and the fossil fuel economy as causes (in Collingwood's second sense) of climate change and environmental destruction, and he protests that Latour's hybridism and his refusal to assign agency or the capacity to individually initiate processes of linear causation to human beings hinders our ability to identify and address these 'causes'.

4.1.2 What Malm Gets Right

I argue that Malm is quite obviously right about a number of things. I argue that there is certainly some political utility in pointing to the fossil fuel economy as the 'cause' of climate change, or industrial farming as the 'cause' of soil degradation. When I talk to my grandmother about how she will vote, or I discuss vegetarianism or the importance of buying local produce with a neighbour; it seems very obvious that being able to blame certain systems of production is incredibly useful. Furthermore, ANT is incredibly complicated, hard to explain and may truly obfuscate what people can actually do because of its insistence on shifting focus away from solely human action and tracking the mediation of as many actants as possible. It is important to remember that since ANT does not hold that there is one

privileged figuration of any given action, it rejects the idea that for example the statement "capitalism causes soil degradation" has more objective truth than "God is punishing us by making our soils less fertile"; instead it holds that these are different figurations of the same action, and that the lack of soil fertility is the result of a complex network of actants, each affecting each other. For ANT there is never a single discrete agent that causes an environmental issue, and there is therefore also never an entity that is singularly at fault for causing any action. Insofar as selecting a person or group to blame, hold responsible, remove from power or deplatform is useful; I argue that Malm's approach is obviously more useful. Furthermore, in regard to soils; in politics, in science communication and in everyday parlance, I argue that it is obvious that it can be incredibly important to do just that. It is sometimes important to identify that the big companies selling artificial fertiliser and promoting heavy ploughing and excessive pesticide use *are responsible for certain harms*. It is also sometimes politically important to say that *humans are causing* the erosion and depletion of the world's topsoils *and we need to stop right away.*

4.2 What a Latourian Terrestrial Account Gets Right

Soils are, as I have already demonstrated, very complex entities. They contain life, they have important ecological functions, they affect how we live our lives and there are multiple conflicting ideas about how to correctly define them. This is why I argue that the Latourian terrestrial approach to soil has the potential to be very useful in addressing environmental problems. Drawing on Skiveren's (2023) argument for methodological pluralism in the environmental humanities, I argue that although there is certainly a utility to Malm's (and Hornborg's) framing of environmental issues, the terrestrial approach that I have developed

in this thesis also has the possibility of being useful for addressing environmental problems exactly because of the complexity of soil systems. In a similar vein to the argument I laid out above, Skiveren argues that the core disagreement between new materialism and eco-Marxist theory (of which Malm is a representative) is a disagreement over methodology (Skiveren, 2023, p. 183). He argues that Malm frames critique as the only legitimate mode of inquiry; that for Malm the only right way to address environmental issues is to identify who and what social system is responsible, *and that this is a form of methodological dogmatism* (Skiveren, 2023, p. 187). For Skiveren, this dogmatism leaves Malm and other like him blind to the fact that most new materialists do not extend agency with the primary aim of critiquing the acts of "ants and trees" (Skiveren, 2023, p. 188), they extend agency in order to "to help us recognize, affectively and perceptively, our minuscule role in a much larger cosmos, hoping that we'll act with less superciliousness and self-centeredness. By learning about the ability of nonhumans to act, the logic goes, we may develop alternative feelings about our environment" (Skiveren, 2023, p. 188).

For Skiveren new materialists have the very important role of helping us change our patterns of response to the environment and open up new affective relations between humans and nonhumans, and in this way they can act as a potentially significant supplement to critical methodologies (Skiveren, 2023, pp. 190-191).

I argue that the terrestrial account of soil that I have developed has the potential to be very useful both in opening up new affective relations between humans and nonhumans, which may lead to greater motivation to protect and care for soils and soil systems; and in developing new scientific and investigative practices that may lead to important discoveries in how we can manage and adapt to changing soil circumstances in a warming world.

Therefore, following Skiveren, I argue that if we are to embrace a Latourian terrestrial account of soil that is compatible with Latour's ontological claims about the nature of agency, action and causation and his rejection of a nature-society dualism, it must be only one of our analytical tools, alongside critique.

I argued earlier that the terrestrial account of soil I have developed is able to account for all of the different 'roles' that soils, soil biota, soil systems and soil-related objects 'play', as it sees them all as actants that affect one another; and is therefore able to take into account the fact that each of them participate in the causes of soil action, and create certain effects in states of affairs. I argued that this terrestrial account does not rule out seeing soils as alive and spirited, nor does it rule out conceptualising worms and other soil biota as our coworkers, or farmers as managers of soil fertility. These conceptualisations entail different figurations of soil action, and none are excluded or taken to be objectively correct. Instead, ANT-based terrestrial theorists can learn from each of these conceptions, as they highlight important aspects of the actants they draw attention to. To take just one example, Bellacasa's lively soils draw attention to the vast amount of movement and aliveness underneath our feet in soils, and to the role soils and soil biota play in feeding us and keeping us alive (Bellacasa, 2019). Bellacasa also points out that as more attention is paid to the aliveness of soils, artists and scientists are more inspired and find more ways to represent it. This leads to more affection towards soils from the public, which in turn means that "scientists are also touched, not only by environmental concerns and public pressures, but by a wave of renewed affection for soils that invokes science to support better care" (Bellacasa, 2019, p. 5). This demonstrates exactly how an ANT-based terrestrialism may be an incredibly useful perspective to adopt. *By drawing attention to more and more previously invisible or disregarded actants in soils and soil systems, scientists, artists and educators may be inspired to create new ways of*

representing, investigating and interacting with soils; which may lead to more and better care for them. Soils are, as I have already pointed out, incredibly important to human life, and protecting and caring for them is of significant importance to our survival.

Furthermore, the terrestrial account of soil I have developed might be very useful in developing new ways of reacting to unforeseen developments and consequences in nature. As Chandler points out in his argument for modes of governing that focus on *responding to effects* rather than predicting causes and trying to prevent negative effects; there is in some cases good reason to adopt policy interventions that seek

> …to respond to the effects of indeterminacy and risk as inherent in the complex and interdependent world rather than understanding problems in a modernist telos of solutionism and progress. Problems in their emergence are the ontological product of complex feedback loops and systemic interactions that often cannot be predicted or foreseen in advance. Surprising and catastrophic effects thereby call for new ways of thinking and governing: ways that go beyond modernist linear cause and effect assumptions and that can potentially cope with unexpected shocks and unseen threats (Chandler, 2023, p. 142).

Soil and soil systems are vastly complex networks, and climate change and environmental destruction are happening. The world's topsoils are being eroded and this is causing new and unexpected problems, feedback loops and changes to the land, to food chains, to ecosystems and to soil fertility and capacities. As Chandler points out, ANT emphasises tracking effects rather than causes (Chandler, 2023, p. 145). The causes of soil-related problems are seen by an ANT-based terrestrial approach as distributed and difficult to isolate –this is exactly what Malm takes issue with; but in some cases it might be a good thing that an ANT-based account resists simple explanations for complex soil-related actions and occurrences. As Chandler points out, as effects "become more central than causes, "solutions-thinking" becomes less useful and *potentially a barrier to responsiveness* [emphasis added], … because problem

solving tends to affirm current practices and approaches rather than emphasizing the need to be alert to emergent effects" (Chandler, 2023, p. 142). Since ANT is specifically designed to decentre the idea of simple and straightforward linear causation, an ANT-informed approach to soil encourages researchers, policy-makers and scientists to respond to emergent effects and what is actually happening in soils, instead of trying to control soil processes. If theorists like Chandler are correct, that moving towards effect-based policy is the way to react to the complex and unpredictable 'natural' systems that are constantly changing (especially now in the context of climate change), then an ANT-based terrestrial approach to understanding soil might be exactly what is, at least in some cases, most useful.

Therefore, I argue that an ANT-based hybridist terrestrial approach to soil of the sort that I have laid out in this thesis can generate a way of thinking about soil that is potentially very useful for expanding the ways in which we can think about soil; and inspiring new ways of representing, investigating, studying and relating to soils. However, this approach also has some significant limitations, and is likely not the most useful approach for certain aspects of science communication and political mobilisation. Therefore, I argue that if we are to adopt this kind of terrestrialist perspective on soil, we ought not to exclude other ways of conceptualising soils, soil systems, and soil-related action. In particular, I argue that eco-marxist thinkers such as Andreas Malm and Alf Hornborg provide useful ways of thinking about nature and society, not as dualistically conceived ontologically separate substances, but as analytically different categories that mark distinct properties. This thesis was focused on testing the viability of a Latourian terrestrial approach to soil, so a full examination of the usefulness of Malm's conceptualisation of nature and society with regard to soil lies outside the scope of this thesis, but I believe I have demonstrated that there is reason to believe that his conception may be useful; and therefore reason to adopt

methodological pluralism when it comes to theorising about how to solve pressing soil-related problems.

Conclusion

In this thesis I have examined and discussed the usefulness of adopting a Latourian terrestrial view of soil. I have used soil specifically as a case study because it is incredibly complex, intertwined with human life in various complex ways; it is full of movement and change (which for Latour is exactly the aspect of the so-called 'natural' world that we have to change our conceptualisation of); and because, as I have argued, there is clearly a history of thinking about soil within a resource-based mechanistic paradigm. The dualist nature-society worldview and the mechanism that goes along with it is what Latour takes to be the cause of our harmful conception of 'nature', and so I have argued that soil makes an excellent case study to test if Latourian terrestrialism might actually be useful. Terrestrialism for Latour is a political project, he frames it as a new way of seeing the world that can escape from the problematic viewpoints that have led to the climate crisis and an alienation from the processes of and our dependence on the nonhuman world. In order to investigate the viability of a Latourian terrestrial conception of soil I began by laying out in some detail what Latour's concept of terrestrialism is, and gave some context for the worldview it is responding to by drawing on the work of Val Plumwood and Carolyn Merchant. I then laid out my arguments for why I take soil to be a good case study for Latour's terrestrialism. Then I laid out what I take to be the most relevant details of Latour's actor-network theory and his theory of hybridism, and applied them to soils and soil systems to generate a detailed picture of what a terrestrial approach to soil would actually look like. Finally, I considered some objections from Andreas Malm regarding the usefulness of a Latourian perspective in addressing concrete climate-related problems. I therefore concluded that although there are good reasons to believe that a terrestrial approach to soil would be useful in informing and inspiring useful approaches to understanding, relating to and working with soils; Malm's objections do

highlight some significant weaknesses in a Latourian terrestrial approach. I therefore concluded that the best approach to theorising about soils and soil-related problems is methodological pluralism that allows for ANT-based approaches but also allows for critique. It is possible that another version of terrestrialism can be generated that does not have these shortcomings because it does not rely on Latour's ANT and hybridism, but it would entail a significant departure from Latour's other work. Therefore, I argue that a terrestrial view of soil that is based on Latour's arguments in *Down to Earth,* as well as his ANT and hybridism has significant but limited value as a way of orienting our solutions to soil-based climate problems. I therefore argue that the arguments laid out in this thesis open up certain avenues for further research, specifically in regard to exactly which soil-related problems an ANT-based terrestrialism might be useful in addressing, and exactly how. Furthermore, developing a similar terrestrial account of other important ecological phenomena may also be an interesting avenue for further research.

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