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Linda Kealey

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The Dissertation of Linda Kealey
is approved:

_____
Professor Nico Orlandi, Chair

_____
Professor Karen Barad

_____
Professor Abe Stone

_____
Lori Kletzer
Vice Provost and Dean of Graduate Studies

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Abstract

Frontiers of Plant-Human Collaboration

Linda Kealey

In Findhorn, Scotland, as part of the "New Age" in the 1960s, a novel form of plant-human collaboration developed in which humans collaborated with "nature", or specifically with "devas" and "nature spirits", beings that are not physical and cannot be engaged with in the usual physical manner, but that through this collaboration made a meaningful difference in the lives of the humans and in the physical reality of their gardens. In a "modernist" world, defined such that only the "physical" is scientifically real, where the physical is that which can be observed and measured with the physical senses and their technological extensions, it is not possible to make sense of non-physical beings such as devas and nature spirits. The underlying theme of this project is to overcome this modernist "physicocentrism" in order to expand what is considered to be scientifically real.

Methodologically, Findhorn's experiences are not dismissed outright, nor is it attempted to reduce them to the physical, but their experiences are engaged with as real on their own terms, suggesting the need for a critical rethinking of implicit modernist assumptions about the nature of reality, including individualist metaphysics, nature-culture dualism, human exceptionalism, and reductionism. The New Age implicitly retains these modernist tendencies, resulting in problematic practices, but with Karen Barad's "agential realism" – an ethico-onto-epistemology

that, among other features, provides a coherent interpretation of quantum physics – these modernist limitations are overcome through the reworking of key concepts such as matter, causality, space, time, agency, and knowledge.

Through agential realism's fundamental in/determinacy of matter that is in stark contrast to the determinate individuals of modernism, it is possible to make sense of devas as "virtual beings", of nature spirits as "transphysical beings", and of collaboration as not limited to humans but inclusive of any mutually intra-acting agencies that jointly take responsibility for the iterative enaction of their common world. There is a possibility of engaging scientifically with virtuality and transphysicality through their physical traces in laboratory experiments, and collaborating with devas and nature spirits could help create ethically responsible scientific practices with plants.

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1. Introduction

What if it were possible to dramatically increase soil fertility and food production yields by communicating directly with plants to find out how to best enable their growth and vitality? If this seems like a fairly radical question to ask, consider the immense significance that such an alternative mode of sustainable food production and soil regeneration could have in terms of addressing current global issues. While there is as yet no scientifically established method of engaging with the plant world that includes plant-human collaboration as a key aspect, collaborative relationships between humans and plants are certainly not new, and traditional and Indigenous practices are being considered in conjunction with Western scientific practices.[1] This project is not intended to be a survey or a history of plant-human collaboration, but is focused on one particular style of plant-human collaboration that was developed by a "New Age" community in the 1960s in Findhorn, Scotland (Findhorn Community 1975).

Because the very idea of communicating directly with plants as collaborative partners may seem impossible within existing scientific frameworks, we must investigate and overcome the limitations of these frameworks. The overall intention of this project is to engage with Findhorn's plant-human collaboration in a way that has the potential to affect our own beliefs and actions, which is more likely to be accomplished if we can connect Findhorn's experiences with current scientific

[1] For example, Robin Wall Kimmerer (2013) is a plant ecologist who engages with Indigenous practices through her Potawatomi ancestors' traditional ways of knowing, and Fikret Berkes (2012), an applied ecologist who worked with the Cree Indians in subarctic Canada, examines local and Indigenous knowledge in relation to scientific ecology.

theories. The thesis of this project is that "agential realism" – an ethico-onto-epistemology developed by Karen Barad (2007) that, among other features, provides a coherent interpretation of quantum physics – allows for the possibility of coming to terms in a scientific way with the efficaciousness of Findhorn's plant-human collaboration by overcoming the implicit limitations of our current scientific frameworks.

In order to understand how I have arrived at this thesis, as well as how this thesis could inform our current beliefs and actions, it will be helpful to begin with detailed overviews of the key points from each chapter. This thorough introduction to the project as a whole will necessarily result in a rather condensed presentation of the material, but grasping the whole will render each part more comprehensible when it is expanded upon in the subsequent chapters. Because we will be shifting between ontological frameworks in which our basic implicit assumptions are being disrupted, it is important to define a working vocabulary in order to focus the discussion and remain as clear as possible, so this chapter will include initial definitions and clarifications that will be discussed in more detail later.

In §1.1, I will introduce Findhorn's plant-human collaboration, and in §1.2, I will introduce the various frameworks that will be utilized, including agential realism. In §1.3, we will address the anthropological considerations involved in studying Findhorn's plant-human collaboration, and in §1.4, we will investigate how Findhorn's experiences do and do not make sense from within the various frameworks we are considering. This will lead us to the thesis of this project, which

will be addressed in two parts: in §1.5, we will see how agential realism expands the notion of collaborative partners beyond humans; in §1.6, we will use agential realism to show how it could be possible to make sense of the particular plant-human collaborative methods utilized at Findhorn. Finally, before concluding in §1.8, we will, in §1.7, consider what might be required in engaging with plant-human collaboration scientifically.

1.1 Findhorn's plant-human collaboration

The Findhorn Garden (Findhorn Community 1975), about which we will go into depth in Chapter 3, was established not as an intentional experiment but to help sustain a small group of individuals living in the sub-arctic, sandy soils of northeastern Scotland. The bounty of unusually large and beautiful foods and flowers that they were able to grow in this inhospitable environment was exceptional even when compared to plants grown in rich fertile soil – and all the more inexplicable in the barren soils. In fact, according to soil experts who later examined the garden, even with the best farming knowledge and techniques it should not have been possible to create such balanced soil in such a short time without the use of artificial fertilizers (Findhorn Community 1975, 26) (Hawken 1975, 176-77). According to the initial group of humans involved in the garden – Peter Caddy, Eileen Caddy, Dorothy MacLean, and later, Robert Ogilvie Crombie (Roc) – the reason for their surprising success was the collaboration that they unexpectedly established with the plants in their garden.

This initial group of gardeners, whom I will refer to collectively as the "Findhorn gardeners", established their garden using methods in line with their spiritual practices, which were part of what is often referred to as the "New Age". These practices required them to align with the "God within", or with the divine wholeness within themselves, thereby following their inner guidance rather than any kind of external authority. Eileen and Dorothy both received guidance from their "inner voice", and Peter, who did most of the physical labor in the garden, made decisions by following his intuition. While they engaged in physical gardening practices such as gathering manure and seaweed to enrich the existing sandy soil, they also focused on positive thinking, and they "radiated" their love and light into the soil and plants. With such practices, the Findhorn gardeners connected to nature through love and joy, not seeking out any special, personal kind of contact with nature. But eventually, to their surprise and initial shock, nature – in the form of "devas" and "nature spirits" – made personal contact with them.

According to Dorothy, with whom the devas established contact, each type of plant has a corresponding plant deva that exists "outside" of spacetime, holds the form or pattern of this plant type, and directs its "energy" toward the materialization of this form. For example, the kale deva holds the pattern for every kale plant that could possibly exist in material form. While devas hold the pattern for a plant species as a whole, Roc learned from the nature spirits that they minister to individual plants as they are materializing in spacetime – for example the kale plant growing in a pot on my balcony. The nature spirits work in the etheric realm, using the "energies"

channeled to them by the devas to build the "etheric counterpart" for each plant, which supplies the plant with "life force", and within which the plant grows and develops. To use an analogy from architecture, the plant devas are the architects of the plants while the nature spirits are the craftsmen (Findhorn Community 1975, 58). According to the Findhorn gardeners, we tend to see only the outer, finished form of the plant instead of recognizing these dynamic inner processes that are guided by the devas and nature spirits. These various entities and processes are not ultimately separate but are united in oneness.

This initial contact between the Findhorn gardeners and the devas and nature spirits eventually resulted in a collaboration that was instrumental in producing the remarkable results for which the garden is known. The devas not only taught Dorothy about themselves and their relation to humans, but also gave advice on how to how best to manage the various components of the garden, while Roc learned from the nature spirits how to handle specific plants in order to least disturb their work. The Findhorn gardeners also learned that the devas and nature spirits are generally not happy with the way in which humans dominate and control nature, viewing humans as a sort of "parasite" on Earth (Findhorn Community 1975, 22). Because the devas and nature spirits are responsible for the life force of the plants, upon which humans are dependent, the message is that humans must learn to collaborate with devas and nature spirits in order to maintain a balance that benefits all beings. For example, instead of imposing their vision on the devas and nature spirits through forceful methods such as excessive pruning, humans can work collaboratively with

them to make changes in the devic patterns, which will affect the development of the physical plants without compromising the work of the devas and nature spirits.

The original Findhorn garden still exists, now surrounded by an intentional community including an eco-village and a spiritual retreat center, but the original beyond-normal growth of the plants has come to an end. According to the Findhorn gardeners, the purpose of this beyond-normal growth was to demonstrate the possibility of a collaboration between humans and devas and nature spirits, but the plants were not necessarily "happy" growing under these conditions (Hawken 1975, 28). Moreover, once Dorothy and Roc were no longer present at Findhorn, no one else was able to directly communicate with the devas and nature spirits, and the focus at Findhorn shifted away from plant-human collaboration. Now, more than fifty years since the inception of the Findhorn garden, the current Findhorn community is publicly broaching the subject of collaboration with the devas and nature spirits, looking for next steps in bringing this initial vision to fruition.[2]

1.2 Ontological considerations

In order to make sense of plant-human collaboration as it occurred at Findhorn, we must first be clear about the ontological frameworks – modernist, New Age, and agential realist – with which we will be working. The New Age will be described in detail in Chapter 3 along with the story of the Findhorn garden, and the

[2] In September 2018, the Findhorn Foundation held a 7-day conference entitled "Co-Creative Spirituality: Shaping Our Future with the Unseen Worlds" (Findhorn Foundation 2018), where the term "unseen worlds" refers to beings such as devas and nature spirits.

others will be thoroughly discussed in Chapter 2. But in order to properly introduce the main points and arguments of this project, it is necessary to provide brief overviews here. The term "modernist" is not intended to describe a fixed or coherent position that a specific group of individuals can be said to hold, but it is intended to capture the scientifically-informed "common sense" stance of the intended audience of this project. This modernist stance does not include a common-sense understanding of quantum physics but is rooted in deterministic, classical physics, which is based on an individualist metaphysics. Reality is composed of individual things that we can detect with our physical senses and their technological extensions, and which can be reduced to measurable bits of matter that are separably located in a spacetime container, that are characterized by various attributes, and that can be related to one another via quantifiable relations. This modernist framework is based on a separation between "culture" and "nature", where only human minds ("culture") generate meaning and have agency, while "nature" is seen as a passive resource. An important modernist goal is the use of science to predict and control nature according to human values, but the human mind has no necessary connection to nature, or to matter more generally, and is thus limited to forming "representations" of the external world that it seeks to understand. The rise of modernist science and philosophy occurred in conjunction with the development of the political-economic system in seventeenth century Europe, as part of which spirits were banished, matter came to be understood as mechanical, and the interest of the individual replaced the human-land-spirit entanglement. Finally, religiously inclined modernists implicitly accept the

existence of immaterial agents such as God and angels, yet such entities are usually treated as mere beliefs and held separate from any scientific discussion.

The framework referred to as the "New Age" is not a homogeneous entity or a movement, but is a set of heterogeneous practices that can be described as "alternative spirituality" (Sutcliffe 2003, 11). The original Findhorn community, in which the gardeners collaborated with devas and nature spirits, has been described as one of the earliest New Age communities in Britain (Chryssides 1999, 325). The New Age is generally against the certainty that comes from external authorities such as science and institutionalized religion; instead, the New Age self is encouraged to seek its own certainty through methods of self-improvement and empowerment. Some themes characterizing the New Age are oneness, wholeness, and God as the "voice within" or the "inner divinity". Techniques common in New Age practices include listening to the voice within, following one's intuition, releasing one's inner divinity, positive thinking, being in tune with the "good of the whole" through love, and following the "Law of Manifestation", which suggests that our thoughts create reality. Finally, as will be critiqued in Chapter 4, the New Age is generally associated with a negative stigma, resulting from its superficial appropriation of quantum physics principles and its implicit retention of modernist limitations that create problematic social and political practices.

The agential realist framework, developed by theoretical particle physicist and feminist science studies scholar Karen Barad (Barad 2007), is based on quantum instead of Newtonian physics, resulting in a metaphysics of relationality instead of

individuality, as well as performativity in place of representationalism. Agential realism is moreover inclusive of ethical and political considerations, and it questions the assumptions of human exceptionalism. As will be discussed in more detail in Chapter 2, agential realism is a relational ethico-onto-epistemology in which subjects (not limited to humans) and objects, as well as space and time, do not individually pre-exist but are *spacetimemattering*, or iteratively enacted in relation to one another, within and as part of entangled in/determinate *phenomena.* The ultimate units of reality are thus not individual determinate entities, but they are phenomena, which are ontological entanglements. An ontological entanglement means that matter is fundamentally indeterminate, in that there are always multiple incompatible possibilities for how determinacy could be enacted within a phenomenon; the use of the term "in/determinate" signifies the dynamism of indeterminacy and determinacy. As part of this dynamism, the ontologically inseparable entities are relationally differentiated by an *agential cut* within the phenomenon,[3] which includes the forming of new entanglements, in the sense that the enacted entities have been linked together in a particular relationality with respect to the rest of the universe. Thus, agential cuts are differentiating-entangling, and determinacy is never enacted once and for all, but is always associated with sets of possibilities.

Continuing with agential realism, in contrast to modernist *interactions* between pre-given, separable individuals, the separability between agential realist subjects and objects emerges from their *intra-action* (interaction redefined for

[3] This cut is enacted not by any given entity, but by the whole material-discursive arrangement of which the enacted entities are a part.

mutually co-constituting entities) and exists only in relation to the phenomenon as a whole. The agential realist "subject", a subject-in-the-process-of-becoming, is ontologically constituted within the phenomenon along with the objects-in-the-process-of-becoming, or the "objects" that are being known, making knowing inseparable from being. Ethics is also reframed, such that it is no longer about a separate pre-existing individual having responsibility towards other individuals. Instead, because human subjects are themselves relationally constituted through intra-action, the ethical obligation becomes more primary, directed at how the human differentially comes into being in relation to their world. Agential realist "response-ability" is about enabling new responses as part of intra-action, because the drawing of boundaries has real material consequences that play into issues of power and politics, both in terms of what materializes and what is excluded from materializing. Not only do neither knowing nor ethics require a human "subject" as their locus, but humans themselves are neither given nor fixed, and must be recognized as differentially constituting in relation to the world. Finally, with agential realism, the mode of investigation shifts from one of "reflection" to one of "diffraction". Reflection results in debate about which representational mirroring of a pre-given reality is more real or true. But without a pre-given reality in terms of which to compare different representations, we engage diffractively by examining the differences between various approaches, not only conceptually, but also by taking responsibility for how the effects of these differences can make a meaningful difference in our own practices.

One more distinction between modernism and agential realism is required in order to understand the following anthropological discussion. With modernism, matter and meaning are separate: the "world" is the matter, or the external reality, and the "ontology" is the meaning, or the beliefs and theories that describe the external reality.[4] In contrast, with agential realism, matter and meaning[5] are not separate, and the term "material-discursive" indicates their inseparability. In this sense, both "world" and "ontology" are ever-shifting sets of material-discursive practices that cannot be separated from one another. Thus, it does not make sense to talk about a world apart from its discursive practices, nor does it make sense to talk about meaning devoid of materiality. We will use the term "onto-world" to remind us of this inseparability of world and ontology, of matter and meaning. Similarly, the term "practices", when utilized in an agential realist sense, implies material-discursive practices.

In referring to onto-worlds, my description of which is based on insights from agential realism, I am using agential realism as an overarching framework to inform the methodology of this project, which will be further discussed in the following section. At the same time that agential realism functions as a guiding framework, the agential realist onto-world is one of the three onto-worlds – along with the modernist

[4] These are not rigorous definitions of "world" and "ontology" but are meant to convey how these terms are often used philosophically to distinguish between matter and the meaning that is ascribed to the matter (where matter and meaning have no necessary relation to one another).

[5] With agential realism, we have already discussed how the concept of "matter" is fully re-worked such that the ultimate entities are in/determinate phenomena. In conjunction with this shift, the concept of "meaning" is also re-worked as *discursivity*, which encompasses not only the description of static, linguistic, human concepts, but is also productive of concepts and knowledge by constraining and enabling what is possible.

and New Age onto-worlds – that we are studying in relation to plant-human collaboration.[6]

1.3 Anthropological considerations

In Chapter 2, we will discuss the anthropological considerations involved in working with Findhorn's material-discursive practices of plant-human collaboration. While this is not primarily an anthropological project, we do need to be clear about how we are engaging with Findhorn's New Age onto-world. With its devas and nature spirits that are efficacious in the material world, Findhorn's collaborative practices could be treated as mere beliefs instead of investigated as serious practices that could inform our own practices.

The recent "ontological turn" in anthropology (see, for example, Paleček and Risjord 2013) rejects the practice of analyzing different cultures in terms of how accurately they represent a universal pre-given reality, as judged according to the dominant culture (modernism). Instead, with the ontological turn, the culture that is being studied is no longer treated as a different, less correct interpretation of a universal reality, but it is recognized as a world or ontology – an onto-world, as I am calling it – that exists in its own right. Each of these onto-worlds is understood to be a different interpretive web of relations constituted by particular groups of humans and their environment, none of which has privileged access to any pre-existing truth.

[6] Barad's (2007) agential realist framework does not itself make use of the term "onto-world". But I am referring to the "agential realist onto-world" as one of three onto-worlds being considered in this project, because it sets a context from which we can compare Findhorn's plant-human collaboration from within different sets of background assumptions and practices.

Thus, instead of translating concepts into the understanding of the dominant, privileged culture to make sense of them, thereby erasing key differences, the anthropologist immerses themself in the interpretive web of the onto-world that they are studying in order to learn how concepts function in that onto-world. Then, this experience can be brought back to the anthropologist's onto-world, informing their own practices.

The ontological turn in anthropology results in the existence of multiple different onto-worlds, but it is unclear what exactly this is supposed to mean, and how we can compare between them when there is no one true or ultimate onto-world that serves as a reference. After reviewing a response to this question in the anthropological literature, we will use insights from agential realism – again operating as a guiding framework – to come to terms with the existence of multiple onto-worlds. As with agential realism, the ontological turn in anthropology shifts from representationalism to relationality, recognizing that things exist only by virtue of their relations to other things or beings. However, agential realism goes further by recognizing this relationality as an iterative differentiating-entangling of fundamentally in/determinate matter. With agential realism, we can understand each onto-world as a set of material-discursive practices that resolves the fundamental indeterminacy in different patterned ways, giving the appearance of separate onto-worlds that are, however, thoroughly entangled, and ultimately inseparable from one another. Onto-worlds are not different representations or interpretations of a single

reality, nor are they multiple realities, but they are different, yet entangled, patterns of enactment of a fundamentally in/determinate universe.

This anthropological analysis is relevant to the methodology utilized in this project. The intent is not to stay rooted in our own onto-world and then judge the validity of Findhorn's plant-human collaboration according to our own practices, as would be case for representationalist anthropologists not influenced by the ontological turn. Nor is the intent to merely recognize Findhorn's practices as constituting a separate but valid onto-world that may or may not have some effect on our own practices if we can learn to engage in their relational web of interactions, as would seem to be the intent for anthropologists engaged with the ontological turn. Instead, with agential realism in its role as a guiding framework, we are engaging at the level of in/determinacy, in which there are no fixed or separate onto-worlds, either as pre-existing or as results of material-discursive practices. We can still talk about the modernist, New Age, and agential realist onto-worlds, but only with the recognition that each one is a set of ever-shifting material-discursive practices, and that they are all fundamentally entangled with one another. This results in a diffractive methodology, in which we do not simply compare how things show up differently in these onto-worlds, but we examine the effects of these differences, seeing how they matter and how they can make a difference in our own practices.

While this agential realist methodology may appear quite similar to what is happening with anthropologists in the ontological turn, the agential realist recognition of in/determinacy is crucial for several reasons. First, we are not simply comparing

Findhorn's New Age onto-world to our modernist onto-world, because this assumes that these onto-worlds are separate to begin with; instead, by engaging with Findhorn's practices, our own onto-world is materially-discursively affected, such that new possibilities may arise while others may be excluded. Second, responsibility is implicated in intra-action; thus, by enacting this entanglement with Findhorn's practices, "we" have a responsibility to recognize how "our" boundaries (and those of "our" onto-world) are constituted in relation to plant-human collaboration, and how they might need to shift.

Finally, as part of a thorough agential realist analysis, it is necessary to analyze multiple entangled sets of practices including not only philosophical and scientific practices – which are the focus in this project – but also ethical and political issues,[7] which will be hinted at but not fully sketched out as part of this project.[8] To be clear, utilizing agential realist methodology in the service of any project requires thinking through ontological, epistemological, ethical, and political issues together, because these interrelated factors act as apparatuses that materially-discursively constrain and enable how the researchers themselves are constituted and situated, how the issues are framed and construed, and what materializes as part of the project.

[7] With agential realism, ethical issues are also necessarily political issues, because individuals are not pre-given but are iteratively co-constituted as part of societies, making any "individual" ethical responsibility a matter of social justice (personal communication from Karen Barad to the author on May. 6, 2019).

[8] It is not due to a lack of interest that I have not fully engaged with the ethical and political issues that are integral to this project. What happened is that I did not properly understand, until shortly before the dissertation needed to be completed, that doing justice to agential realism required a thorough engagement with these issues as part of my philosophical project; however, with my background in science and analytical philosophy, I did not have the appropriate training to properly complete this part of the analysis in the remaining time.

Thus, what I am contributing with this dissertation should not be uncritically taken up in the absence of a more thorough analysis of the relevant interrelated factors.

1.4 Findhorn's practices in modernist, New Age, and agential realist onto-worlds

In Chapter 4, we will investigate Findhorn's New Age onto-world in relation to the modernist and agential realist onto-worlds. Specifically, we will determine that plant-human collaboration as it occurred at Findhorn simply does not fit into a modernist onto-world. While Findhorn's New Age onto-world overcomes the modernist restrictions that preclude plant-human collaboration, it implicitly retains modernist tendencies that limit its usefulness in further investigating plant-human collaboration. With agential realism, the limitations of these implicit modernist constructions are overcome, and thus, the agential realist onto-world allows for the possibility of coming to terms in a scientific way with the efficaciousness of Findhorn's practices of plant-human collaboration. To examine this thesis in more detail, we must make a few distinctions.

First, we need to be clear about the difference between "determinate individuals" and "in/determinate phenomena". In a modernist onto-world, the ultimate entities are fully-formed, fully-determinate, separate pre-existing individuals: they do not include any process of coming into being or perishing; they do not include any form of possibility, potentiality, or indeterminacy as integral to their existence; they do not rely on any necessary relation to any other individual. Thus, we can refer to the ultimate entities of a modernist onto-world as determinate

individuals. In contrast, as discussed above, the ultimate entities of an agential realist onto-world are in/determinate phenomena, as part of which there are no pre-existing separate individuals, nor is anything ever fully determinate. Thus, in an agential realist onto-world, matter always includes possibility, but in an inseparable and dynamic manner. In the context of Findhorn's devas and nature spirits, we will develop the following: devas are associated with possibility/indeterminacy because they hold unmaterialized, or potential forms, while the physically materializing plants we see growing in the ground, as well as the etherically materializing nature spirits, are spacetimematterings that materialize (within phenomena) at the exclusion of other possible determinacies.

In order to understand this, we need to make a distinction between the different kinds of spacetimematterings that can be enacted within phenomena. In an agential realist onto-world, matter is differentially constituted along with space and time, so that neither space nor time are pre-given or limited to any particular configuration. In contrast, the determinate individuals of a modernist onto-world are located in a pre-given, independently-existing, physical spacetime, where the term "physical" will be utilized in this project to designate what is generally considered to be scientifically real in a modernist onto-world. To be physical, something must be perceptible through the use of the physical senses and their technological extensions, and must ultimately be measurable – we will construe this as existing in, or being

reducible to something that exists in, a metrically defined spacetime.[9] For example, the plants that we see growing in the ground have a physical body that can be measured and otherwise physically manipulated.

In a modernist onto-world, matter is equated with the physical, but in an agential realist onto-world, there is no pre-existing constraint that enacts spacetimematterings only according to physical configurations. Thus, an agential realist onto-world can also include transphysical spacetimematterings, where the term "transphysical" will be utilized to designate any spacetimemattering that is enacted according to configurations other than the physical.[10] For example, we will be referring to Findhorn's nature spirits as transphysical because they are etherically instead of physically spacetimemattering. I am using the term "physicocentrism" to denote the privileging of the physical, or the assumption that in order for something to exist and be efficacious, it must have a physical basis. Physicocentrism is a core part of modernism with its determinate physical individuals, where neither possibility nor the transphysical exist (or at least they are not scientifically investigatible). An important part of this project is showing how agential realist matter can overcome physicocentrism, because it includes indeterminacy and can also include the transphysical.

[9] There may be other necessary designations in order for measurement to be possible, but minimally, we can point to a metrical spacetime as a necessary requirement, in order to contrast this below with other configurations of spacetime.

[10] The physical/transphysical distinction is not part of agential realism, but because there is no pre-determined pattern according to which spacetimemattering occurs, we can differentiate between different possible patterns of spacetimemattering; in the context of this project, the physical/transphysical distinction is relevant.

Additionally, we must discuss what is meant by the notion of a realm in our various onto-worlds. In a modernist onto-world, a realm is a container-like spacetime populated by individual determinate entities that change their configurations through time according to pre-given and fixed patterns, or the so-called "laws of nature". The modernist onto-world has only a physical realm,[11] which is causally closed.[12] In contrast, the New Age onto-world generally includes additional realms beyond the physical, such as etheric, astral, mental, and various spiritual realms.[13] We will be focusing on Findhorn's descriptions of devas and nature spirits, which require an etheric realm (where the nature spirits work), as well as a devic realm that is "outside" of spacetime. While the multi-realm cosmology of the New Age might seem outrageous to a modernist, what the modernist and New Age onto-worlds have in common is this notion of a realm as a fixed spatiotemporal structure populated by individual entities (whether they are physical entities, etheric entities, spirit entities, etc.). In contrast, using agential realism as a guiding framework, we will see that it is possible to accommodate devas and etheric nature spirits without this notion of a realm. That is, with agential realism, there are no pre-determined, independently existing realms populated by different types of beings, nor are realms iteratively created in such a way that they become stable entities that are causally closed with

[11] Some dualistically-inclined modernists might additionally posit a mental realm, but the general modernist tendency, as I am working with it in this project, is to assume that the mental will eventually be reducible to or otherwise explicable in terms of the physical. In any case, with modernism, the physical realm is the only realm that can be scientifically studied.
[12] As will be further discussed in Chapter 6, causal closure of the physical realm means that every physical event can be sufficiently described by only physical causes.
[13] Depending upon the particular New Age tradition, these realms are referred to by various terms, such as "transphysical", "paraphysical", "non-physical", "unseen", or "subtle" realms.

respect to other realms. Instead, we can talk about different sets of material-discursive practices that tend toward certain patterns of spacetimemattering, all of which are thoroughly entangled, and none of which result in anything separate or fixed.[14] In other words, introducing a distinction between physical and transphysical spacetimematterings does not mean that separate physical and transphysical realms are being posited. Although agential realism does not refer specifically to transphysical spacetimematterings or etheric beings, it does not preclude the possibility of particular material-discursive practices involving a multiplicity of beings engaging in efficacious collaborations while enacting different patterns of spacetimematterings.

Now we can examine Findhorn's New Age onto-world in relation to the modernist and agential realist onto-worlds. Based on the data of Findhorn's plant-human collaboration, we need to make sense of a multi-realm cosmology of collaborative beings, where devas exist in a devic realm "outside" of spacetime, and nature spirits exist in an etheric (transphysical) realm. To do this, we must accommodate collaborative beings other than humans, as well as realms other than the physical. As discussed above, only the physical is real in a modernist onto-world. Devas and nature spirits, not being physical, are thus not real in a modernist onto-world. A modernist could argue that the existence of devas and nature spirits could ultimately be explained in physical terms, but this "explaining away" of the specific

[14] Note that it may appear as if one particular patterning, such as the physical, is separate and even causally closed, because the particular sets of cuts that are enacted result only in physical spacetimematterings.

features of devas and nature spirits, by reducing them to the physical, would not be consistent with Findhorn's practices.

With the New Age onto-world, additional transphysical realms become available, and we can talk about collaborations with beings in other realms. However, New Age constructions can be seen as problematic due to implicit modernist limitations, such as the notion of a realm. Additionally, the New Age tends to make reference to quantum physics to support concepts such as oneness, wholeness, and the material efficacy of consciousness, but not in a way that is rigorously based on the science. To complicate matters, many different and conflicting interpretations of quantum physics exist, and New Age concepts tend to be supported by a simultaneous reference to multiple conflicting interpretations (personal communication from Karen Barad to the author on Jan. 20, 2019). This can lead to confusion about concepts such as the relationship between matter and mind, which can result in problematic assertions such as the notion that our thoughts create reality.

Therefore, we turn to agential realism in order to make sense of plant-human collaboration by overcoming limiting modernist assumptions – such as the metaphysics of individualism – that are implicitly retained in New Age constructs. Because agential realism is an ontological framework that proposes a coherent interpretation of quantum physics, it is more likely to allow for the possibility of coming to terms in a scientific way with the efficaciousness of Findhorn's practices of plant-human collaboration. With agential realist matter as fundamentally

in/determinate and iteratively spacetimemattering, we can enable a new understanding of Findhorn's multi-realm collaborative cosmology by sketching out a possible way in which the agential realist onto-world could be said to accommodate an efficacious collaboration of humans, devas, and nature spirits. In §1.5, we will address the fact that humans are not the only collaboratively enacted beings in an agential realist onto-world. In §1.6, we will explain why we are not precluded from making sense of Findhorn's devas and nature spirits in an agential realist onto-world with its in/determinate matter that can be relationally differentiated as both physical and transphysical spacetimematterings.

1.5 Collaboration in an agential realist onto-world

In Chapter 5, we will examine why humans are not the only collaboratively enacted beings in an agential realist onto-world. First, it is necessary to look more closely at the term "collaboration". Recall that modernism is based on a metaphysics of individualism, while agential realism is thoroughly relational. Collaboration, in a modernist sense, implies an interaction between individuals, and only human individuals are considered to be capable of collaboration. A modernist collaboration between individuals is usually some kind of a bargaining agreement with stakes and returns that either do or do not benefit the individual. For the purpose of this project, we will say that collaboration – defined in a modernist sense – minimally requires some sort of agency, knowledge, intelligence, and the ability to communicate. In Findhorn's New Age onto-world, the term "collaboration" has a slightly different

emphasis, because humans work with devas and nature spirits not based on their individual stakes and returns, but as a co-creation that benefits the good of the whole. This presence of wholeness moves in the direction of agential realism. In an agential realist onto-world, where intra-action is the relational differentiating-entangling of ontologically inseparable entities (agential realist wholes), we will develop the notion that collaboration is enacted as part of mutually intra-acting agencies jointly taking responsibility for, or enabling new responses toward, the iterative enaction of their common world.

Modernist assumptions lead to the belief that humans are privileged in having attributes such as agency, knowledge, and intelligence, which we have defined as necessary for collaboration in a modernist sense. In an agential realist onto-world, however, there are no pre-existing individuals to whom attributes do or do not belong, so in Chapter 5, we will make sense of modernist attributes in a different way. Briefly, with agential realism, agency does not belong to individuals but is the dynamism of intra-action, the ongoing reconfiguring of in/determinate matter. Instead of pre-existing individuals either having or not having agency, agency is the dynamism through which individuals are relationally differentiating-entangling, where these individuals need not be humans but could be any possible configuration of spacetimemattering. Regarding knowledge, we explained above that knowing and being are inseparable in agential realism. Knowing does not require any particular material configuration such as a human brain; any material configuration, by virtue of its being, is also knowing, or engaging in differential responses and accountability

within intra-action. Intelligence is reframed as *intelligibility* within agential realism: intelligence does not belong to individuals, but one part of the world becomes intelligible to another when ontic and semantic determinacy are enacted within a phenomenon.

Regarding communication, I have chosen some important aspects of modernist communication on which to focus the discussion. We will say that communication requires subjectivity and intentionality, as well as an exchange of information that includes the use of physical sense organs and has a shared meaning for the communicators. For a modernist, subjectivity and intentionality are usually considered to belong solely to humans, and while Barad (2007) does not develop an account of how subjectivity and intentionality could be reconfigured as aspects of intra-action, it should be possible. The important point to make for now is that this discussion is not ultimately about why attributes such as agency, knowledge, intelligence, subjectivity, and intentionality, should or should not be granted to non-humans such as plants, because this formulation is based on the assumption that individual physical entities with attributes are the fundamental existents, and that humans have a privileged role. Instead, with agential realism, the human no longer has a privileged status as an exceptional ontological being, and the ultimate entities are relational, in/determinate phenomena, so these "attributes" are re-framed as dynamic features of intra-action, regardless of whether or not a human is involved.[15]

[15] This is not to say that every intra-action is characterized in the same way by its various possible features. For example, the knowing enacted by humans is certainly different from the knowing enacted by plants, but there is no line that separates knowing from non-knowing, because knowing is a

In addition to subjectivity and intentionality, we have defined communication as requiring an exchange of information utilizing physical sense organs and resulting in the creation of shared meaning. In a modernist onto-world, separate determinate individuals are the ultimate entities, and there is no necessary relation between these individuals. Thus, the only way to exchange information between individuals is through external mechanisms, such as via physical contact or as mediated by physical sense organs; note that this is an example of physicocentrism. With agential realism, we can overcome both the individualism and the physicocentrism of modernism. Instead of a pre-given physical spacetime structure populated by individuals that interact with one another, both objects and subjects emerge during intra-action, along with space and time. This radically alters what we mean by information exchange and by communication more generally.

Regarding the communication of meaning between subjects, it is not clear in a modernist onto-world how meaning is attached to the physical information that is exchanged between individuals, because there is no necessary relation between matter and meaning (unless meaning/mind is reduced to matter). Moreover, the creation of meaning, for example via mental representations, is limited to humans. It is important to note that there is a large and growing body of work, often referred to as "embodied", "interactive", or "enactive" approaches, in which meaning is not transferred between subjects through mental representations, but intersubjective

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part of being. In other words, agential realism removes the ontological distinctions that grant particular attributes to certain beings (i.e. humans) and not others, but we must still be able to account for their differential enaction.

meaning emerges from a joint communicative encounter in which the mind and body are not entirely separate (see, for example, Chemero 2013; Gallagher and Zahavi 2012; Thompson 2007; Varela et al. 1993). These approaches move in the direction of agential realism, where agential realism fully overcomes both the matter-meaning split and the metaphysics of individualism. Every agential intra-action, whether or not a human is involved, is a material-discursive relational differentiating-entangling from an ontologically inseparable whole, in which the materiality of the enacted individuals is inseparable from meaning-making. Notably, with agential realism, the term "meaning" no longer refers to something conceptual that is separate from the physical, but instead, meaning is reframed in terms of material-discursive practices, which have real material consequences.

This discussion is not ultimately about how non-humans such as plants can generate and share information that is meaningful to humans (and vice versa), because this formulation is based on the assumption that interactions occur between individuals. With such a formulation, individuals must not only be able to send information back and forth between their physical bodies, but they must also somehow bridge the gap of meaning between separate individuals. Instead, with the in/determinate relationality of agential realism, meaning-making is materially enacted in a co-constitutive material-discursive process, regardless of whether a human is involved, and the presence of physical sense organs – whether human or otherwise – is not necessarily required.

In a more general sense, in an agential realist onto-world, any potential subjects are inherently connected by virtue of entanglement. While this inherent connection could be construed as a sort of communication, in the sense that these potential subjects are co-constituted in terms of one another, this would not entail meaning-making but would be at most a trivial sense of communication. But when this inherent connection through entanglement is made ontically and semantically determinate through intra-action, such that it becomes materially-discursively intelligible for (and as part of) particular enacted subjects – for example as sense perceptions or thoughts or images – this does entail meaning-making. Then, with the iterativity of intra-action, patterns of meaning-making can develop for and as part of particular sets of iteratively enacted subjects, such that sustained meaningful communication can be said to occur.

Having sketched out how we will make sense of agency, knowledge, intelligence (as intelligibility), and the ability to communicate, as agential realist material-discursive practices that are not dependent on human involvement, we can bring the discussion back to collaboration. The kinds of collaborations that occurred at Findhorn included mutual care and consideration in their striving toward the good of the whole. In an agential realist onto-world, as we learned above, the ethical obligation is not from one separate pre-existing individual to another, but it is directed at how individuals differentially come into being in relation to one another. Similarly, collaboration is not between separate pre-formed individuals, but it occurs as part of the joint constitution of intra-action, in the sense that mutually intra-acting

agencies participate in their joint process of relational differentiating-entangling. But although anything that shows up in an intra-action is therefore a potential collaborator, simply participating in the co-constitution of another does not entail collaboration in anything more than a trivial sense. We will develop the notion that collaboration is enacted as part of mutually intra-acting agencies jointly taking responsibility for, or enabling new responses toward, the iterative enaction of their common world, and we will understand this taking of responsibility in terms of being attentive to the possibilities that might lead to mutual flourishing, or in terms of the regeneration of livable common worlds.[16] Before investigating this topic further in §1.7, we must include devas and nature spirits in the discussion, because devas and nature spirits show up as efficacious collaborators in Findhorn's plant-human practices, redefining the scope of what a plant is.

1.6 Devas and nature spirits in an agential realist onto-world

In Chapter 6, we will show how with agential realism, we are not precluded from making sense of Findhorn's devas and nature spirits. For nature spirits, we need to make sense of the etheric realm and its efficacious relationality with the physical realm. For devas, we need to understand what it could mean to exist "outside" of spacetime yet be efficacious in spacetime materialization. This will require us to move beyond physicocentrism and its associated causal structure. We will begin with

[16] As we will develop in Chapter 5, the notion of mutual flourishing comes from Barad (2007), while the regeneration of livable common worlds is from Apffel-Marglin's (2012) agential realist analysis of the practice of ritual.

a general discussion regarding spacetime and causality, followed by an overview of the relevant details pertaining to nature spirits, and then devas.

As discussed above, an agential realist onto-world does not have pre-existing spacetime realms, but we can address the notion of spacetime as a part of spacetimemattering. Spacetimemattering is the relational enaction of space and time along with matter, such that spacetime exists only in relation to the specificities of its material-discursive enaction. Moreover, spacetime is not bound to any particular geometry or other patterned regularities, but it is iteratively reconfigured according to the available possibilities and limited by any existing constraints. A modernist onto-world does not recognize this process of construction, starting instead with physical spacetime as a pre-given and fixed entity, and thereby losing touch with our participation in the material-discursive enaction of spacetimematter. With modernism, the existence of physical spacetime is primary, while with agential realism, it is not any particular determinate spacetime configuration but the very fact of spacetimemattering that is primary. The apparent spatiotemporal stability of our experience can be understood as the iterative enaction of particular patterns of spacetimemattering, as long as we recognize that these patterns do not thereby constitute causally-closed realms that exist apart from their iterative intra-action.[17] Thus, agential realism allows us to move beyond physicocentrism, because any

[17] The point being made here is that in the modernist onto-world, where reality consists only of a causally-closed physical realm, it is taken for granted that physical configurations are the only possible configurations of spacetime (and indeed, that this physical spacetime exists apart from any process of construction that could have been different).

spacetimemattering with its associated regularities can theoretically be agentially intra-acted, based on the available possibilities and subject to the existing constraints.

Regarding causality, in a modernist onto-world, the physical realm with its metrical spacetime is pre-existing and occupied by individual bits of matter that interact mechanically and through field effects, according to strict deterministic causality. In contrast, with agential realism, in/determinate phenomena are the ultimate units of reality, and there is no vector-like transmission of causal influence between separate interactions. Instead, a causal structure is enacted within phenomena as part of the agential separability of the cause and effect, thereby shifting the possibilities for further intra-action. This enacted causality has to do with the manner in which bodies are relationally differentiating-entangling, as opposed to the modernist causality of pre-given individual bodies externally affecting one another. We can also talk about "apparatuses" – material-discursive boundary-drawing practices that are responsible for enacting agential cuts – as causal factors in conditioning what is defined and how things are patterned in intra-action.[18] Finally, because of the dynamism of in/determinacy, we can talk about indeterminacy as playing a causal role in shaping intra-action. As we will see below, these types of agential realist causality do not explicitly account for, but neither do they explicitly exclude, the types of causality that occur in conjunction with Findhorn's devas and nature spirits.

[18] Apparatuses will be more thoroughly discussed in Chapter 6. In short, with agential realism, the notion of an apparatus is generalized from a physical-conceptual observing instrument in the laboratory, to a material-discursive practice that conditions specific agential cuts, thereby resulting in specific material reconfigurings of the world.

1.6.1 Nature spirits in agential realism

As discussed above, Findhorn's nature spirits do their work in the etheric realm, where they causally affect the materialization of entities in the physical realm. According to the Findhorn gardeners, the etheric realm is "nonmaterial" and "intangible" (Findhorn Community 1975, 102), and is made of a "fine energy substance" (Findhorn Community 1975, 114).[19] While Findhorn's devas are consistently referred to as being "outside" of spacetime, this does not seem to apply to etheric bodies, suggesting that they are materialized in or along with some form of spacetime. However, we know from Findhorn that these etheric materializations are not perceptible with the physical senses alone. We have defined the physical as ultimately perceptible by the physical senses and ultimately measurable, or locatable in a metrical spacetime. The fact that etheric bodies are not perceptible with the physical senses (and their current technological extensions) suggests that what Findhorn refers to as etheric is in fact different from what we are referring to as the physical, in which case we could say that Findhorn's nature spirits and the etheric realm do not exist in a modernist onto-world.

In contrast, in an agential realist onto-world, it becomes interesting to question this physicocentrism and to further explore how the distinguishing features of nature

[19] This is an example of how Findhorn's New Age onto-world does not have the appropriate language to talk about new concepts. It is assumed that only the physical realm is material, such that the etheric realm must be "nonmaterial", which however contradicts the assertion that it is made up of a "fine energy substance", or what is also sometimes referred to as "less dense" matter or matter of a "higher vibration". With agential realism, in contrast, we are no longer limited to physical spacetimematterings.

spirits and the etheric realm could be made sense of. In Chapter 6, we will investigate the pernicious role that physicocentrism plays in shaping our understanding of what is real. We will develop a feeling for how an onto-world could include transphysical spacetimematterings that are just as real as physical spacetimematterings, and we will consider how we might – in our own experience – recognize etheric spacetimematterings as distinct from (but thoroughly entangled with) physical spacetimematterings. Then, I will present the hypothesis that etheric spacetimematterings are distinguishable from and not reducible to physical spacetimematterings because they enact different spatiotemporal relations and causal connectivities.

Regarding the relationality between physical and etheric spacetimematterings, it is important to understand that these physical and etheric spacetimematterings do not each form causally closed realms or any kind of boundaried spaces of their own, but that they are relationally co-constituted and causally connected. We know from Findhorn that nature spirits build the etheric counterparts that supply the life force for the physical realm, thereby playing a causal role in how physical forms grow and develop. In an agential realist onto-world, we can say that certain sets of agential cuts enact etheric nature spirits along with physical plants, such that the enacted etheric-physical causal structure is indicative of the causal role that the nature spirits play in the enaction of physical determinacy within phenomena. It is important to note that physical spacetimematterings also affect etheric spacetimematterings, for example in the sense that physical constraints may cause an etheric counterpart to materialize

differently. In addition to this enacted causal structure, physical and etheric intra-actions can be enfolded through one another, affecting one another through exclusions and shifting possibilities. In Chapter 6, I will take what we know from Findhorn regarding the necessity of the etheric realm as the supplier of life force for the physical realm, presenting a hypothesis that further characterizes etheric spacetimemmatterings as conditioning physical spacetimemmatterings to enact life-specific processes.

These above hypotheses are speculative and will be provided only in order to give examples of how some of the specific features of Findhorn's nature spirits and the etheric realm could be made sense of in an agential realist onto-world. The thesis of this project is not dependent upon these hypotheses but is supported by the fact that agential realism overcomes the modernist limitations that preclude the possibility of accommodating etheric nature spirits (without reducing them to the physical). In summary, with the iterative enaction of multiple different yet causally-connected patterns of spacetimemattering in an agential realist onto-world, we are not precluded from talking about a multiplicity of enacted beings, not limited to humans or to physically spacetimemattering beings; in particular, we are presenting a possible way in which to make sense of nature spirits as "transphysical beings". Then, with particular sets of material-discursive practices such as those enacted at Findhorn, etheric nature spirits can be co-constituted along with humans, such that they together enact an efficacious collaboration.

1.6.2 Devas in agential realism

As with the nature spirits discussed in previous subsection, the important point to make in this subsection is that agential realism overcomes the modernist limitations that preclude the possibility of making sense of devas. We know from Findhorn that devas hold potential (non-materialized) forms "outside" of spacetime, and that they causally influence the spacetime materialization of these forms. Findhorn's devas and their potential forms do not exist in a modernist onto-world with its determinate physical individuals. But with agential realism, we can begin to make sense of Findhorn's devas by discussing in/determinacy and virtual intra-action (in this brief overview, we will focus only on in/determinacy). My claim is that devas – which I will be referring to as "virtual beings" – show up in agential realism as the indeterminacy within matter, where their causal role in shaping intra-action can be understood in terms of the dynamism of in/determinacy. In Chapter 6, we will also include Findhorn's God within as part of this discussion.

Matter in an agential realist onto-world is not pre-existing but is in/determinate, where indeterminacy is part of what makes it possible for matter to relationally differentiate in particular patterns and not others, but this indeterminacy is never resolved once and for all. We can say that indeterminacy refers to the possibilities, or the ordered sets of potential determination that are associated with phenomena, and determinacy refers to that which is iteratively and relationally differentiated within phenomena, thereby shifting the associated possibilities. But we must be careful not to think of phenomena as statically composed of bits of

determinacy and bits of indeterminacy; instead, phenomena are actively reconfigured through the ongoing dynamism of in/determinism, and matter is inseparable from its associated possibilities.

This in/determinacy of the agential realist onto-world provides an opening for making sense of Findhorn's devas. According to the Findhorn gardeners, the devas hold potential patterns and are associated with the "inner" aspect of a plant, which is inseparable from its "outer" aspect that is materialized in spacetime. The plant materializes in conjunction with the devas, which hold all the possible variations of patterns associated with that plant (in its ongoing spacetime materialization), and we can say that the constitution of the devas is in turn affected by these materializations. Moreover, Findhorn's devas are an inseparable part not only of plants but also of minerals, weather, land formations, insects, humans, machines,[20] etc. In an agential realist onto-world, with its dynamic reconfiguring of fundamentally in/determinate matter, we can begin to make sense of devas in terms of particular patterns of indeterminacy that are inseparable from, and dynamically reconfiguring with respect to, their associated spacetimematterings.

We must also address the fact that Findhorn's devas direct their "energy" toward the spacetime materialization of their potential pattern, thereby playing a causal role in the process of materialization. With modernism, there is no mechanism in terms of which to talk about causality stemming from something "outside" of spacetime, which conjures up Aristotelian notions of an active "form" that acts upon

[20] Devas can also exist for forms of matter that have been created by humans, such as machines (MacLean 1981, 103).

passive matter.[21] With quantum physics, we get the notion of a superposition of possibilities, along with the popular interpretation that upon measurement, this superposition "collapses" such that one of these possibilities becomes actualized while the others disappear. Moreover, it is common to interpret these superpositions in terms of an uncertainty that is resolved by measurement, resulting in the so-called "collapse". It is important to be clear that agential realism does not subscribe to this "collapse" interpretation of quantum physics but instead introduces intra-activity as the ongoing dynamism of in/determinacy, which is consistent with Bohr's understanding of superpositions as a matter of indeterminacy (as opposed to uncertainty). With agential realism, as will be further discussed in Chapter 6, the enactment of determinacy is a contingent, relational resolution of the indeterminacy, which does not result in a physical collapse of the entanglement, but rather reconfigures and redistributes the entanglement. Every agential cut is a differentiating-entangling – even as one set of possibilities becomes determinate within a particular phenomenon, the entanglement is extended in order to account for the new correlations produced by that cut. This is important because with a "collapse" interpretation, it may seem as if what is ultimately relevant to the enacted

[21] The Findhornian analogy mentioned above – that the devas are the architects of the plants while the nature spirits are the craftsmen – is the classic analogy utilized to explain Aristotle's theory of causation, where the "architects" refer to the formal cause, or the active form that informs the passive matter. It is unclear whether the Findhorn gardeners intended the devas to be construed in this Aristotelian manner, and it is furthermore unclear what is meant by "energy" when it is said that the devas direct their "energy" to spacetime materialization. This is another example of not having the appropriate language to talk about new concepts, which is why we are making sense of devas with agential realism. Regarding the analogy, it is still a useful analogy, but with agential realism, the relationality between the architect and the craftsmen is complexified.

determinacy is only the one possibility that has been enacted, but with agential realism, the determinacy is constituted by the entire pattern of possibilities.

Thinking in terms of devas, we might imagine that all the various plant devas existing "outside" of spacetime are each directing their "energy" toward a particular spacetime materialization that will then take on its particular plant pattern (in conjunction with other conditions and constraints) – the broccoli deva is implicated in the materialization of the broccoli plant, the kale deva is implicated in the materialization of the kale plant, etc. However, from the Findhorn gardeners we know that devas are both one and many, so this image is too simplistic. With the help of agential realism, we can recognize devas as entangled patterns of possibilities, such that if any "one" deva can be said to cause spacetimematterings, it is by virtue of their joint action. This means that every physical plant is constituted by every deva, to at least some degree, even if only by virtue of its exclusion. Thus, indeterminacy can be said to play a causal role in shaping intra-action, in the sense that determinacies-within-phenomena are constituted not by any single possibility that becomes determinate while the other possibilities disappear, but by the entire pattern of possibilities involved in the intra-action, such that the indeterminacy does not resolve once and for all, but is further entangled.

In showing how it is possible to make sense of devas in terms of the indeterminacy within matter that plays a causal role in shaping intra-action, we must also pay attention to any subtle differences that matter. That is, Findhorn's devas are beings that collaborate with humans, so it would be limiting and incorrect to simply

claim that devas *are* the indeterminacy within matter. Instead, I am proposing the possibility of devas as virtual beings that hold and work with the patterns of possibility associated with particular sets of intra-actions; in Chapter 6, I will present hypotheses regarding how we could make sense of "holding" and "working with" patterns of possibility in the context of agential realism. Then, instead of simply engaging with indeterminacy as an abstract concept that is necessary in order for the mathematics to function properly, our analysis suggests that it might be possible to work with the indeterminacy of matter by investigating what kinds of cuts produce devas, and then collaborating with these devas.

In summary, with the dynamic in/determinacy of matter in an agential realist onto-world, we can begin to make sense of Findhorn's devas in terms of the indeterminism that plays a role in causally shaping intra-action. We can additionally speculate about how to make sense of some of the specific features of devas as virtual beings, but in terms of supporting the thesis of this project, what is important is that we have shown that agential realism overcomes the modernist limitations that preclude the possibility of making sense of devas at all. In conjunction with the outline presented in the previous subsection for making sense of nature spirits as transphysical beings, we can, in an agential realist onto-world, find a way to engage with Findhorn's plant-human collaborative practices instead of dismissing them outright, as would be likely from within a modernist onto-world.

1.7 Engaging scientifically with plant-human collaboration

In Chapter 7, we will explore what might be required in order to engage scientifically with plant-human collaboration in an agential realist onto-world. In a modernist onto-world, scientists focus on the fully-formed, physical aspects of matter, which means that they engage with plants as what I will refer to as "simple objects", or as determinate individual objects located in physical spacetime. In contrast, the Findhorn gardeners engaged with plants as complex beings spacetimemattering both physically and etherically in conjunction with their devas and nature spirits – with agential realism, we can say that they engaged with plants as complex material-discursive phenomena. With the physicocentrism of the modernist onto-world, devas (virtual beings) and nature spirits (transphysical beings) are explicitly excluded, but in an agential realist onto-world, we can recognize virtuality and transphysicality as hidden apparatuses[22] involved in the production of plants.

In an agential realist onto-world, we have an ethical obligation to take responsibility for these apparatuses as part of our scientific practices. As we discussed above, agential realism is an ethico-onto-epistemology in which ethics is given as part of the structure of intra-action. I do not pre-exist as an individual with an ethical obligation and with an ability to collaborate, but I-in-the-process-of-becoming, or "I", am relationally co-constituted with and as part of everything that is

[22] Here, and throughout this paper, the term "apparatus" is being utilized in the agential realist sense, not simply as a measuring device in the laboratory, but as a material-discursive practice that conditions specific agential cuts, thereby resulting in specific material reconfigurings of the world. Findhorn's devas and nature spirits – or virtuality and transphysicality, more generally speaking – are hidden apparatuses in the production of plants, because the role that they play is not accounted for in the modernist onto-world.

"other" to "me", and therefore "I" have an intrinsic responsibility toward all "others", both ethically and as potential collaborators. In this way, scientific experiments cannot be performed in isolation from their ethical implications, because with every action, we are always already engaged in materializing the world in certain ways and not others. In studying plants scientifically, whether we consider them to be simple objects or complex material-discursive phenomena, we are inherently responsible for the ethical implications. This gives us a reason to reconsider our working relationships with plants.

As an example in Chapter 7, we will include a discussion of plant-human collaboration in the context of a recent technological achievement in which spinach plants were implanted with carbon nanotubes in order to detect the presence of explosives in groundwater (Wong et al. 2017). It may be easy to justify this collaboration according to human values, but when we ask *for whom* this collaboration is beneficial, we need to be open to the possibility that it might be somehow deleterious to these plants to be forced to assume non-native functions in service of human needs. The fact that a nanobionic spinach plant is an exciting technological achievement masks the underlying ethical issues that require us to reconsider our working relationship with plants. But how should we understand the "for whom" in relation to plants?

In the context of scientific and philosophical research on plants, there is a growing body of work on what is variously referred to as "plant cognition", "plant intelligence", "plant consciousness", and "plant neurobiology", and which I will refer

to collectively as “plant sentience”. An overview of some of the research on plant sentience is presented in Appendix A. This research is being conducted with modernist scientific approaches and rigor, yet it remains on the fringe and tends to be dismissed or even ridiculed by mainstream modernists. If we include in this discussion the possibility of plant devas and nature spirits as experienced by the Findhorn gardeners, who were not even working with academic methodology, this would clearly constitute a further violation of modernist adherences. Interestingly, as discussed in Appendix A, this scientific and philosophical research on plant sentience is embedded within a modernist onto-world, yet it stretches toward the in/determinate relationality of agential realism with “embodied” and “ecological” approaches that begin to blur the boundaries both between pre-existing individuals and between matter and mind/meaning. If the scientific research within the modernist community is suggesting that plants have some degree of sentience, and if we begin to consider that we are working with plants as fellow sentient beings, then it does make sense to include the plants when we inquire for whom our research practices matter.

Whether or not we think of plants as sentient beings, agential realism confirms that plants are more than simple objects (there are no simple objects in agential realism), and that questions of ethicality extend beyond the human. With agential realism, objects exist only in conjunction with the entire phenomenon that is productive of the object, where what is excluded matters too. A plant that we see growing in the ground is only an object by virtue of its co-constitution with “us”, not to mention its iterative co-constitution with the rest of its enacted environment.

Moreover, objects are enacted materially-discursively, so we must take into account not only physical data but also social and cultural practices, recognizing that these do not exist separately from one another. According to agential realism, not only do "we" shift along with our objects of study, but "we" are responsible, at least in part, for the world that "we" participate in shaping. Thus, it is not sufficient to study, describe, and work with plants (or anything else) as simple objects, but we must take responsibility for our intra-active participation with plants as agential realist phenomena that are entangled with all sorts of diverse material-discursive practices.

In the context of Findhorn's plant-human collaboration, analyzing the material-discursive apparatuses that are productive of plants means recognizing that in a physicocentric modernist onto-world in which humans are the only agents, the work of virtual and transphysical beings is excluded from mattering. One way in which to engage with virtuality and transphysicality in our scientific practices is through their physical traces in laboratory experiments. That is, anything non-physical cannot be measured, imaged, or otherwise detected with the physical senses, but with agential realism as a theoretical framework, it should be possible to connect the effects of virtuality and transphysicality with their physical traces. For example, the Lamb shift is a scientifically accepted example of linking virtuality (vacuum fluctuations) to a measurable value.[23] In Chapter 7, we will discuss two further examples regarding measurements of bioelectric fields. First, Barad (2015) shows

[23] As Barad (2007) explains, the hydrogen spectrum, which indicates the differences corresponding to the possible energy levels of hydrogen's electron, includes a measurable shift – called the Lamb shift – corresponding to the vacuum fluctuations of the quantum vacuum (92).

how the bioelectric pattern of a frog face, which lights up on the surface of a developing frog embryo *before* the actual frog face develops, can be understood with agential realism in terms of virtual intra-actions, or the virtual exploration of possibilities for how this face could be materialized. Second, the "biofield" is proposed to be an electromagnetic field that surrounds living bodies and is associated with energetic healing modalities that function in terms of some kind of "subtle" energies or bodies, making it possible to link changes in the images of these biofields to the efficacy of these healing practices (Rubik 2002), but without a theory that rigorously links the subtle bodies (e.g. virtuality and transphysicality) to the physical images. These examples will show that while anyone could claim that a measurement or an image is indicative of virtuality or transphysicality, agential realism is a theoretical framework (based on a coherent interpretation of quantum physics) that makes it possible to causally connect physical and transphysical spacetimematterings, along with the virtuality that is partially constitutive of all spacetimematterings.

In order to work with virtual and transphysical beings beyond a mere examination of their physical traces in laboratory experiments, we must develop apparatuses other than the physical sense organs, and we must accept the types of knowledge that are produced as part of these new ways of engaging. In Chapter 7, we will discuss how both Goethe and Barbara McClintock developed apparatuses beyond their physical sense organs in order to engage in alternative ways of knowing as part of their scientific practices. By including collaborations with the relevant plant devas and nature spirits as part of our scientific practices with plants, we could frame our

practices in a manner that is aligned with the work of these virtual and transphysical beings, thereby taking account of these otherwise hidden apparatuses while engaging in ethically responsible working relationships with plants. This could help ignite a shift from studying plants as simple objects for scientific and technological progress, to responsibly co-creating a mutually flourishing world through our collaborations with devas and nature spirits (and other human, non-human, virtual, and transphysical beings). This is part of a more general shift from a modernist science that studies nature in apparent isolation from social, political, or other contextual influences, to science as a politics of intra-actively coordinating a livable common world among and for a multitude of enacted beings.

1.8 Summary

In this project, we are deepening our engagement with the modernist and agential realist onto-worlds in the context of the plant-human collaborative practices of Findhorn's New Age onto-world. None of these onto-worlds is separate or pre-given or fixed, but each is iteratively differentiating-entangling from a fundamentally in/determinate universe according to a characteristic, dynamically-shifting pattern. With agential realism in its role as the overarching framework informing the methodology of this project, we can understand the modernist onto-world as produced by a particular set of practices and cuts. Specifically, it appears that the material-discursive practices of modernist scientists produce agential cuts that enact only physical spacetimematterings as part of their scientific data, while also obscuring the

role of indeterminacy in intra-action; this is why we cannot make sense of Findhorn's devas and nature spirits in a modernist onto-world. In contrast, Findhorn's New Age onto-world is more versatile because their material-discursive practices produce agential cuts that enact other spacetimematterings besides the physical (etheric nature spirits), while also providing an engagement with indeterminacy (the devas and their potential patterns). But it is challenging to make scientific sense of devas and nature spirits in a New Age onto-world because of their implicit acceptance of modernist limitations, as well as their incoherent appropriations of quantum physics, not to mention their other problematic practices. Thus, we turn to the agential realist onto-world, which, among other features, provides a coherent interpretation of quantum physics.

In this introduction, we have provided an overview of the support for the thesis that agential realism is a framework that allows for the possibility of coming to terms in a scientific way with the efficaciousness of Findhorn's practices of plant-human collaboration by overcoming the limitations of implicit modernist constructions. With agential realism, we overcome human exceptionalism, making room for collaborators other than humans, and through the fundamental in/determinacy of matter, we can overcome physicocentrism, presenting the opportunity to make sense of devas as virtual beings, and of nature spirits as transphysical beings. Scientifically, the agential realist onto-world provides the possibility of developing specific theories that connect virtuality and transphysicality to their physical traces in laboratory experiments. Moreover, with collaboration in an

agential realist onto-world construed in terms of jointly taking responsibility as part of mutual intra-action, we can take responsibility for creating ethical working relationships in our scientific practices with plants by including collaborations with the relevant virtual and transphysical beings, working toward mutual flourishing.

2. Ontological, Anthropological, and Methodological Considerations

> When you are criticizing the philosophy of an epoch, do not chiefly direct your attention to those intellectual positions which its exponents feel it necessary explicitly to defend. There will be some fundamental assumptions which adherents of all the variant systems within the epoch unconsciously presuppose. Such assumptions appear so obvious that people do not know what they are assuming because no other way of putting things has ever occurred to them. With these assumptions a certain limited number of types of philosophic systems are possible, and this group of systems constitutes the philosophy of the epoch. (Whitehead 1925, 48)

In our examination of plant-human collaboration as it occurred in Findhorn in the 1960s, we will be working with three different onto-worlds: Findhorn's New Age onto-world, the modernist onto-world, and the agential realist onto-world. The term "onto-world" is being used to remind us of the inseparability of "world" and "ontology", as was discussed in Chapter 1 and as will be further elaborated below. As an example, the modernist onto-world is not merely a theory about the nature of reality, nor is it a pre-given world, but it is an ever-shifting set of material-discursive practices that enacts particular patterns that we can recognize as "modernist". This understanding of the inseparability of "world" and "ontology" is based on agential realism – though it is important to note that Barad's (2007) agential realist framework does not itself make use of the term "onto-world" – where agential realism is functioning as a guiding framework informing the methodology of this project. That is, I am drawing on agential realism in two different ways in this project – both as the overarching framework and as one of three onto-worlds. In the context of making sense of Findhorn's plant-human collaboration, these three onto-worlds are each characterized by different sets of background assumptions and practices, resulting in

different possibilities of engaging with plant-human collaboration, but as we will develop in this chapter, it is agential realism that helps us understand how to approach an engagement with these multiple onto-worlds in the first place.

The New Age onto-world will be discussed in Chapter 3 along with a detailed presentation of Findhorn's plant-human collaboration. Overviews of both the modernist and agential realist onto-worlds will be presented in §2.1 of this chapter. Then, in preparation for our philosophical engagement with Findhorn's plant-human collaboration in the following chapters, we will, in §2.3, discuss our particular use of agential realism's diffractive methodology as an approach to working with Findhorn's practices, or more generally, with the practices of any different onto-world. In order to illuminate this methodology more clearly, we will first, in §2.2, discuss the recent "ontological turn" in anthropology, using agential realism to help extend some insights, as well as resolve some ambiguities, that have been raised as part of this ontological turn. This anthropological engagement will serve to clarify our use of agential realism as the overarching framework guiding the methodology of this project, by situating our use of agential realism as an extension of current anthropological practices.

2.1 Ontological Overviews

2.1.1 The modernist onto-world

I will use the terms "modernist" and "modernism" not to describe a coherent position that a specific group of individuals can be said to hold, but to point to a

general set of beliefs and practices that cohere with modernist common-sense, that tend to be scientifically-informed, and that most likely characterize the general ontological understanding with which, whether overtly or implicitly, the intended audience of this dissertation was educated. In this summary of the modernist onto-world, I will briefly discuss several of the historical developments that are relevant both to the rise of modernism and to its current destabilization, focusing on specific details and examples that exemplify the aspects of modernism that are relevant to our study of plant-human collaboration: nature-culture dualism, mechanism, individualism, representationalism, reductionism, and quantification. My description of modernism is based on various sources, most notably including Frédérique Apffel-Marglin (2012),[24] Richard Tarnas (1993), and Alfred North Whitehead (1925).[25]

As will be developed, my specific use of the term "modernism" is based on the Cartesian-Newtonian conception of the universe that arose and took hold through multiple transformations in fifteenth through nineteenth century Europe, differentiating itself from the prevailing religious and non-dualist views. Specifically, I will be discussing (i) the mathematical-mechanical view of the universe in the context of the Scientific Revolution in seventeenth century Europe, (ii) the undermining of non-dualist practices as part of the nature-culture dualism that arose along with both the mathematical-mechanical view of the universe and the political-

[24] Apffel-Marglin's (2012) interpretation of modernism is particularly relevant to our discussion regarding Findhorn's devas and nature spirits, because she contrasts modernism with agential realism in the context of practices such as ritual, which involve spirits.

[25] Other sources that are implicated in my scientific characterization of the modernist onto-world include Burtt (2003), Capek (1960), and LeClerc (1972).

economic system that was developed in seventeenth century Europe, and (iii) the challenges to this framework with twentieth century developments in physics.

According to Tarnas (1993), modernism emerged out of Europe between the fifteenth and seventeenth centuries – rooted in and yet differentiating itself from both the medieval Church and ancient views – in the form of the Renaissance, the Reformation, and the Scientific Revolution (282). We are here focusing on the mathematical-mechanical view of the universe that developed as part of the seventeenth century Scientific Revolution. As part of this, both Kepler and Galileo were instrumental in formulating a new way of seeing the universe as mathematically organized, which enabled them to make progress in science by making empirical observations and fitting them to mathematical hypotheses (Tarnas 1993, 262): Kepler revolutionized celestial motion by suggesting that the planets go about their orbits due to mechanical forces (Tarnas 1993, 262), and Galileo applied mechanical and mathematical analyses to terrestrial systems (Tarnas 1993, 263). Additionally, Descartes was conceiving his mechanistic philosophy in which the physical universe is made up of inert particles of matter that interact with one another according to laws (Tarnas 1993, 268). Newton then brought all these ideas together with his three laws of motion and his universal theory of gravitation that accounted for both terrestrial and celestial motions (Tarnas 1993, 269).[26] Also with Newton, the study of physics became satisfactorily based upon the use of measurement, such that science became

[26] The Newtonian conception of gravity is not actually mechanistic, but is a force that acts at a distance, in the sense that every bit of matter attracts every other bit of matter; despite this fact, the universe was still seen as a mathematical-mechanical system (Tarnas 1993, 270).

primarily quantitative: "Search for measurable elements among your phenomena, and then search for relations between these measures of physical quantities" (Whitehead 1925, 44-45). Thus, by the beginning of the eighteenth century, the universe was seen as a complex mathematical-mechanical system (Tarnas 1993, 270).[27]

Several key features of the modernist onto-world are evident in this Cartesian-Newtonian view of the universe. For example, Whitehead (1925) remarks that a fundamental assumption underlying the Cartesian-Newtonian formulation is that "the world is a succession of instantaneous configurations of matter" (50), in the sense that nature is composed of bits of matter that are located in independently-existing space and time without any necessary relations to any other matter, space, or time (49); this is the metaphysics of individualism[28] that underlies the modernist onto-world. Moreover, because forces are determined by how matter is configured, these configurations of matter determine their own changes (Whitehead 1925, 50), creating a self-contained material system: "The new universe was a machine, a self-contained mechanism of force and matter, devoid of goals or purpose, bereft of intelligence or consciousness, its character fundamentally alien to that of man" (Tarnas 1993, 326). As Whitehead (1925) notes, this notion of a separate human mind that experiences an external world made of meaningless matter resulted in a fundamental duality between matter and mind (54-55), where this matter-mind duality is an expression of the

[27] With Newton, the universe was still seen as having been created by God, the divine architect (Tarnas 1993, 270).
[28] I am following Barad (2007) in utilizing the term "metaphysics of individualism", and also the term "individualist metaphysics".

nature-culture duality that we will discuss below. Furthermore, with mechanism serving as the new form of explanation, final causes (teleology) and spiritual causes (God), which could not be scientifically tested, were expunged from science (Whitehead 1925, 306), such that the modernist concept of causality includes only the material and efficient causes (Whitehead 1925, 488 n11). Thus, the Cartesian-Newtonian formulation provides the vision of a material universe in which systems can be isolated in ideal circumstances and probed by science in order to precisely calculate the details of this universe simply through the knowledge of the changes in motion of bits of matter (Whitehead 1925, 45-46). This vision of the universe was accompanied by a reductionistic methodology, or by the assumption that ultimately, all the complexities of experience could be reduced to fundamental scientific principles (Tarnas 1993, 332). As discussed above, this was to be accomplished through a process of making empirical observations and fitting them to mathematical hypotheses, by determining the mathematical relationships between measurable qualities.

According to Tarnas (1993), this seventeenth century Cartesian-Newtonian formulation of the mechanistic cosmos resulted in a new kind of truth: with science replacing religion as the ultimate authority (247, 286), science now stood for both common sense and concrete reality, promising objectivity and certainty, prediction and control, invention, and the ability to know through observation and reason (282-283). This formulation was strengthened during the eighteenth and nineteenth centuries, as medieval aspects were removed through the Enlightenment, the

industrial and democratic revolutions, the rise of the West to global hegemony, and Darwin's theory of evolution (Tarnas 1993, 284). The canonical view is that the mechanistic philosophy took hold because it was epistemologically superior to the existing (non-dualist) philosophies in terms of its ability to account scientifically for the available evidence (Apffel-Marglin 2012, 32). However, Apffel-Marglin (2012) points out that a critical rethinking[29] of mechanical nature as universally given has resulted in the insight that the flourishing of this mechanistic philosophy was not due to an innate superiority but was enabled during its initial seventeenth century formulation by concurrent political and economic forces (34). We will discuss these political and economic forces in some depth, as they are relevant to the context of this project in understanding how the modernist onto-world came to exclude entities such as spirits.

According to Apffel-Marglin (2012), Descartes' mechanical philosophy was partially enabled by the dualistic thinking that accompanied the sixteenth and seventeenth century politics of domination in Western Europe, in which non-dualist groups were persecuted as part of the rise of the market economy and the enclosure of common lands. For Apffel-Marglin (2012), non-dualist groups include various European Renaissance movements such as occult philosophy, hermeticism, alchemy, and "magic" (28), as well as Indigenous ontologies[30] in which spirits exist and practices such as ritual are efficacious; she characterizes these non-dualist groups in

[29] This critical rethinking occurred in fields such as science studies, feminist studies, and anthropology (Apffel-Marglin 2012, 34).
[30] The specific "Indigenous ontology" that informs Apffel-Marglin's (2012) book is based on her experiences with Indigenous people in the Peruvian Andes.

terms of viewing nature as animate, infused by the divine, and having its own agency, where humans are not ontologically separate from this nature (30). In contrast, according to Apffel-Marglin (2012), a hallmark modernist practice is the dualism between "nature" and "culture", in which agency is granted solely to human minds, or "culture", and the rest of "nature" – which also includes subjugated or otherwise excluded humans – is rendered a passive resource. Similarly, ecofeminist Val Plumwood (1993) identifies such dualisms[31] as being at the root of the western mechanistic conception of nature (104) and of materialist reductionism (120). Plumwood (1993) describes the nature-culture dualism as resulting from: first, the identification of the human with "mind" or "reason"; second, the construal of "mind" and "reason" so as to exclude nature; third, the construction of nature as "ineluctably alien" (107).

According to Apffel-Marglin (2012), this rise of the nature-culture dualism occurred along with the gradual defeat of the non-dualist paradigm during sixteenth and seventeenth century Western Europe (26-27), as part of the enclosure of common lands and the rise of the market economy. An important aspect of non-dualist practices was the use of common lands, where humans, non-humans, and spirits – which were all intertwined with one another – could practice rituals as part of honoring their obligation to this communally entangled web (Apffel-Marglin 2012, 36). But between the late fifteenth through the eighteenth centuries, throughout

[31] For Plumwood (1993), the nature-culture dualism is best understood as one of a set of interrelated dualisms informing Western culture, where this set of interrelated dualisms also includes, for example, male-female, master-slave, mind-body, subject-object, and self-other dualisms (42-43).

Europe but primarily in England (Apffel-Marglin 2012, 36), these common lands were enclosed and privatized, and those who had participated in non-dualist practices on these lands were persecuted, for example as "witches" (Apffel-Marglin 2012, 28, 42). When humans living in these non-dualist ways, co-creating with a land that was alive and had agency, were forced through colonial-type politics to work for the new "owners" of the land, human labor became a commodity, the land became a resource, and nature came to be viewed as de-spirited and agency-less (Apffel-Marglin 2012, 36). Moreover, with the development of the market economy in the seventeenth century, humans were further disentangled from nature as they benefited from acting in their own self-interest instead of as part of a communal web (Apffel-Marglin 2012, 37), and both the human and the non-human went from being part of a community to being resources that factor into economic equations (Apffel-Marglin 2012, 38). In summary, these colonial politics of domination stripped "nature", as well as particular groups of humans, of all or some of their agency, instead granting the agency to "culture", or to the empowered humans. Thus, economic and political power structures became aligned with the dualistic modernist influence, or with the masculine modern Western subject, marginalizing and disempowering groups of people whose means of livelihood and sense of self were based on non-dualist practices, which included both women and Indigenous peoples (Apffel-Marglin 2012, 27).

According to Apffel-Marglin (2012), these political and economic forces were partially responsible for enabling the acceptance of the new mechanistic view of the

universe, including the representationalism that it entailed (as will be discussed below) (27, 51-52): "…these ongoing actions of enclosure, and all that they entailed, were the sociopolitical horizon that fostered the emergence of the Cartesian mechanist dualist worldview, and gave it its plausibility" (54). The mechanistic philosophy depends upon a nature that is made up of bits of matter that are mechanically subject to external forces and laws instead of moving themselves, which is contrary to non-dualist views of nature as spirited and having agency. But concurrent with Descartes' creation of this mechanistic philosophy during the first part of the seventeenth century, common lands were being enclosed, and those who participated in non-dualist practices on these lands were being persecuted (Apffel-Marglin 2012, 42). As we have discussed, this meant that the land was stripped of its agency and treated as a material resource, and the economic interest of the individual replaced the communally entangled web of humans, non-humans, and spirits: "Nature as an agency-less, amoral entity could only emerge once people bypassed the spiritual dimension and treated the land and the rest of the landscape not as the source of gifts from God and/or the spirits, but as purely material entities to be used for one's own material advantage" (Apffel-Marglin 2012, 41). With agency relegated to the individual humans in power, everything else became agency-less, de-spirited matter that could be adequately described by the emerging mechanistic philosophy.

Regarding representationalism, Apffel-Marglin (2012) explains how the act of representing is possible only in a dualistic and mechanistic worldview, in which "humans have the exclusive capacity to unilaterally speak of or otherwise represent

what is taken to be a pre-given social or physical reality" (52). That is, with the nature-culture dualism, the human becomes a privileged, subjective "we" that is separate from the rest of the exterior world, and a gulf opens between the sentient human mind with its unique qualities and characteristics, and a separate, passive world made of matter that obeys mechanistic laws. This ontological dualism between matter and mind goes hand in hand with a representationalist epistemology: with individual subjects and objects as separate and pre-given, the human mind is limited to forming "representations" of the external world that it seeks to understand. This results in an epistemological crisis because there is no inherently necessary relation between the human mind and the entities in the external world, with no way to prove that the representations accurately reflect the world.[32] Another related feature of the modernist onto-world is human exceptionalism, or the fact that non-humans are excluded from having particular attributes and abilities that are granted to humans. For example, Tarnas (1993) explains how it is a consequence of the modernist framework that intelligence and purpose belong only to humans, who use these unique capacities to manipulate the impersonal material world (286-287).

This modernist conception that we have been developing, as based on the classical Cartesian-Newtonian cosmology, flourished during the golden age of

[32] One implication of representationalism, according to Apffel-Marglin (2012), is that it excludes the possibility of properly understanding practices such as the types of ritual in which humans engage in efficacious co-creation with the non-human world via spirits, which is similar to what we are considering in this project regarding plant-human collaboration. In Apffel-Marglin's (2012) assessment, efficacious ritual practice depends upon an ontological entanglement of human and non-human, as well as of spirit and matter, which are not available in a modernist onto-world. Thus, a modernist would naturally conclude that practices such as ritual cannot be efficacious, and that the human is only symbolically or metaphorically representing a "nature" that is silent, passive, and separate (49-52).

science in the nineteenth and early twentieth centuries – science was linked to technology, religion and philosophy were defined in terms of science, and there was an unbounded optimism in the potential of science (Tarnas 1993, 355). However, this modernist conception was challenged by late nineteenth and early twentieth century developments in physics, such as Einstein's theories of relativity and the development of quantum physics. According to Tarnas (1993), by the end of the 1930s, the classical Cartesian-Newtonian picture of the world had been undermined, including the notions of individual solid building blocks (atoms), space and time as pre-given, and strict mechanistic causality (356);[33] however, the scientific challenges posed by the new physics were not reconcilable by physicists in terms of how these theories were supposed to describe the actual world, and they also remained mostly unintelligible to the imagination of the layperson (358). Thus, my description of the modernist onto-world includes an awareness of these developments, in the sense that they are utilized scientifically and technologically, and perhaps discussed colloquially, but they are not part of the common-sense understanding that informs how modernists generally see, interact with, and understand their world, which still adheres mostly to the classical Cartesian-Newtonian understanding. This classical understanding also includes the notion of an electromagnetic or gravitational field

[33] For the purpose of my description of the modernist onto-world, I am focusing on these scientific challenges to the Cartesian-Newtonian view of the universe, but this is not to exclude the concurrent philosophical challenges that resulted in the recognition that, as Tarnas (1993) puts it, "the truths of science are neither absolute nor unequivocally objective" (359). Of course there have been more recent philosophical challenges to the modernist onto-world as well, from diverse fields, but in the context of this project, we will be focusing on how agential realism provides an alternative to the modernist onto-world.

that pervades all space and time, such that we can understand causality as occurring both mechanically and through field effects.

In summary, based on this historical analysis of the rise of modernism and its subsequent destabilization, I will be referring to the modernist onto-world as follows. The ultimate entities of the modernist onto-world are individual bits of matter that are fully determinate at any given moment, that occupy a definite location in universal space and that persist through universal time, that are intrinsically characterized by various measurable qualities, and that are externally related to one another in ways that can be adequately expressed by mathematical relations. Movement and change are understood in terms of the locomotion of these bits of matter through space and time, and causality occurs as mechanical interactions and through field effects. Scientists analyze phenomena by reducing them into discrete, determinate parts that can be related to one other via quantifiable relations, which enables both prediction and control of the phenomena without recourse to "supernatural" or "metaphysical" explanations. That is, religiously inclined modernists implicitly accept the existence of immaterial agents such as God and angels, although such entities are usually treated as mere beliefs and held separate from any scientific discussion. The data of science is that which can be observed in a reproducible manner by the bodily senses and their technological extension. In some cases, the data of science also includes phenomena such as gravitational fields that cannot themselves be directly observed but that are accepted as real by virtue of their observable effects. Although only these data of science are ultimately considered to be real in the modernist onto-world, the

common-sense modernist understanding also includes the sentient human mind that – as part of the nature-culture dualism – is endowed with qualities not otherwise found in nature; this is an example of human exceptionalism, and it moreover results in representationalism as the dominant form of knowing. As we will see in the following subsection, agential realism challenges many of these features of the modernist onto-world.

2.1.2 The agential realist onto-world

The agential realist framework, developed by theoretical particle physicist and feminist science studies scholar Karen Barad (Barad 2007), is an ethico-onto-epistemology that provides a coherent interpretation of quantum physics. Agential realism is a rational reconstruction and further elaboration of Niels Bohr's interpretation of quantum physics, as diffracted through feminist science studies, philosophy of science, and a host of political insights from fields such as Marxist studies, critical race studies, postcolonial studies, queer studies, trans studies, deconstruction, and post-structuralism. Some of the key characteristics of agential realism, in contrast to modernism, are its basis in quantum instead of Newtonian physics, its metaphysics of relationality as opposed to individuality, its performativity in place of representationalism, its inclusion of the ethical and political dimensions, and its critical engagement with humanism. Agential realism proposes a shift from a representationalist framework based on pre-existing, determinate, individual entities where human minds are the only knowers situated in an external material world, to a

relational ethico-onto-epistemology in which subjects (not limited to humans) and objects, as well as space and time, do not individually pre-exist but are iteratively enacted in relation to one another, within and as part of entangled in/determinate phenomena. The ultimate units of reality are thus not individual determinate entities, but rather, they are phenomena, which are ontological entanglements of inseparable entities that do not pre-exist their entanglement, but rather, intra-actively emerge. An ontological entanglement means that matter is fundamentally indeterminate, in that there are always multiple incompatible possibilities for how determinacy could be enacted within a phenomenon; the use of the term "in/determinate" signifies the dynamism of indeterminacy and determinacy. These details will be further discussed in what follows.

Without going into too much detail about the physics, it is nevertheless important to convey that Bohr overcame significant limiting assumptions about the nature of reality through his work on addressing the puzzling outcomes of quantum mechanics. The representationalist (modernist) belief is that words mirror a pre-existing nature, so that humans are outside of nature reflecting back on nature. But through experiments in which the nature of light presents as either wave or particle (mutually exclusive behaviors) *depending upon the apparatus used to observe it*, it became clear to Bohr that as observers, "we are a part of that nature that we seek to understand" (Barad 2007, 26). This result also holds for the nature of matter. Thus, Bohr recognized that we are no longer outside of nature reflecting back on nature, but that we are an active part of nature, thereby anticipating performative accounts in

which discursive practices are understood "as practices of engagement with, and as part of, the world in which we have our being" (Barad 2007, 133). This required Bohr to re-work key modernist adherences, notably the assumption that the ultimate entities are spatially separable individuals with determinate properties. As we will see in what follows, Barad remains true to Bohr's attempt at placing the human back into nature,[34] while fixing certain inconsistencies and limitations by making his account ontological, by generalizing it beyond laboratory experiments and beyond the human, and by reworking key concepts including matter, causality, space, time, objectivity, agency, and ethics.

From Heisenberg's uncertainty principle, we know that the momentum and position of an electron cannot be simultaneously measured beyond a certain level of precision – that is, they cannot be simultaneously known – though it is assumed that these values still exist. Bohr disagrees with Heisenberg,[35] and instead of the uncertainty principle, he proposes the theory of complementarity. For example, when an experiment is configured to measure position, that particular experimental setup precludes the possibility of measuring momentum[36] – not only does the momentum have no determinate value, but the very concept of momentum has no meaning, or in other words, there is no determinate property called momentum (Barad 2007, 111). Because position and momentum measurements are dependent upon mutually exclusive experimental setups, such that these concepts are not materially compatible,

[34] This does not mean that the human is reduced to nature, because this rethinking of the human in relation to nature is done in conjunction with a rethinking of the nature-culture binary itself.
[35] See Barad's (2007) account of the differences between Bohr and Heisenberg (402-403).
[36] A position measurement (of an electron) requires a fixed support while a momentum measurement requires a moveable support. See Barad (2007), p.111 for more details.

the corresponding values are not only not simultaneously knowable (as Heisenberg would claim), but they do not simultaneously *exist*. For Bohr, concepts are inseparable from the physical arrangements that give meaning to these concepts, which is what it means to say that the conceptual and physical cannot be separated (Barad 2007, 109, 139). Barad generalizes Bohr's physical-conceptual observational instruments, which are measuring devices in the lab conducted by humans, to *material-discursive practices*. With Barad's generalization, the term "material" goes beyond physical laboratory instruments to encompass any material arrangement. Importantly, "matter" – including laboratory instruments – refers not to individual determinate things, but to phenomena that are iteratively and intra-actively reconstituted. Similarly, the term "discursivity" applies not only to the description of static, linguistic, human concepts, but is also *productive* of concepts and knowledge (among other things) by constraining and enabling what is possible (Barad 2007, 147-149).[37] Discursive practices are boundary-drawing practices that result in specific material (re)configurings of the world (Barad 2007, 206, 334), and material-discursive practices are generalized claims about the nature of reality – not limited to experimental findings, and not limited to human actions. The materiality and the discursivity of a material-discursive practice cannot be separately articulated, but are better referred to as "material-discursive". Comparing this to the modernist nature-culture dualism, with agential realism, both "nature" (the material) and "culture" (the discursive) are material-discursive practices, and neither can be articulated without

[37] Barad's (2007) reframing of discursivity is done in conversation with (and drawing on insights from) Foucault's notion of discursive practices (147-149).

the other. And comparing this to the modernist representationalist way of knowing, with agential realism, knowing occurs as a part of coming-into-being, which is how epistemology and ontology become inseparable.

Along with this disruption of the nature-culture dualism, the modernist metaphysics of individualism no longer holds up either, radically changing our understanding of subjects and objects. With a metaphysics of individualism, it appears that a quantum measurement intended to measure a particular object necessarily *disturbs* this object in the process of measuring it, thereby limiting the types of measurements that are possible (according to Heisenberg's uncertainty principle). But Bohr's insight moves beyond individualism because the determinate value attained through measurement cannot be ascribed to a measurement-independent, pre-existing, individual object at all. In other words, it is no longer possible to delineate a pre-existing "cut" between the object and the measuring device, or the "agencies of observation" (Barad 2007, 113-114), so the objective referent for the measured value becomes *the whole experimental setup*. This is a critical point: in a relational ontology we can no longer refer to the properties of a given object in isolation, but we must take responsibility for how this object is constituted and situated, by describing the agencies of observation used to measure these properties. A phenomenon, as described by Bohr, is a "particular instance of wholeness" (Barad 2007, 197) in which there is no inherent cut between the object and the agencies of observation. Said another way, the object and agencies of observation are not pre-existing individuals but are fundamentally relational, such

that phenomena are inherently indeterminate in the absence of a measuring apparatus. Moreover, the resolution of this indeterminacy, or the measurement, is enacted only *within the phenomenon*, or within the context of the particular experimental setup. Thus, the agencies of observation, or the measuring apparatus, must always be included as part of the description of the measured object, ensuring that this object doesn't assume an existence independent from the phenomenon (Barad 2007, 118).

With a modernist metaphysics of individuality, the cut between the subject (agency of observation) and the object, or between any entities, is given. This results in a given spatiotemporal separability between them, which allows individual entities to interact with one another, and which is thought to be required for objectivity. With Bohr's move toward a relational ontology, however, this pre-defined cut no longer exists, and instead we have both the cut and the separability being enacted *within* the phenomenon. Barad (2007), as part of their rational reconstruction and further elaboration of Bohr's account, introduces some terms that help to clarify and talk about these important shifts. Using the language of agential realism, the *agential cut* that is enacted within a phenomenon is not simply a line between a subject and an object, but it includes the set of material-discursive practices responsible for enacting the cut – or the *apparatuses*[38] – and it also includes the new entanglements that are formed, in the sense that the enacted entities have been linked together in a particular relationality with respect to the rest of the universe. That is, agential cuts are

[38] Note that Barad's use of the term "apparatus" has been generalized from a physical-conceptual observing instrument in the laboratory, to a material-discursive practice that conditions specific agential cuts, thereby resulting in specific material reconfigurings of the world (140).

differentiating-entangling (Barad 2014a), and the agential cut is enacted not by any given entity, but by the whole material-discursive arrangement of which the enacted entities are a part. In contrast to the *interactions* between pre-given entities, the ontologically inseparable entities delineated by the agential cut have been made determinate through *intra-action*, where Barad's neologism "intra-action" is necessary to capture how entities-in-the-process-of-becoming affect one another co-constitutively instead of as pre-existing individuals. Determinate subjects and objects emerge from, instead of pre-existing, their intra-action (Barad 2007, 128), yet they never emerge once and for all, because they are enfolded in further intra-actions (Barad 2007, 170). Thus, entities do not persist in space or through time, but they are *iteratively* and differentially (re)constituted along with space and time – they are *spacetimemattering*. Despite this iterative reconfiguration of the spacetimematter manifold, patterns can stabilize (and destabilize) through iterative intra-action. Finally, the agential cut results in an *agential separability* that, again, exists only within the phenomenon (Barad 2007, 140). This agential separability delineates a causal structure *within* the phenomenon, as opposed to causality being transferred in a vector-like fashion from one phenomenon to another (Barad 2007, 393).

Agential separability also secures objectivity. For Bohr, objectivity does not require spatiotemporal separation because it is enough that humans are able to unambiguously communicate their experimental setup – which is basically a description of how the phenomenon is cut – such that the enacted determinacies can be reproduced (Barad 2007, 339). Barad explains, however, that when Bohr secures

separability (and thereby objectivity) based on this cut within the phenomenon, he inadvertently puts the human in a specialized role by requiring a human knower to communicate the conditions for objectivity. This re-instates the nature-culture dualism, taking the human subject as given instead of asking how it is that the human comes to be differentially constituted within a phenomenon (Barad 2007, 339). Barad, staying true to Bohr's goal of placing the human back within the nature that is being studied, resolves this issue by recognizing that phenomena are *ontological* entanglements, or ontologically primitive relations (Barad 2007, 330, 333), which means that there are no pre-given entities with a pre-given spatial separation between them, but that intra-actions enact agential separability as part of the relational differentiation of entities from the entangled whole. This furthermore means that intersubjective human verification is not required, because it is an ontological fact that certain properties have become determinate (Barad 2007, 339). In this way, phenomena need not be limited to laboratory exercises run by human knowers, and objectivity need not be dependent on human intersubjective communication. Instead, scientific practices are a special case of the more generalized material-discursive practices, and separability and objectivity are enacted within phenomena regardless of whether a human is involved or not.

Through agential intra-action, the boundaries and properties within phenomena become determinate, and particular concepts take on a meaning at the exclusion of others. These concepts are not limited to human theoretical concepts, but are generalized as "particular material articulations of the world" (Barad 2007,

139), just as an experimental setup for measuring momentum is a material articulation of the concept "momentum". These material-discursive determinacies-within-phenomena are enfolded in further intra-actions, thereby affecting the field of possibilities, which includes the opening of new possibilities and the exclusion of others (Barad 2007, 177). In this way, in/determinate phenomena, which include their field of possibilities, are iteratively and materially-discursively reconfigured through differential spacetimemattering, where this reconfiguring is differentiating-entangling. This is indicative of the dynamism of in/determinacy, where "Indeterminacy is not a state of being but a dynamic through which that which has been constitutively excluded re-turns" (Barad 2014a, 178). More generally, agential realism provides a performative understanding in which both discourse and matter come to matter, and in which matter is an active agent in its own materialization. The dynamism by which phenomena continue to be reconfigured is *agency*, which is "the ongoing reconfigurings of the world. The universe is agential intra-activity in its becoming" (Barad 2007, 141).

Epistemology and ethics are inseparable from these ontological considerations. Epistemologically, we have shifted from a representationalist account in which individual pre-existing fully-formed subjects that are located "outside" or "above" an "external" world can know this world only through representations (Barad 2007, 341), to the agential realist subject that is ontologically constituted within the phenomenon along with the object about which knowledge is being sought (Barad 2007, 342). With agential realism, knowing and being are inseparable, and knowing

is not limited to a human subject but is generalized in the sense that an intra-action is one part of the world being made intelligible to another part of the world (Barad 2007, 176). Importantly, the world itself is iteratively and differentially constituted as part of these material-discursive practices.

Ethically, we no longer start with an individual pre-given human and ask what their ethical responsibility toward other individuals should be. Instead, because human subjects are relationally constituted through intra-actions, such that we can no longer assume pre-existing boundaries or cuts, the ethical obligation becomes more primary, directed at how the human differentially comes into being in relation to their world. Recall that prior to the modernist separation of nature and culture, the human was enmeshed in the world, and only with this dualism does the human become a privileged, subjective "we" that is separate from the rest of the exterior world. With agential realism we again must take responsibility for the constitution of this "we", where responsibility is reframed in terms of response-ability, or the enabling of response as a part of relational differentiation. It matters how "our" boundaries are drawn because material-discursive practices make both exclusions and connections, which have real material consequences; when we forget to acknowledge our ongoing differential constitution and instead fix the category of "human", we eliminate a whole set of possibilities, and this plays into issues of power and politics. Finally, ethical responsibility is not limited to humans; agential realist ethics is more generally about being accountable for how boundaries get enacted. Knowing is inseparable from being, and similarly, ethics is an intrinsic part of intra-action, and neither

requires a human subject as their locus (Barad 2007, 393). Thus, agential realism is an ethico-onto-epistemology, and any ontological-epistemological analysis must include a thorough accounting of the intrinsically related ethical issues. These ethical issues are also necessarily political issues, because individuals are not pre-given but are iteratively co-constituted as part of societies, making any "individual" ethical responsibility a matter of social justice (personal communication from Karen Barad to the author on May. 6, 2019).

In summary, phenomena are constitutive of agential reality, so "reality" is not an independently existing thing that humans observe from the outside, but we are differentially co-constituted as a part of agential reality, our epistemic descriptions are descriptions of how we intra-act as part of agential reality, and our ethical responsibility is toward our iterative relational becoming, including the boundaries that are enacted as well as the exclusions and connections that are made. Methodologically, with agential realism the mode of investigation shifts from one of "reflection" to one of "diffraction". Reflection results in debate about which representational mirroring of a pre-given reality is more real or true. But without a pre-given reality in terms of which to compare different representations, we engage diffractively by examining the differences between various approaches, not only conceptually, but also by taking responsibility for how the effects of these differences can make a meaningful difference in our own practices. Thus, diffraction is a performative, onto-epistemological engagement measured by its pragmatic consequences and requiring responsibility for these consequences. This notion of

diffraction will be relevant to our methodological analysis below, and we will more generally continue to deepen our engagement with agential realism throughout the remainder of this project.

2.2 Agential Realism and the Ontological Turn in Anthropology

In conjunction with our subsequent philosophical analysis of Findhorn's practices of plant-human collaboration, we need to orient ourselves anthropologically, which will serve to highlight the role that agential realism is playing in informing the overall methodology of this project. Importantly, there has been a recent "ontological turn" in anthropology, in which the practices of another culture are no longer treated as a different perspective on one world, but instead they are treated as "multiple worlds" or "multiple ontologies". In this section, we will not provide a thorough review of the ontological turn in anthropology, but rather we will focus on the ontological turn as it has been described and worked with philosophically by Paleček and Risjord (2013).[39] Based on their philosophical analysis,[40] we will in §2.2.1 and §2.2.2 trace how the ontological turn moves the field of anthropology in a similar direction as occurs when we shift from a modernist to an agential realist onto-world,

[39] Because our analysis of the ontological turn will be focused only on this particular philosophical engagement with it, it is important to at least point to some of the further complexities. For example, Zoe Todd (2016) explains that the lack of meaningful reference to Indigenous thinkers in academic discourse on the ontological turn, even as Indigenous ideas are "filtered through their white intermediaries" (7), perpetuates colonial violence; moreover, she asserts that the ontological turn cannot reach its fruition until these Indigenous voices are included and recognized on their own terms (18).

[40] Paleček and Risjord (2013) consider the ontological turn in anthropology in light of philosopher Donald Davidson's (1973-1974) calling into question the dualism between conceptual schemes and the empirical content to which the schemes refer, or in other words, the deconstruction of the notion that there can be multiple conceptual schemes referring to one (empirical) world.

most notably in terms of rejecting representationalism. Additionally, with agential realism in its function as an over-arching framework for this project, we will in §2.2.3 discuss how agential realism can help extend some insights, as well as resolve some ambiguities, that arise with the ontological turn in anthropology – for example, the notion of multiple worlds or multiple ontologies. In turn, this analysis of the ontological turn in anthropology will help to clarify our methodological use of agential realism as an extension of current anthropological practices.

2.2.1 From representationalism to the ontological turn

The ontological turn in anthropology, like agential realism, no longer subscribes to representationalism, resulting in a shift in the meaning of terms such as "matter", "ontology", "world", "concept", and "difference". But when we discuss representationalist approaches to anthropology, we must remember that in the dualist, representationalist framework of modernism, the material and the discursive are considered to be separate: the "world" is considered to be purely material, and the word "ontology" is used in a purely discursive sense, as a theory or a set of beliefs that refer to, or represent, this material world.[41] A discursive ontology that is an abstract set of ideas cannot capture the whole of a material world; however, when the dualism between the material and the discursive is overcome with agential realism, there is no longer a question of how accurately or thoroughly the ontology reflects the

[41] These are certainly not the only possible definitions of "world" and "ontology", but in the context of this project, they are meant to convey how these terms are often used philosophically to distinguish between matter and the meaning that is ascribed to the matter (where matter and meaning have no necessary relation to one another).

world, because no ontology can exist apart from its material enaction, and no purely material world can exist without discursivity. This will be further explored below.

Beginning with representationalist approaches to anthropology, we can take several different approaches to studying a culture whose ontology and methods differ substantially from our prevailing ontology and methods. Consider the anthropological study of plant-human collaboration in the Findhorn Garden, in which the gardeners communicated with devas and nature spirits in order to collaboratively create a thriving garden. First, we can tell their experience as a story and leave it at that. Such a glimpse into their way of being would be more like reading a fairy tale or a science fiction novel, and though it might spark the imagination, it would not likely lead one to seriously consider whether we could re-create such experiences ourselves. This is clearly not the intent here.

Second, we can take their experience and distort it by appropriating certain elements that more naturally find a home within our modernist ontology, while ignoring or even ridiculing others. For example, in order to stay within a modernist ontology that has (at least in theory) banished anything but physical entities from existing, we could maintain that no entities such as devas or nature spirits exist, while entertaining the notion that through meditation with plants – as meditation is currently being studied scientifically within our modernist ontology – we might be able to improve our plant management processes. While this approach might in fact lead to new agricultural practices that include meditation, or to new understandings of such practices that might already exist, it would not honor Findhorn's New Age ontology.

In other words, this method assumes that there is one world – as represented by *our* ontology – and that stories like the Findhorn Garden story are different, and most likely incorrect, representations of this one world. While it could still be interesting to develop new insights and methods by studying human difference in this way, this is not our approach either, because by limiting ourselves to the belief that only one ontology (ours) can exist and be "correct", we miss the broader implications of the Findhorn gardeners' experience. To recognize the broader implications, we must first accept that their ontology, including devas and nature spirits, is as real as ours – this is the next method considered.

Third, instead of considering the Findhorn story merely as a *story*, we can consider it as a reality. Then, to the best of our ability, we can learn about and honor their New Age practices as valid in their *own* right, such that their methods of plant-human collaboration can take on new significance and meaning for us. This approach, which is consistent with the ontological turn in anthropology, recognizes the limitations of engaging with only an epistemological study of the different beliefs of other cultures, and chooses instead to view these differences as ontological, such that the ethnographer no longer translates concepts from one culture into another but instead honors the differences between them. With a representationalist approach, these differences are construed as being different representations of a single external world, but with the rejection of representationalism inherent in the ontological turn, these differences are instead understood in terms of different worlds, or different

ontologies, each of which has its own "web of interactions" through which both concepts and things are interpreted (Paleček and Risjord 2013, 18):

> There is no single ontology that is the basis for understanding all human activity, no view of what there is independent of interpreters. Ontologies are the product of human interpretive interactions with one another and with their environments. These interactions are often very different, constituting different ontologies. They are incommensurable in the sense that no one way of engaging the environment is right or wrong in metaphysical terms. (Paleček and Risjord 2013, 18)

With this ontological pluralism, things are not individually pre-existing, but they exist only by virtue of their relations to other things (Paleček and Risjord 2013, 20), according to the complex web of interactions constituting that particular ontology. Moreover, no ontology is metaphysically privileged in terms of having the "correct" interpretation of some pre-existing reality (Paleček and Risjord 2013, 18). In the following subsection, we will further explore the relativism that this seems to imply.

The ontological turn results in a revision of what it means for anthropologists to study human difference. Under the yoke of representationalism, the ethnographer comes to understand another culture by translating concepts from one culture to another, which tends to erase differences between them by privileging the ethnographer's culture as having the "right" understanding of these concepts. In contrast, with the ontological turn, the ethnographer comes to understand the utterances of another culture by immersing themself in that culture's web of interactions, acknowledging that the concepts and objects in this web of interactions are valid in their own right (Paleček and Risjord 2013, 18). In this way, what we learn about another ontology can also be brought to bear on our own ontology. As

the anthropologist Holbraad (2010) says, "Rather than using our own analytical concepts to make sense of a given ethnography (explanation, interpretation), we use the ethnography to rethink our analytical concepts" (as cited in Paleček and Risjord 2013). Thus, when the ethnographer attains the proper relationship not simply to one or several individuals but to the entire interpretive community of the culture they are studying, they are no longer merely a translator of concepts, but they become ontologically enmeshed, participating in the complex meanings that arise from this web of interactions, while being able to work with the differences in a productive way (Paleček and Risjord 2013, 21).

In terms of Findhorn's plant-human collaboration, we can say that with the Findhorn gardeners' particular web of interactions, devas and nature spirits exist and communicate with them. Because we do not participate in Findhorn's web of interactions, we have likely not experienced devas and nature spirits ourselves, but that does not make them any less real. While a modernist representationalist approach would deny the existence of devas and nature spirits altogether, with the ontological turn we acknowledge that the existence of devas and nature spirits, or the existence of any being or object, is not a universal pre-given fact but is dependent upon a complex web of relations and interactions. Because one cannot say that any particular web is metaphysically privileged over any other, one cannot claim in a universal sense that devas and nature spirits either do or do not exist, except in relation to a particular web. Then, instead of using our own analytical concepts to create a (limited) explanation or interpretation of the Findhorn gardeners' so-called

collaboration with the devas and nature spirits, where the leading question would be why these people hold such beliefs about these entities, we question what devas and nature spirits are, or could be, in the first place – what must they be, and how can we think about them and all their entanglements, in such a way that they no longer seem absurd? This is the approach that we are taking in this project. First, we acknowledge that it is not given that we know what devas and nature spirits are. Then, we recognize that what they are is not merely superficial but requires us to rethink our own fundamental categories, e.g. what humans are, what (non)-physical entities are, and how communication occurs. Finally, while it does not make sense for devas and nature spirits to exist according to our modernist ontology, one could, however, still pose the question whether, if we spent time living our lives with the Findhorn gardeners in their world, becoming assimilated within their web of interactions, we could also come to experience devas and nature spirits.

2.2.2 The multiple onto-worlds of the ontological turn in anthropology

With a representationalist approach toward the study of different cultures, each culture is seen as having its own ontology, which is a different expression of the one true and ultimately unknowable reality, or the one world. Moreover, it should be possible to empirically test the ontological theories associated with these different cultures in order to determine which one more correctly mirrors the ultimate reality. But with the ontological turn, we learn that different cultures do not merely form different ontological representations of some ultimate reality, but that they are each

an ontology or world in their own right. Because there is no ultimate reality undergirding multiple descriptions of this reality, we instead talk about the enactment of multiple worlds, or the co-existence of multiple ontologies, or what in the context of this project we are referring to as "onto-worlds".[42] Not only is it initially unclear what could be meant by multiple onto-worlds, but it moreover seems to result in relativism because we can no longer determine which onto-world is better or more correct. In this subsection, we will examine how Paleček and Risjord (2013) have responded to these issues in the context of the ontological turn.

As discussed above, the ontological turn in anthropology is undergirded by a rejection of representationalism, opting instead for a relational approach in which not only how an object is understood but also what an object *is* depends on the interactive web in which it is enacted. Namely, when we overcome the dualism between the theories about objects and the objects themselves (Paleček and Risjord 2013, 12), ontologies are no longer limited to being systems of beliefs or concepts *about* a world, but instead, ontologies are actual worlds (i.e. onto-worlds), and we can no longer help ourselves to an ultimate reality that is independent of beliefs and theories. Because there is no ultimate reality behind these enacted onto-worlds, there is no longer a criterion for comparison, or a standard against which to measure the correctness of any given onto-world. That is, empirical tests are done within the framework of some particular onto-world and thus already presuppose that onto-

[42] The term "onto-world" was introduced in Chapter 1. In the following sub-section, we will discuss the term more fully, but for now it will be helpful to utilize it in this discussion on the multiple onto-worlds of the ontological turn in anthropology, in order to avoid the confusion that results from referring sometimes to "multiple ontologies" and other times to "multiple worlds".

world, so there is no independent basis for creating and understanding empirical tests that could adjudicate between different onto-worlds.

Because of this lack of adjudication between multiple onto-worlds, the ontological turn in anthropology seems to fall prey to relativism. However, Paleček and Risjord (2013) argue extensively that the relativism inherent in the ontological turn is different than the relativism that occurs in representationalist frameworks, because representationalist relativism hinges on the dualism between beliefs and reality that is overcome with the ontological turn (10-12).[43] Following Viveiros de Castro, Paleček and Risjord (2013) characterize the relativism of the ontological turn as "ontological perspectivism" (19-20). Whereas the relativism associated with representationalism has to do with the inability to know which theory best mirrors reality, ontological perspectivism is a relativism between the different perspectives of the different onto-worlds, where these perspectives are exhibited in terms of the particular relationalities within these onto-worlds: "Ontological perspectivism, then, is the view that what a kind or category of object is, turns on the relation of that object to something else" (Paleček and Risjord 2013, 20). That is, we are not comparing differences in the beliefs of different cultures, asking why particular

[43] Paleček and Risjord (2013) work with the relativism of representationalist frameworks in terms of dependence and incommensurability. Dependence means that something is dependent on and varies with something else, for example that morality is dependent on and varies with the historical period (10). Incommensurability means that it is not possible to compare between these different moral judgments because there is no external standard of comparison (11). The ontological turn seems to result in dependence if we assert that beliefs depend on culture, but because this dualism has been collapsed, we can no longer speak of the strict dependence of one on the other (11). Incommensurability is not strictly applicable either because it relies on representationalism, yet they conclude that there is still something incommensurable about the existence of multiple ontologies because none of them is privileged over any other (11-12). The upshot of their analysis is that the multiple onto-worlds of the ontological turn result in something that bears at least a family resemblance to the relativism of representationalist frameworks (12).

groups of people believe certain things, but we are noting how both things and beliefs (where things and beliefs are not separate from one another) exist only by virtue of the particular relationality within each onto-world. Thus, Paleček and Risjord (2013) conclude that the existence of multiple onto-worlds can be understood in terms of ontological perspectivism, meaning that reality is perspectival, or dependent upon the relationality within one's particular onto-world. Although ontological perspectivism avoids the representationalist form of relativism, there remains a question regarding how it is that multiple onto-worlds can co-exist and entangle with one another while yet remaining distinct from one another, despite their not having some common, underlying, unifying reality to serve as a basis for both their differentiating and entangling; this will be addressed in the following subsection.[44]

2.2.3 An agential realist analysis of the ontological turn in anthropology

As with agential realism, the ontological turn in anthropology both questions the dualism between matter and meaning, and shifts from representationalism to

[44] It is also instructive to briefly consider Graeber's (2015) response to Viveiros de Castro's interpretation of the ontological turn (OT) in anthropology (which is the interpretation on which Paleček and Risjord (2013) base their analysis). Graeber (2015) clarifies that most anthropologists utilize the term "ontology" as a synonym for "culture" (14), while OTers utilize it to mean a "way of being", as opposed to the philosophical use of "ontology" as a *discourse about* a way of being (15). Thus, the claim that people of different cultures actually inhabit different worlds, such that we must accept the fact of "multiple ontologies", means to Graeber (2015) that, "despite protestations to the contrary, OT does not abandon the traditional philosophical quest for a universal ontology, but rather proposes its own tacit universal ontology, which is essentially a form of philosophical Idealism" (3); this notion of idealism arises because the tacit universal ontology of OT is the belief that "ideas generate realities" (21) in the sense that what people say (the concepts they utilize) is generative of their realities (20). In contrast, Graeber (2015) prefers to define "reality" as something that can never be completely described in terms of theoretical constructs (24), although he considers it valuable to develop many different (and possibly incommensurable) theories about this reality (31). As we will see in the following subsection, analyzing OT with agential realism clarifies Graeber's (2015) intuition of an ultimately unknowable reality in terms of a fundamentally in/determinate universe, while also reconciling the separation between ideas and realities with material-discursivity.

relationality, recognizing that things exist only by virtue of their relations to other things or beings. However, the material-discursivity of agential realism more fully disrupts the matter-meaning dualism, and the intra-active relationality of agential realism more clearly overcomes the modernist metaphysics of individualism through its iterative differentiation of fundamentally in/determinate matter that is not dependent on human interpretive communities. In this subsection, we will more closely examine how agential realist in/determinate phenomena and their material-discursive intra-action clarify the rejection of dualisms, the move from individualism to relationality, and the multiple onto-worlds of the ontological turn in anthropology. We will also address the implicit humanism involved in the ontological turn, in the sense that it relies on human interpretive communities. While I am certainly not alone in applying agential realism to the ontological turn (see, for example, Marshall and Alberti 2014), the particular analysis I am presenting here is in the context of furthering our philosophical discussion regarding some of the important shifts that occur between the modernist and agential realist onto-worlds.

With the ontological turn, we have seen that the terms "ontology" and "world" lose their distinctness because ontologies are no longer sets of beliefs or theories that represent an independently existing world. Paleček and Risjord (2013) do not explicitly bring the terms "ontology" and "world" together to indicate that they are inseparable, for example as "ontology/world" or "onto-world", but they seem to refer interchangeably to these terms, as well as to terms such as "concept" and "object", when utilizing them in the context of the ontological turn in anthropology. For

example, they say that, “the object becomes the symbol” (Paleček and Risjord 2013, 8), and they quote the ontological anthropologists Henare, Holbraad, and Wastell (2007) as claiming that “concepts and things are one and the same” (as cited in Paleček and Risjord 2013, 8). Note that in each case, the dualism is more generally between some kind of matter and some kind of meaning. Although Paleček and Risjord (2013) clearly reject these dualisms, they continue to use terms that reinforce separations, not only between matter and meaning, but also between individuals, for example when they refer to “webs of relationship among individuals, objects, and interpretive communities” (18); there is also an implicit separation between humans and nonhumans, for example in their reliance on interactions between humans, or “the thing that thinks” (9), and the “nonhuman world” (11).

With agential realism, the dualism between matter and meaning is more explicitly overcome: any dualism presupposing a material and a discursive component must be rethought as inextricably material-discursive, where these “components” cannot be treated independently of one another. For example, with agential realism, terms such as “beliefs” and “objects” would both be referred to as “material-discursive practices”, to underscore the fact that it is not possible to speak of meaning (e.g. beliefs) apart from matter (e.g. objects), and vice versa. As part of this shift with agential realism, the concepts of “meaning” and “matter” are themselves radically reworked, as was discussed in §2.1.2. Now we can more fully understand the significance of the term “onto-world”, which we have already been utilizing in order to clarify that ontology and world, both being material-discursive

practices, are inseparable. An onto-world is not an external world or an ultimate reality, nor is it a conceptual ontology that floats free from materiality, but it is material-discursive, an iteratively reconfiguring, complex set of practices. Each time we use the word "onto-world", we are reminding ourselves that we cannot talk about ontology without recognizing that it is iteratively enacted as part of material reality, and that we cannot talk about a world without recognizing that it exists only as part of the discursive web in which it is iteratively enacted. We will utilize this term "onto-world" unless we are referring to modernist representationalist practices in which the terms "ontology" and "world" have separate meanings.

Agential realism also clarifies the notion of *multiple* onto-worlds. First, we must inquire not only how multiple onto-worlds can be differentiated from one another if they are all sets of material-discursive practices, but also how any one onto-world can be distinguished as such when the material-discursive practices that constitute it are always shifting. To address the latter, we can say that an onto-world is a set of material-discursive practices that is still shifting to some degree, yet particular habits and patterns have stabilized – meaning that similar types of material-discursive practices are repeated at the exclusion of others – thereby giving the appearance of a discrete onto-world. We can distinguish between different onto-worlds because each one is characterized by a particular set of habits and patterns. For example, we can differentiate Findhorn's onto-world from the modernist onto-world because Findhorn's onto-world includes habitual sets of practices that enact particular sets of cuts that are productive of devas and nature spirits, while this is not

the case for the modernist onto-world. Note, however, that no onto-world is closed off or otherwise separate from other onto-worlds. Moreover, the habits and patterns of onto-worlds can always be destabilized by further intra-action, for example by immersing oneself in the practices of a different onto-world. Finally, bringing in the in/determinacy of agential realist matter, we can understand multiple onto-worlds as characteristic sets of material-discursive practices that resolve the fundamental indeterminacy in different patterned ways, giving the appearance of separate onto-worlds that are, however, thoroughly entangled, and ultimately inseparable from one another.

With the representationalism of a modernist onto-world, we posit an ultimate, pre-given, fully-determinate, physical reality that underlies multiple representations of it. With the ontological turn in anthropology, we discard this ultimate pre-given reality and instead have multiple onto-worlds. With agential realism we can, in a sense, have the best of both worlds: the multiple fully-entangled and always-shifting onto-worlds are relational differentiations of the ultimate *agential* reality, which is in/determinate. In other words, the ultimate units of existence are in/determinate phenomena, which can be *differentially* enacted, which means that different sets of material-discursive practices enact different agential cuts that are productive of different onto-worlds, or of different kinds of objects, beliefs, symbols, transphysical beings, humans, plants, etc. In summary, multiple onto-worlds are not different representations or interpretations of a single reality, nor are they multiple realities, but

they are different, yet entangled, patterns of enactment of a fundamentally in/determinate universe.

Our agential realist analysis furthermore serves to question, and then clarify, the way in which the ontological turn in anthropology relies on webs of interactions that include human interpreters. We need to question both the role of the human and the use of the term "interaction", along with the individualism that this seems to imply. With the ontological turn's rejection of representationalism, we have learned that both objects and beliefs are the products of interpretive communities and thus exist only relationally, but this scheme seems to presuppose the existence of (human) interpretive communities: "The relationships that constitute meaning are complex webs of interactions among a group of people who interpret one another. When the ethnographer appears on the scene, she is trying to understand the web of interactions found among her interpretees…. Ontological difference appears as the result of entangling the interpretive communities" (Paleček and Risjord 2013, 20-21). While this analysis seems to be aligned with agential realism in recognizing ethnography as a material-discursive process of enacting ontological difference rather than a merely discursive practice of studying epistemological difference, it is unclear how humans fit into this process. In other words, while we know that *things* exist only relationally within these webs of interactions – "'Things' are not taken to be simply natural, preexisting objects but a product of human interaction with the nonhuman world" (Paleček and Risjord 2013, 11) – it seems that the role of the human is being taken for granted because things exist only as products of *human* interactions and

interpretations, where the "human" is at least in some ways being held separate from the "nonhuman world". But in relation to what is the human constituted? And why should a human participant be required in order for things to exist?

To put these questions into a wider context, the ontological turn in anthropology does include a questioning of where the human boundary ends. This shows up in Paleček and Risjord's (2013) analysis in terms of the "extended mind hypothesis",[45] which is a philosophical approach that helps them clarify what it means to move beyond representationalism (8). In the context of the ontological turn, "The extended mind hypothesis also requires rejecting the standard philosophical conception of the person as an ontologically independent 'self.' If the person is *res cogitans,* the thing that thinks, and thinking is partly constituted by interaction with things in the environment, then the self depends on the characteristic of the environment" (Paleček and Risjord 2013, 9). They seem to be arguing that because a human thinks, and thinking is partly constituted by the environment, then the human is not ontologically independent. Though it may be problematic to equate a human with thinking, and though the term "interaction" implies an interaction between individuals instead of a mutual co-constitution of human and environment, we can at least conclude that they *intend* to replace a metaphysics of individualism with relationality, in the sense that the human is not ontologically independent but is co-constituted along with the environment. Thus, as with agential realism, the ontological turn in anthropology questions the notion of the human as an individually

[45] With the extended mind hypothesis, the environment plays an active role in driving processes such as thinking within the human mind (Clark and Chalmers 1998).

existing self,[46] but agential realism is more rigorous in recognizing that the human is iteratively and materially-discursively co-constituted along with its world. First of all, the material-discursive nature of intra-action means that the human is *ontologically* co-constituted with their environment, instead of only through their "thinking", as is implied with the extended mind hypothesis. Furthermore, neither the human nor the environment nor any objects have pre-existing boundaries, but they all exist only within phenomena and in relation to the entire universe (though some aspects are more relevant than others). In this way, what becomes important is taking responsibility for how these boundaries are iteratively made and remade, and particularly, for the ongoing differential constitution of the human.

Not only is the human not a pre-given individual with a pre-given boundary, but with agential realism we learn that activities such as thinking and interpreting are not the exclusive rights of humans, nor do they require a "mind", but they are themselves part of material-discursive intra-action more generally.[47] This results in the crucial realization that human participants, or human webs of interactions, or human interpretive communities, are not required for material-discursive intra-action, or for the relational differentiation of onto-worlds. With agential realism, we can

[46] Note that while Bohr also takes the human subject as a given by requiring a human knower to communicate the conditions for objectivity, he does not make his account ontological by asking how the human is differentially constituted. In contrast, Paleček and Risjord (2013) do refer to the environment as partially constituting the human, though like Bohr, they do not generalize to the case in which a human is not involved.

[47] This aspect of agential realism will be more fully explored in Chapter 5 when we discuss the nature of collaboration in an agential realist onto-world. For now, it is sufficient to note that we need not rely on humans, or more specifically on "thinking" humans, in order for agential intra-action to occur.

generalize beyond the field of anthropology, which necessarily includes humans,[48] to recognize that there could be onto-worlds that are not productive of humans at all – much like the modernist onto-world is not productive of devas and nature spirits. Humans are differentially constituted within and as part of (some) webs of interactions, but they are not necessary to them. Thus, instead of requiring human interpretive communities, we can talk about different sets of material-discursive practices being productive not only of different objects and beliefs, but also of different humans. Moreover, we can be more true to the relationality of the ontological turn by replacing "webs of interactions" with "webs of intra-action", thereby clarifying the fact that there are no individually existing entities, human or otherwise, that interact with one another, but that these entities mutually co-constitute one another through their intra-action. Agential realism helps us understand that although anthropology is a human practice, we cannot take the (human) ethnographer as a given but must take responsibility for their iterative and differential co-constitution within and as part of their onto-world.

Finally, to conclude this anthropological discussion, I will describe my own web of intra-action. Through my upbringing I was constituted within a modernist onto-world, which has gradually shifted to incorporate elements of alternative ontological frameworks such as Barad's (2007) agential realism, and also, notably,

[48] Anthropology obviously requires humans because it is a human endeavor, but while anthropology is traditionally the study (by humans) of other groups of humans, Eduardo Kohn (2013) – whose work is also situated within the ontological turn – addresses the notion of moving the field of anthropology beyond the study of humans. In his book "How forests think: toward an anthropology beyond the human", he seeks to show that "thinking" is not distinctively human (which creates a gulf between thinking humans and the non-thinking world), but that we can understand other aspects of the world, such as forests, as also engaging in such processes.

Alfred North Whitehead's (1978) process relational philosophy. Though Whitehead's onto-world is informed by his background in logic and mathematics, which likely appeals to a different audience than Barad's, which is informed by quantum physics, feminist science studies, and issues of social justice, I continue to find that diffracting these two onto-worlds through one another both clarifies and extends each of them in productive ways. Another important co-constituting factor in my onto-world is the philosopher Eric Weiss (2012), who adapted Whitehead's approach to include the "transphysical" worlds, opening my mind to the possibility of multiple different spacetime geometries that are relationally enacted along with the metrical spacetime of the physical world (as introduced in Chapter 1). Though my main ontological focus in this project is on agential realism, the influence of both Whitehead and Weiss serve as diffractive undercurrents throughout this work and will be referred to when appropriate. Currently, my web of intra-action continues to shift as it entangles with Findhorn's New Age onto-world due to my studying of the Findhorn story and my own attempts at collaborating with devas and nature spirits. Ethnographically, I am studying difference – both human and non-human – by immersing myself in Findhorn's gardening practices with devas and nature spirits, which leads me to question and shift my own gardening practices, as well as my intra-active relationships with the non-human world more generally. When ethnography is practiced according to the ontological turn in anthropology, "Ethnography is more than the collection of different worldviews; ethnography is akin to philosophy" (Paleček and Risjord 2013, 10). Philosophically, I am questioning the implicit

assumptions of the modernist onto-world, exposing the lack of philosophical rigor of the New Age onto-world, and working creatively with the agential realist onto-world, in order to allow my engagement with Findhorn's plant-human collaboration to make a meaningful difference for and as part of "my" iteratively enacted and ever-shifting onto-world.

2.3 Further Methodological Considerations

Agential realism, in its role as a guiding framework for this project, has not only clarified and extended insights from the ontological turn in anthropology,[49] but it further informs our methodology in working with the modernist, New Age, and agential realist onto-worlds in our investigation of Findhorn's plant-human collaboration. To briefly review, the intent is not to stay rooted in our own onto-world and judge the validity of Findhorn's plant-human collaboration according to our own practices – for example by judging whether or not devas and nature spirits actually exist or are mere beliefs – as would be case for representationalist anthropologists not influenced by the ontological turn. Instead, with the ontological turn in anthropology, we would recognize Findhorn's practices as constituting a separate but valid onto-world that may or may not have some effect on our own practices if we can learn to engage in their web of intra-action. In this way,

[49] Although we are utilizing agential realism to help understand the ontological turn, and more generally as a guiding framework in this project, it is important to recognize that agential realism should not be treated as any kind of a final answer or new foundation. As Alberti et al. (2011) point out with respect to metaontologies that can be utilized in support of the ontological turn, even a relational ontology such as Barad's agential realism is limited to describing relationality according to a set of rules, or at the level of theory, and must therefore be treated with skepticism (905).

ethnographers are given the challenge of allowing their own web of intra-action to shift by becoming entangled in the web of another community, whose onto-world must be considered as real as that of the ethnographer. For an ethnographer studying Findhorn's plant-human collaboration, this would require them to suspend their disbelief about entities such as devas and nature spirits, and to immerse themselves in the material-discursive practices of the Findhorn gardeners in an attempt to understand how it is that devas and nature spirits are real for the Findhorn gardeners.

Using insights from our guiding framework of agential realism, we have deepened our understanding of the ontological turn by engaging with in/determinacy, recognizing that there are no fixed or separate onto-worlds, either as pre-existing or as results of material-discursive practices. We can still talk about the modernist, New Age, and agential realist onto-worlds, but only with the recognition that each one is a set of ever-shifting material-discursive practices, and that they are all fundamentally entangled with one another. Both the Findhorn and modernist onto-worlds enact both plants and humans, but the agential cut is made differently in these onto-worlds, resulting not only in different plants but also in different humans. It is important to recognize that these onto-worlds are not only epistemologically but also ontologically entangled with one another, which means that there are no clear boundaries separating them, and nothing is fixed once and for all, including the constitution of the human. Thus, it should theoretically be possible for an ethnographer to become the kind of human who not only understands how the Findhorn gardeners consider

devas and nature spirits to be real, but who is themself aware of the presence of devas and nature spirits.

As philosophers involved with this project, we are not necessarily engaging with Findhorn's practices of plant-human collaboration in the field, yet we also must suspend our disbelief as we work philosophically with these practices, and we also can change as humans simply through this philosophical engagement, which is not a mere theoretical engagement but is a material-discursive practice. To understand this, it is helpful to consider how agential realism, in its role as a guiding framework, teaches us that our own onto-world, including our own constitution, are not as fixed as they might seem. For the sake of illustration, we will be referring to the modernist onto-world as "our" onto-world here. According to agential realism, the ultimate units of reality are not individual things such as humans and plants and pruning shears, but the ultimate units of reality are in/determinate phenomena that are iteratively and differentially reconfigured, where what we think of as individual things exist only in relation to their particular intra-action. Moreover, even the (apparent) regularities that are referred to as "laws of nature" in our modernist onto-world are enacted according to the particular way in which our onto-world has (temporarily) stabilized with its particular habits and patterns. The fact that what appear to be necessary regularities are habits and patterns that depend on particular limited sets of possibilities for how the spacetimematter manifold can be reconfigured, means that they could have been, and could be, enacted otherwise,

helping us to recognize the contingent nature of our onto-world.[50] If it is the case that our onto-world could have been and can become otherwise, even regarding what we consider to be its fundamental regularities, then it becomes easier to accept the existence of other onto-worlds that have (temporarily) stabilized according to different habits and patterns. Though different onto-worlds may appear to be mutually exclusive – such as the New Age onto-world that enacts devas and nature spirits, and the modernist onto-world that does not – they are entangled with one another and are always open to reconfiguration.

Moreover, our material-discursive engagement with Findhorn's plant-human collaboration could be a catalyst for significant change in our own modernist onto-world, or in any other onto-world for that matter, because this engagement has material affects, in that the field of possibilities will shift in new ways, opening up new possibilities (and foreclosing others) for how we and our onto-world will be further enacted. If we adhere rigidly to the habits and patterns of our onto-world, we may not recognize these new possibilities, and this will continue to fold back in and strengthen the iteratively enacted boundaries that (contingently) determine us, as well as our onto-world. But by opening to the possibilities, we may destabilize some of the habits and patterns by which our onto-world is iteratively differentiating-entangling, thereby opening up further new possibilities for engaging with plant-human collaboration. How we are enacted influences further intra-action, so we have

[50] The suggestion that modernist "laws of nature" are contingent patterns or habits instead of necessary laws has been argued by Whitehead (Whitehead 1933, 112-115) and has also been suggested by Rupert Sheldrake (Sheldrake 2012, 108).

a responsibility for creating, maintaining, and possibly destabilizing, our onto-world: "We are responsible for the world within which we live, not because it is an arbitrary construction of our choosing, but because it is sedimented out of particular practices that we have a role in shaping" (Barad 2007, 203). Thus, instead of living passively as part of an onto-world that enacts particular habits and patterns, including our own habitual constitution, we can become attentive to new possibilities, such that any particular habit or pattern has a chance of being enacted differently.

Before concluding this chapter, I must take responsibility for a particular pattern that has guided my writing of this dissertation, but that is not fully in line with how a proper agential realist analysis should be conducted. As has been made clear, my focus in studying Findhorn's plant-human collaboration is mainly philosophical, though I also include significant discussion on some scientific aspects. However, as mentioned above, with agential realism, it is problematic to engage in a philosophical and scientific analysis without including the relevant ethical and political apparatuses that are an integral part of the discussion, because these apparatuses materially-discursively constrain and enable how I myself am constituted and situated, how the issues are framed and construed, and what materializes as part of this project. As Barad (2007) says in terms of including social, cultural, and political analyses along with analyses of science, technology, and medicine, "But understanding and reworking different disciplinary apparatuses in isolation won't suffice. Intra-actions matter" (222). That is, political issues cannot be separately analyzed and then somehow added back in to an already existing scientific analysis, because the

scientific is always already political, and thinking through entangled scientific and political analyses together results in an ongoing intra-active engagement that cannot be replicated by the juxtaposition of separate analyses.

I have added some such intra-active engagement where possible, for example in the description of the modernist onto-world in this chapter, as part of a critique of the New Age in Chapter 4, and in Chapter 7 when discussing both the nanobionic spinach plant and the physical traces of virtuality and transphysicality. But it is important to state clearly that, because agential realism is being utilized as the overarching framework informing the methodology of this project, a more rigorous analysis of the ethical and political apparatuses involved in Findhorn's plant-human collaboration is required, not simply in addition to, but rather in an intra-active engagement with, the philosophical and scientific analysis that I am presenting in this dissertation. Thus, what I am contributing with this dissertation should not be uncritically utilized in the absence of a more thorough analysis of the relevant set of entangled apparatuses.

In the following chapters, we will be working with agential realism mostly as an onto-world on the same level as the New Age and modernist onto-worlds, in order to determine the meaningful differences that result when we consider Findhorn's plant-human collaboration from within these three onto-worlds. In this chapter, agential realism has functioned as a guiding framework to help us understand how to approach an engagement with these multiple onto-worlds (one of which is the agential realist onto-world). To summarize, we will be using a diffractive

methodology, in which we do not merely judge how things show up differently in these onto-worlds, but we examine the effects of these differences, seeing how they matter and how they can make a meaningful difference in our own practices. We are not simply comparing between different onto-worlds, because this assumes that they are separate to begin with. Instead, by engaging with Findhorn's practices, our own onto-world is materially-discursively affected, such that new possibilities may arise while others may be excluded; and in turn, Findhorn's onto-world may also be affected. This is a practice of looking beyond the patterns and habits enacted within our onto-world to recognize the field of possibilities that both constrains us and also offers us an opportunity for the enaction of new patterns and habits. That is, to be enacted as humans, or as anything determinate, particular exclusions must be made, but if we can become aware of these exclusions, perhaps we can more actively participate in our intra-activity. In fact, because responsibility is implicated in intra-action, "we" have a responsibility to recognize how "our" boundaries (and those of "our" onto-world) are constituted in relation to Findhorn's plant-human collaboration, and how they might need to shift.

3. The Findhorn Garden and its New Age Onto-World

> The ancients, of course, accepted the kingdom of nature spirits without question as a fact of direct vision and experience. The organs of perception of the super-sensible world have atrophied in modern man as part of the price to be paid for the evolving of the analytical scientific mind. The nature spirits may be just as real as they ever were, though not to be perceived except by those who can redevelop the faculty to see and experience them. (Findhorn Community 1975, 22)

Findhorn's plant-human collaboration, which was introduced in Chapter 1 and will be recounted in detail in this chapter, took place during the 1960s, when the original co-founders of what later became the Findhorn Foundation were actively collaborating with the devas and nature spirits in their garden. The modern Findhorn Foundation is no longer focused on plant-human collaboration, but has become a spiritual retreat center and community, as well as an eco-village. However, in September 2018, the Findhorn Foundation held a 7-day conference entitled "Co-Creative Spirituality: Shaping Our Future with the Unseen Worlds", with the purpose of re-awakening the co-creative partnerships between humans and the "unseen beings" (e.g. devas and nature spirits),[51] in order to explore the potential for future collaboration (Findhorn Foundation 2018). Thus, while my project is focused on the plant-human collaboration of the early Findhorn years, it is also relevant as part of what the current Findhorn Foundation is envisioning.

[51] Findhorn's plant-human collaboration in the early days was with devas and nature spirits (and the God within), but it has since been discovered that there is an entire rich "ecology" of unseen beings, where devas and nature spirits are just two types of members of this ecology (Spangler 2010). For the purpose of this project, however, I will refer only to devas and nature spirits (and the God within), which suffices to get us thinking beyond the limitations of fully-determinate physical matter.

A real-time ethnography of the 1960s experience when the Findhorn gardeners were actively communicating with the devas and nature spirits is obviously not possible at this time. Paul Hawken (1975) wrote about their plant-human collaboration when he visited Findhorn in the 1970s, and I have included references to his work, but already at that time the original co-founders had departed and no one was left who actively communicated with the devas and nature spirits. Other ethnographic and sociological studies on the Findhorn community[52] focus not on plant-human relations but on Findhorn as a New Age spiritual community. Thus, the main sources from which I draw in recounting the Findhorn plant-human collaboration are directly from the writings of the co-founders themselves, each of whom wrote down their stories, including lengthy transcriptions of their communications with the "God within", the devas, and the nature spirits. It is important to note that they received these communications over many years, during which their own linguistic interpretations changed as a result of their changing consciousness (Findhorn Community 1975, 78), so there are multiple angles from which to understand their experiences.

In an attempt to "get into conversation" with these co-founders, and because we need as many descriptions as possible to begin to form an embodied experience of Findhorn's New Age onto-world, I will be utilizing extensive quotations, especially regarding the devas and nature spirits. Before recounting the story of Findhorn's plant-human collaboration in §3.2, we will in §3.1 discuss the New Age onto-world,

[52] These ethnographic and sociological studies on the Findhorn community include Castro (1996), Chryssides (1999), Rigby (1974), and Sutcliffe (2003).

which both influenced and was influenced by the Findhorn community. In this chapter, we will focus on the New Age onto-world in relation to the original 1960's Findhorn community and their plant-human collaboration. Additionally, in Chapter 4, we will engage in a more general critique of the New Age onto-world, which is relevant to how the current Findhorn Foundation is perceived. As we will discuss below, the New Age onto-world is a set of material-discursive practices that are not necessarily internally consistent and could thus be interpreted in numerous ways. Thus, when appropriate, I will refer instead to the "Findhorn onto-world" to indicate the particular sets of New Age practices that were utilized by the Findhorn gardeners. Finally, even within the reports of the original co-founders of the Findhorn Garden, there is some ambiguity regarding the descriptions of devas and nature spirits. Although the main focus in this chapter is a recounting of Findhorn's story according to the original texts, I will occasionally draw attention to particular instances of confused language or other inconsistencies, in order to suggest a coherent interpretation with which we can move forward in the context of this project.

3.1 The New Age Onto-World

To understand Findhorn's remarkable collaborative garden, it is helpful to be aware of the "New Age", which according to Chryssides (1999) was most prominent during the 1980s and 1990s (315), although New Age practices can be traced back as

far as the 1930s[53] (Sutcliffe 2003, 1). The original Findhorn community, in which the gardeners collaborated with devas and nature spirits, has been described as one of the earliest New Age communities in Britain (Chryssides 1999, 325). According to Sutcliffe's (2003) detailed analysis, the New Age is not a homogeneous entity, nor can it be called a movement, but it is a "codeword for the heterogeneity of alternative spirituality" (11). In Chapter 1, we used agential realism as a guiding framework to recognize that no onto-world is completely homogeneous because it is a set of material-discursive practices that is always open to reconfiguration, but we can still name a particular onto-world and describe particular homogeneous strands that set it apart from other onto-worlds. The New Age onto-world is here being described as particularly heterogeneous, but it still embodies some homogeneities, or themes, that tie together the disparate strands of "alternative spirituality".

One important theme of the New Age onto-world is its focus on the inner self and the ongoing process of seeking, as opposed to the desire for the kind of certainty that is derived from external authorities. This is most markedly illustrated in the New Age's rejection of institutionalized religion, in that individuals no longer treat organized religion as an external authority but instead look within themselves for answers and guidance (Chryssides 1999, 316). Other external authorities such as science are also rejected, such that the kind of critical analysis that is expected in a modernist onto-world does not hold the same power for the New Age (Castro 1996,

[53] Sutcliffe (2003) discusses the following thinkers and movements, starting in the 1930s, which paved the way for the Findhorn community and its contribution to the New Age: the "occult", the re-enchanted cosmos, theosophy, magic, astrology, spiritual technology, gurus, spiritual healing, spirit guides, radical personal transformation, self as seeker, the Rosicrucians, Alice Bailey (post-theosophy), Gurdjieff, Crowley, Steiner, Ouspensky, Jung, Sheena Govan's "Children of the New Age" (35-63).

19). While the New Age is not in itself against the practice of science and other types of critical analysis – for example, quantum physics principles are often cited in their explanations – these scientific sources are not considered to be ultimate authorities; instead, the New Age self relies on personal experience as its touchstone (Sutcliffe 2003, 222). The New Age self is seen as a divine part of the oneness of all life and is encouraged to seek its own certainty through methods of self-improvement and empowerment, utilizing intuition and creativity (Chryssides 1999, 317-319).

The New Age is further characterized by the theme of "oneness". Oneness is a togetherness and interdependence of all existence, in which something is considered to be whole even as it is made up of separate parts: "Together with minerals, plants and animals, we make up the body and consciousness of a single living organism – Earth. We move within this body, intricately related to and dependent upon every other part of it" (Findhorn Community 1975, 173). Within this oneness, it is recognized that "what we call opposites are only complementary parts of a greater whole" (Findhorn Community 1975, 173), such that what we think of as separate and even opposed parts are encompassed by greater wholes. The New Age onto-world additionally includes a oneness between humans and God, where God shifts from being an external authority associated with any particular religious tradition to the "voice within", or the "inner divinity" (Sutcliffe 2003, 172): "God has many forms, but yet is one; God may appear to be worshipped as if God is distinct from the self and the world, but yet is one with it; God is me, and I am God; what is outside is also within – if indeed one should talk of 'inside' and 'outside' at all" (Chryssides 1999,

324). Furthermore, being in touch with and following God's will, or the advice one gets from the voice within, leads to the best possible outcome, which is aligned with the "good of the whole" (Findhorn Community 1975, 29). As Dorothy, one of the co-founders of the Findhorn garden who will be more thoroughly introduced in §3.2, said, "To me, God is an indwelling presence, the core of what I am and what everything is. God is life itself, speaking through all life. And God's will is the path we tread which develops the best for us and for all we encounter" (Findhorn Community 1975, 54). The "God within" and the New Age concept of oneness, which I will also refer to in terms of wholeness, will be discussed more thoroughly in the context of Findhorn's plant-human collaboration below.

Peter and Eileen Caddy, the other two co-founders of the Findhorn garden who will also be more thoroughly introduced in §3.2, contributed to the New Age onto-world with several of the methods that informed their early gardening days, and which later became techniques used in the Findhorn spiritual community: they operated largely on what they called "intuition" instead of with logic, intellect, and reason (Hawken 1975, 34-35), they practiced releasing their "inner divinity", they utilized the "Law of Manifestation", and they practiced "positive thinking". In more detail, Eileen was told by her "voice within" that all the wisdom and knowledge and understanding were already within her, and that she had to take the time to be still and go deep within herself in order to find it (Findhorn Community 1975, 37). Listening to the voice within requires the ability to develop one's intuition. This leads to the

practice of connecting with and releasing one's inner divinity, which means being in tune with the whole. One way to feel this wholeness is through love:

> Love is the energy of acceptance that cuts through the apparent barriers and links us with every part of life. Loving and accepting every aspect of ourselves, we become whole. We begin to experience the compassion that allows us to feel and understand the essence of all forms of life. Through love we can blend with the consciousness of a plant or with the consciousness of another human being. (Findhorn Community 1975, 175)

This practice is obviously relevant to the work of communicating with devas and nature spirits.

Being in tune with the whole also means being able to manifest the good of the whole. The Law of Manifestation[54] suggests that one will get whatever one asks for in order to have one's needs met (Hawken 1975, 32). In Peter's experience, the Law of Manifestation did indeed provide for all of their needs, as long as he was willing to give up his individual will for the divine will, which meant only asking for things that his inner divine guidance suggested (Hawken 1975, 34). In a New Age onto-world, thoughts have a direct bearing on what manifests in one's life, so it is crucial to practice positive thinking. Positive thinking refers not only to mental activity but is an entire attitude that additionally requires positive intentions and a positive emotional state, for example by going about one's daily work in a state of joy and love. As received in inner guidance by Eileen, "You can bring about anything by your thoughts. That is why this new-found power can only be used when there is no self left to mar it; otherwise it could so easily be used for the wrong motive and not

[54] This is also sometimes called the "Law of Attraction" in the New Age.

for the good of the whole" (Findhorn Community 1975, 9). Thus the New Age spiritual seeker desires to move beyond their individual "egoic" self in order to tune in to and act for the good of the whole. These New Age themes will continue to be explored as we discuss the development of the Findhorn garden collaboration.

3.2 The Findhorn Story

The Findhorn Garden began in 1962 as a caravan site[55] in the sandy, windswept dunes alongside the North Sea in the northeast of Scotland. The late co-founders were Peter Caddy, who was responsible for most of the physical labor in the garden; Eileen Caddy, who received guidance from God as a voice within herself; and Dorothy Maclean, who established contact with the devas. These individuals came together through their common spiritual practices, eventually settling at a caravan park near the village of Findhorn. Eileen had an orthodox Christian upbringing and did not believe in things like psychics or channeling by mediums, yet prior to the establishment of the Findhorn Garden she began to hear a voice speaking within herself, a voice that identified itself as God (Hawken 1975, 98).[56] Although she attempted to suppress this voice, Peter, who had learned about the "Christ within" from spiritual teacher Sheena Govan (Hawken 1975, 61), eventually convinced Eileen to take this voice of God seriously (Hawken 1975, 98). In this way, God directed

[55] A caravan site is an area where people can park their recreational vehicles (RVs) and stay for an extended period of time at a low cost; this is an inexpensive way to live if one has an RV.
[56] According to Castro (1996), it is possible that Eileen Caddy may have been mistaken in believing that she was hearing the voice of God within herself, due to the large amount of stress she was under at the time, including harsh treatment by her spiritual teacher, Sheena Govan. This theory is supported by the fact that what she "learned" from the God within her was similar to what she would have learned from the movements and practices she was involved with at the time (34).

Eileen and Peter to move to Findhorn to begin their next adventure. They were joined by Dorothy, who had also begun hearing a voice inside herself while pursuing a successful career as a secretary, leading her to the same spiritual teacher, Sheena (Hawken 1975, 108).

Also involved in the garden collaboration was the late Robert Ogilvie Crombie (known as "Roc"), who communicated with the nature spirits. Roc was scientifically trained and valued "an objective search for truth" (Hawken 1975, 126), and to his initial disbelief, he one day began seeing and communicating with nature spirits while sitting in the Royal Botanic garden in Edinburgh (Hawken 1975, 129-130). Roc never lived at Findhorn but he was in regular communication with Peter, Eileen, and Dorothy, and he was a frequent visitor to the garden. In the remainder of this section, we will begin by discussing some of the general New Age practices used by Peter, Eileen, and Dorothy, then we will go into depth about their understanding of and interactions with the devas and nature spirits, then we will touch on some metaphysical and cosmological themes, and finally we will see how this all ties together as plant-human collaboration.

3.2.1 General practices

Peter, Eileen, and Dorothy – whom I will refer to collectively as the "Findhorn gardeners" – had no prior gardening experience, nor any money to purchase fertilizers or soil amendments (Chryssides 1999, 320). The sandy soil in their area did not provide the necessary nutrients for growing food, yet they needed a

garden for sustenance, so Peter began breaking up the top layer of crabgrass and digging it down into the sand, then planting seeds in the sand. Little by little, he was able to procure supplements like manure from neighboring farms, and Eileen and Dorothy harvested seaweed to add as well (Hawken 1975, 101-103). In addition to these physical components of the garden, Eileen reports that the practice of positive thinking was vital for them: "Always it was our attitude that was most important. What we were thinking was reflected in our everyday lives" (Findhorn Community 1975, 34). While working in the garden, Pater's positive attitude was paramount, as he could feel "radiations of light and love" (Findhorn Community 1975, 6) passing through him into the soil. In fact, they were informed by their inner guidance that it was important for all of them to put their radiations into the soil, because each member has something to contribute to the whole (Findhorn Community 1975, 13). These radiations of light and love increased the "life force" of the soil, where the life force is the "energy", or the "true nature", of the physical realm (Findhorn Community 1975, 8). The more this life force increased, the more the plants thrived and became resistant to diseases and pests; moreover, the resulting food grown in the garden contained the proper life force to nourish the gardeners (Findhorn Community 1975, 10-11) (MacLean 1981, 55), such that gardeners and plants were nourishing one another in turn. For Peter, the devas and nature spirits were "the life force personified" (Findhorn Community 1975, 7).

The decisions that needed to be made regarding the garden were in keeping with Peter, Eileen, and Dorothy's spiritual practice, in the sense that they relied on

their inner guidance and the Law of Manifestation, knowing that they would be provided for as long as their intentions were not selfish but were aligned with the divine wholeness within themselves. In Peter's experience, "My own guidance took the form of intuitive flashes of inspiration – often received while working – that carried a sense of conviction, a deep inner knowing" (Findhorn Community 1975, 7). He reports that it was initially difficult for him to distinguish between the voice of his rational mind that would offer advice based on an analysis of pros and cons, and "the voice of the higher mind" (Findhorn Community 1975, 13), or what he also referred to as his intuition. Peter usually double-checked his intuitions with the directives given by Eileen's inner voice, so that they jointly made decisions. This guidance regarded not only how to approach specific tasks in the garden, but also what it was appropriate to ask God for, so that the Law of Manifestation would function according to the greater divine will. With these practices, the Findhorn gardeners gradually established a basic garden for their nourishment.

3.2.2 Dorothy and the devas

Once the basic Findhorn garden had been established, Dorothy was one day unexpectedly contacted (through her inner voice) by the Pea Deva, who informed her that the spirits of the Nature Kingdom[57] were ready to attempt a collaboration with

[57] Used in the early days of Findhorn's collaborative gardening practice, the term "Nature Kingdom" refers to the devas and nature spirits, or the beings that direct their energy and efforts toward the materialization of form in spacetime. Currently, however, this term could be considered problematic, in part because it assumes a pre-given, external "nature" that is separate from and opposed to "culture". Other terms currently used at Findhorn (and elsewhere), include "subtle worlds" and "subtle beings",

the humans in the garden. As Eileen had initially ignored the voice of God within her, Dorothy initially shied away from this contact with the devas: "It was not easy for me to go against normality when I could prove nothing to myself or anyone else in a pragmatic way. It is not easy for our souls or for our intuition to surface in a materialistic world" (MacLean 1981, 89). But eventually, with Peter's urging, she began intentionally connecting with the Pea Deva (Findhorn Community 1975, 57). Apparently, the method of establishing contact with the devas is unique to each person, but for Dorothy it was necessary to be "in a state of joy and purity" (Findhorn Community 1975, 67), which meant being free of any negativity such as resentment or worry (Findhorn Community 1975, 69). From this highest level of her being, she would then focus on the life force or essence of a particular plant, creating a flow of love and appreciation with the plant (MacLean 1981, 123-124). For Dorothy, "The process by which I contact the devas is one of feeling into the essence of a plant and harmonizing my own self with it. The communication doesn't come to me as words, but as thoughts of inspiration, which I then express in words according to my own state of consciousness at the time" (Findhorn Community 1975, 78). Importantly, this did not work when she was in a state of *focused* consciousness, trying to make something happen, but instead she had to enter into a more *diffused* state of awareness, a state from which it is possible to perceive wholes (MacLean 1981, 82). Interestingly, it turns out that we are automatically in contact with the devas, whether

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or "unseen worlds" and "unseen beings". To be consistent with the Findhorn gardeners while recounting their story, I will continue to refer to the "Nature Kingdom" in this chapter.

or not we are consciously aware of it, whenever we are feeling joy or experiencing beauty or are otherwise "lifted out of ourselves" (Findhorn Community 1975, 73).

Through Dorothy's communication with the devas, she not only received advice on planting methods and growth conditions, plus receiving answers to Peter's specific questions about the garden, but she also came to a partial understanding of what the devas are – partial, because it is difficult to describe devas using words that apply to spacetime existence (MacLean 1981, 72), and more importantly, because to form a clear conception of the devas would be to limit them (Findhorn Community 1975, 68), as devas are beyond any limited categorizations or classifications or hierarchies (MacLean 1981, 73). The word "deva", which means "shining ones" in Sanskrit, is equivalent to the English word "angel" (Findhorn Community 1975, 57). Dorothy never saw the devas in any particular form, although it is apparently possible for devas to occasionally appear to humans in the form of an angel (Findhorn Community 1975, 59). The devas are sometimes referred to as "energy", sometimes as "life force", and sometimes as "the intelligent principle of growth" (MacLean 1981, 86), but their most important characterization seems to be that they hold the patterns for and direct the energy toward everything that materializes in spacetime: "The devas hold the archetypal pattern and plan for all forms around us, and they direct the energy needed for materializing them" (Findhorn Community 1975, 58). An archetypal pattern is a model of all the possible forms according to which entities are patterned when they materialize in spacetime. Regarding the use of the word "energy" in this context, the Findhorn gardeners gradually learned that "everything

around us is part of the same energy in different forms" (Findhorn Community 1975, 60), where the role of the devas, according to the devas, is that "We deal directly with energy and that energy shapes us, is part of us, is us, until we breathe it out to where it is needed" (Findhorn Community 1975, 59). Thus, although the devas themselves "work in the formless worlds" (Findhorn Community 1975, 59) beyond spacetime, they act as "causal factors of manifestation" (Findhorn Community 1975, 79) by directing the energy of their patterns toward the spacetime materialization of particular forms.

So where exactly are these devas? First of all, it is important to recognize that devas are beyond any distinction between one and many: "There was a lack of ego or self-awareness which made it possible for a deva to be itself, or to be the whole, or to be nothing, with equal ease" (MacLean 1981, 135, 157). In Dorothy's words, "A Deva is a pattern of life seeking fulfillment – it is everywhere, it cannot die, it simply is" (as quoted in Hawken 1975, 108). The Red Cabbage Deva explained to Dorothy that humans do not tend to recognize devas because humans are limited to their customary spacetime experience while devas are not: "Although we [the devas] live in the moment and are always moving, yet is our past and present with us…. Humans are so inclined to limit and depend upon their five senses to perceive the world that they forget that we are living, changing forces now, outside your sense of time" (Findhorn Community 1975, 60).[58] Another reason that humans tend to overlook

[58] Note that the use of terms such as "changing" and "now" implies some kind of temporality, yet the devas are supposed to exist beyond space and time. This confusion results from attempting to talk about existence beyond spacetime using inadequate modernist and New Age concepts. With agential

devas, according to the Findhorn gardeners, is because the devas deal with the "inner life-giving state" of plants, as opposed to the "solid, outer materializations", though these inner and outer states are interconnected, "like different octaves of the same melody" (Findhorn Community 1975, 60). Thus, though they are not ultimately separate, plants have both an outer physical form and an inner, life-giving energy (Findhorn Community 1975, 60), with which the devas are associated. Humans see the outer, finished, physical forms of plants, but they are not usually aware of the continual inner devic process taking place (Findhorn Community 1975, 81); that is, the work of the devas is invisible if we consider the outer finished form as pre-given instead of as evidence of devic action.

In a modernist onto-world, where physical matter such as minerals and plants and animal bodies come into being through the work of so-called "natural law", or the reconfiguring of the ultimate physical entities according to quantitative relationships, the notion of an entity like a deva having a role to play in the coming-into-being of our physical reality would probably not arise. But according to the messages that Dorothy received from the devas, what we call "natural law" is "energy brought into form through the work of the devic kingdom" (Findhorn Community 1975, 58) – the devas have a vital role to play in the coming into being of what we think of as physical matter, including our bodies. In this role of being responsible for what materializes in the physical world, the devas express no individual choice but create

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realism, as we will discuss in Chapter 6, we can talk about devas in terms of the indeterminacy within matter, such that devas are not themselves spacetimemattered yet they are inseparable from their associated spacetimematterings.

according to the will of the whole. In contrast, humans can express themselves according to their individuality, resulting in potentially destructive consequences (MacLean 1981, 86), because humans are usually focused on only a particular part instead of on the whole.[59] Then why include humans at all? As collaborators, the devas work within the limitations of their patterns, with no free will or choice regarding these patterns, whereas humans have the capability to plan out alternatives, for example by initiating new patterns or otherwise altering conditions (MacLean 1981, 74). We will further discuss these collaborative possibilities below.

3.2.3 Roc and the nature spirits

Once contact had been established between the devas and humans, communication with nature spirits was brought in through Roc's experiences. Before beginning his relationship with Findhorn, Roc had already begun communicating with the nature spirit realm, which includes both the nature spirits and their overlighting[60] god Pan, where "overlighting" means that Pan oversees the nature spirits. "Pan is a universal energy, a cosmic energy, which is constantly found throughout the whole of nature" (Findhorn Community 1975, 112), while the nature spirits, under Pan's guidance, minister to individual plants. For both Pan and the

[59] Given the current ecological crisis and the complaints by the devas regarding human behaviors with plants (as will be discussed below), the tendency in this context is to think about humans as having destructive behaviors. But we must be careful to take into account *for whom* the situation is destructive. For example, a hurricane that destroys a village and results in numerous human deaths would likely be considered destructive for humans, but not necessarily for the good of the whole.

[60] The term "overlighting" has a hierarchical connotation of overseeing or being in charge of, but it also means that Pan envelops the nature spirits as a whole, in an embrace of common purpose and vision. The term "overlighting" is also used to refer to certain devas who overlight other devas or nature spirits.

nature spirits, "Their primary state is what may be termed a 'light body'. It is a whirl or vortex of energy in constant motion.… They may be regarded as whirls of energy, but energy with intelligence. It is possible to see and to communicate with these light bodies" (Findhorn Community 1975, 114). We learned above that in order to better communicate with humans, devas sometimes appear in an angelic form. Similarly, Pan can appear to humans as the mythical god Pan, and nature spirits can appear as fairies, elves, gnomes, etc. Both the devas and nature spirits are assuming forms that have been preserved by humans as "thought-forms" (Findhorn Community 1975, 116, 118), which are patterns that have been repeated over and over again in human practices, thereby conditioning the way in which we perceive these entities. As with the devas, any time one thinks about the nature spirits, one is already in contact with them, but it takes practice to establish a two-way communication, to become aware of their subtle responses (Findhorn Community 1975, 122). As Roc says, "Their realm is intangible and nonmaterial, and cannot be appreciated by means of the five physical senses,[61] except in a condition of heightened awareness.… Yet to one perceiving with the higher senses, it is as real as any of the more material kingdoms" (Findhorn Community 1975, 102).

Roc's first experience "seeing" and "hearing" a nature spirit was with a nature spirit named "Kurmos", with whom he established an ongoing relationship (Findhorn Community 1975, 106). Regarding the visual aspect of this relationship, Roc was

[61] Nowadays we would consider there to be more than five physical senses, but the intent here is that the contact with the nature spirits required something beyond any *physical* sense. What Roc is referring to by "heightened awareness" is achieved through the use of the "higher", or non-physical senses.

sometimes able to see the nature spirits as if they were physically materialized forms, although Roc says about Kurmos that, "I realize I was not seeing him with my physical sight" (Findhorn Community 1975, 105). The nature spirits told him, "This is not your projection, it is bringing cosmic reality into manifestation when it is right to do so" (Findhorn Community 1975, 122). In Roc's case it was "right to do so" because Roc had been chosen to serve as a mediator in the beginning of a new relationship between the human and nature spirit realms (Findhorn Community 1975, 112). Regarding the auditory aspect of communicating with Kurmos, Roc continues, "And the communication between us was, no doubt, taking place on a mental or telepathic level by means of thought transference, probably in the form of images and symbols projected into my unconscious mind and translated into words by my consciousness" (Findhorn Community 1975, 105). Roc's later communications with Pan were similar, though at times he reports that it was as if Pan "stepped into him", and as if he were "outside time and space" with everything "happening in the now" (Findhorn Community 1975, 119). We learned above that Dorothy ultimately considered the devas to be part of her own divine self. Similarly, Roc ultimately felt that Pan was within himself: "But this within-ness is not contained in my physical body which would limit it; it is in all dimensions of space and time; it is infinite, the eternal now. We turn away from the outside world, the material world which so many believe to be the only reality, to seek that true reality which is within and yet everywhere" (Findhorn Community 1975, 120).

The realm of the nature spirits is called the "etheric realm", and it is considered to be the "closest" to the physical realm: "In esoteric knowledge, the etheric plane [realm] is made up of a fine energy substance from which is created the mold for every form we see manifest on the physical plane. Each material form has an etheric counterpart" (Findhorn Community 1975, 114, 116). While the devas are said to work in a "formless" realm, the nature spirits work with forms in the etheric realm: "In this work they use the energies channeled to them by the devas to build up an 'etheric body' or 'etheric counterpart' for each plant, according to its archetypal pattern. The plant grows and develops within this counterpart. In order to fulfill their task, the nature spirits too must take on an etheric body" (Findhorn Community 1975, 114).[62] In other words, the nature spirits fuse the energy of the devas with the growth of the plant, providing the physical plant with "life force" through its etheric counterpart (Hawken 1975, 157). Apparently, plants can grow without the aid of the nature spirits, but they will be lacking in life force and not only will not grow well but will also lack the ability to provide this life force as nourishment when their plant bodies are consumed – that is, physical nourishment will still occur but emotional and spiritual nourishment will be lacking (Hawken 1975, 158). In Roc's words,

> It is important to know that a plant grows within the etheric counterpart brought into existence by the Nature Spirits. By interfering with the natural growth of a plant in trying to alter the form through artificial means, often using force, man can depart from the archetypal design. Apart from the fear and pain produced in the plant, this can bring about lack of alignment with the counterpart, causing

[62] The etheric body is understood in esoteric literature as a "subtle" body that is part of the energetic aura but is still closely tied to the material body. The etheric body is also often called the "blueprint", or the "formative-forces" body, or the body that holds the formative pattern for the material body.

> further discomfort and distress to the plant. (Findhorn Community 1975, 116)

There are, however, other options: "Rather than using force to bring about changes in plants, it would be much better if man would ask the nature spirits to bring them about by modifying the etheric counterpart. This they will do if they are convinced that the change is reasonable and a help to mankind, not simply for expediency" (Findhorn Community 1975, 116). Such collaborative possibilities will be further discussed below.

3.2.4 An anthropological interlude: clarifications about devas and nature spirits

In the anthropological discussion of Chapter 2, with agential realism functioning as a guiding framework, we learned that objects and beliefs – or more generally, material-discursive practices – exist only in relation to the web of intra-action within which they are enacted. The purpose in this chapter is to delve as deeply as possible into the material-discursive practices of the Findhorn gardeners, in order to begin appreciating the significance of devas and nature spirits (and the God within) from within Findhorn's web of intra-action. This requires an initial suspending of disbelief, as well as the awareness that what might seem ambiguous or even contradictory at first, might only appear that way because we are not yet fully enough ensconced in Findhorn's New Age onto-world. We have learned various facts about Findhorn's devas and nature spirits, and indeed, some of these characterizations seem ambiguous or even contradictory. For example, devas are said to work in the formless worlds beyond spacetime, such that they are not themselves

bound by any particular form, but how can they hold patterns of forms without any spacetime to differentiate them? And how can nature spirits be "essentially formless" whirls of energy, while also taking on a variety of forms in the etheric realm? In Chapter 4, we will show that such ambiguities are likely not based on our lack of integration into Findhorn's intra-active web, but that they are indicative of the limitations inherent in a New Age onto-world that is implicitly based on modernist concepts. This confusing use of modernist language and constructs to describe devas and nature spirits may be significantly lessening our capacity to engage fully with Findhorn's practices in this chapter. Therefore, it will be beneficial to make several distinctions and clarifications here, as based on our guiding framework of agential realism.

As discussed in Chapter 2, the ultimate modernist entities are fully-formed, fully-determinate physical individuals located in a physical spacetime. But Findhorn's onto-world includes devas that are "beyond form", as well as nature spirits that are "essentially formless" and that take on "etheric" forms, where the etheric is "intangible" and "nonmaterial". As will be more fully argued in Chapter 4, these descriptions of devas and nature spirits do not cohere with the determinate physical matter of a modernist onto-world. However, as we learned in Chapter 2 with the ontological turn in anthropology, instead of therefore denying the existence of devas and nature spirits, we must instead question the modernist conception of matter to see if we can learn something new that could help us make sense of devas and nature spirits. For now, in order to continue engaging constructively with Findhorn's

practices, we will address the confusion over how the concept of "form" is being used. This can be accomplished by making several distinctions that are lacking in both the modernist and New Age onto-worlds.

First, in Chapter 1 we introduced a distinction between the "determinate individuals" of modernism and the "in/determinate phenomena" of agential realism. To briefly review, modernism does not recognize possibility, potentiality, or indeterminacy as an objective part of reality, while matter in agential realism is in/determinate, or inseparable from possibility. With the relational differentiating-entangling of in/determinate phenomena, as discussed in Chapter 2, we can recognize both indeterminacy (shifting patterns of possibility associated with phenomena) and determinacy (spacetimemattering within and as part of phenomena), where these dynamically reconfigure with respect to one another. In Chapter 6, we will discuss how agential realist in/determinacy is helpful for more fully overcoming the limitations of the New Age onto-world in regards to devas, but in this chapter, the intention is to stay as much as possible with the language used by the Findhorn gardeners. Thus, to avoid the confusion that results from devas being referred to both as holding forms "outside" of spacetime, and as "formless" or "beyond form", I will claim that the proper distinction to be made as part of Findhorn's New Age onto-world is that devas hold unmaterialized, or *potential* forms, rather than materialized forms, because devas are "beyond" spacetime and are therefore beyond materialized

form.[63] The distinction being made here is between forms that are held as (unmaterialized) possibilities "outside" of spacetime, and forms that are materialized in spacetime. Yet even for the Findhorn gardeners, there seems to be no absolute separation between unmaterialized and materialized form, because the devas with their potential forms are ultimately considered to be inseparable from the spacetime materializations of these forms, and vice versa.

In Chapter 1, we also introduced a distinction between "physical" and "transphysical" spacetime materializations, where the term "transphysical" designates any spacetimemattering that is enacted according to configurations other than the physical. This distinction, which overcomes physicocentrism by recognizing that physical matter is not the only possible kind of matter, helps to clarify the language used in reference to nature spirits and the etheric realm. According to the Findhorn gardeners, the etheric realm is "intangible" and "nonmaterial", and the primary state of Pan and the nature spirits are "whirls of energy" that are "essentially formless". Clearly, the intention with the etheric realm is to go beyond the tangible matter of our modernist physical reality, while not going so far as to be completely formless. Thus, we can surmise that the confusing use of the term "nonmaterial" to describe the etheric realm means not that the etheric realm is beyond spacetime materialization altogether, but that it is beyond *physical* spacetime materialization. We can clarify, then, that nature spirits are *transphysically* materialized in an etheric (transphysical)

[63] Regarding the fact that devas sometimes appear to humans in a materialized form, this does not mean that we are actually *seeing* a deva directly, but that we are seeing some materialized form that is indicative of the being of devas: "The devas themselves have no particular form. But in attempting to establish communication and cooperation with humans, members of the devic realms have made themselves visible in a form intelligible to humans" (Findhorn Garden 1975, 59).

spacetime. In other words, nature spirits are etheric whirls of energy that take on particular forms in the etheric realm, where the etheric realm has different characteristics than the physical realm, though both are spacetime materializations.

To summarize, with these clarifications we can say that in Findhorn's New Age onto-world, in addition to forms that are materialized in physical spacetime (physical plant bodies), forms can materialize in etheric spacetime (nature spirits), and forms can also be held as possibilities that are not materialized in any spacetime (devas). This discussion also extends to concepts such as "life force", in the sense that devas hold the *potential* patterns regarding how life force can be materialized, while the nature spirits materialize these patterns as the *transphysical*, etheric counterparts that fuse this life force with the physical plants. These descriptions of devas and nature spirits challenge the modernist understanding of concepts such as "matter", "space", and "time", which we will explore more thoroughly in subsequent chapters. For now, we will continue deepening our experience with Findhorn's plant-human collaboration.

3.2.5 Metaphysical and cosmological considerations

In this section, we will attain an overview of Findhorn's onto-world by arranging its various entities and realms hierarchically, while also discussing the ultimate oneness within which these entities relate to one another. We will additionally consider some of the broader implications that arose for the Findhorn gardeners once they came to recognize the devas and nature spirits, or the Nature

Kingdom more generally, as intelligent forces of nature with whom it is imperative to begin collaborating.

Starting at the "lower" end of this constructed hierarchy, plants are materialized in physical spacetime. These plants are intimately associated with an etheric counterpart, which is materialized in etheric spacetime and provides the life-force for the plant. The etheric realm includes the god Pan, who is in charge of the nature spirits as a whole, while the nature spirits themselves minister to particular plants. For any given plant in the physical realm, its associated nature spirits work in conjunction with the deva of that plant type. A deva overlights many nature spirits, because one devic pattern is materialized in many plants. Whereas Pan overlights the entire nature spirit kingdom, a particular deva overlights only those nature spirits involved with the plants that are materializing the corresponding devic pattern. When a new variety of plants is created, a new deva comes into being: "Each variety establishes its own deva as it establishes its type. As a different arrangement of forces is repeated often enough, an entity develops. That entity is like a daughter to us, yet it is closer than that; it is part of us" (Findhorn Community 1975, 91-92). Devas exist not only for plants but also for, for example, minerals, weather, land formations, insects, humans (Findhorn Community 1975, 57), and even machines (MacLean 1981, 103). Additionally, there are overlighting devas, or devas who act as a "spokesman" for all the devas in a certain region. For example, the overlighting deva for the Findhorn garden was called the Findhorn Angel, and it provided general information about the garden as a whole (Hawken 1975, 116). An overlighting deva

like the Findhorn Angel comes into being once a particular place becomes "united and whole", and it is "born from the radiations of the land, and the energies of the higher selves of not only the humans working on the land but of all the animals and plants there as well" (Findhorn Community 1975, 67). Finally, at the "highest" end of this hierarchy, the God within is "life itself", or the "core" of everything, or the divinity that unites the New Age onto-world in its ultimate oneness, in alignment with the good of the whole.

This hierarchical portrayal of beings in their separate realms is helpful for clarifying the distinctive characteristics of each of these beings and realms, but they are ultimately closely interrelated and united in divine oneness, together with humans. In §3.1, we talked about oneness as a togetherness and interdependence of all life; in the Findhorn onto-world this oneness is evident with respect to a variety of wholes, where a whole encompasses parts that are not dualistically separated, and there are no clear boundaries. For example, the Earth as a whole is considered to be "a single living organism", as part of which all the humans, animals, plants, minerals, etc. function as interdependent parts (Findhorn Community 1975, 173). And just as humans have physical bodies, devas "have substance on the dense physical plane" (MacLean 1981, 152), such that the physical plants being fed "radiations" by the devas are not separate from the devas themselves.[64] In fact, overlighting devas such as the Findhorn Angel demonstrate "the vague overlapping boundaries of the

[64] These kinds of New Age assertions are problematic because they do not follow modernist logic and can thus easily lead to a dismissal of New Age practices by the modernist. But with agential realism, as we will discuss in Chapter 6, we can talk about the inseparability of devas and their spacetime materializations as part of the in/determinacy of matter.

ephemeral inner worlds", in the sense that the Findhorn Angel both "had a life of its own" and "drew substance" from all the beings of the Findhorn Garden (MacLean 1981, 97). Even the various realms we have been discussing are not dualistically separated; according to Chryssides (1999), the physical realm emanates from the devic and etheric realms, which are the "energy" of the physical realm, where these realms are not dualistically separated (323). Finally, the world is one with God, where God is both outside and within the world, such that it no longer makes sense to talk about "inside" and "outside" (Chryssides 1999, 324). The oneness between God and the world, and also between God and the human self, is thus beyond any boundaries delineating "inner" or "outer". An important aspect of collaborating with the Nature Kingdom is for humans to experience wholeness as they come to recognize their oneness with the world, with God, with devas, etc. (Findhorn Community 1975, 162). In summary, as we further discuss the relationships between the various entities and realms of the Findhorn onto-world, we must remember that they are not ultimately separate from one another, from humans, from God, or from the world as a whole.

We learned above that the devas channel their plant patterns as energy or life force to the nature spirits, who build the etheric counterparts within which the physical plants grow and develop according to the devic patterns. As for a possible mechanism, the Landscape Angel says, "We work in what you call mantras, in movements, which produce sound and make a pattern, working up to a certain pitch. By these moves, I am now putting a certain quality of life force into the garden"

(Findhorn Community 1975, 62). Described in terms of forces, devas manipulate forces into patterns (MacLean 1981, 80) and then channel this energy to the nature spirits, who build up the physical form (Findhorn Community 1975, 58-59) through force fields:

> From the seed idea a pattern of force issues from the centre.… Down and out it comes, growing in strength and size, becoming brighter in pattern.… Then the pattern is passed to the makers of form, the elementals [nature spirits].… Remember, this is a process, that the pattern is everywhere apparent in the ethers held by the angels [devas] and made manifest by the energy of the elements through the ministrations of the elementals [nature spirits] at the appropriate opportunity… (MacLean 1981, 79-80)

This is the process by which physical form comes into being, and the devic patterns that are "everywhere apparent in the ethers" do not disappear or become irrelevant but are likewise apparent in the materialized physical forms. For example, Dorothy was shown that the devic pattern in a tree that had recently been transplanted was "blurry" because its "lines of force had been weakened" as a result of the transplantation (MacLean 1981, 79).

But with the joint involvement of devas, nature spirits, and humans in the materialization of physical forms, not to mention physical conditions and constraints, how are decisions made, and what determines whether or not the good of the whole[65] will be followed? As we learned above, devas express no individual choice but create

[65] We must be careful about how the "good of the whole" is construed. In the context of a benevolent God with a parent-child relationship to humans, one might assume that the will of the whole, or God's will, is to make a perfect world for humans. This is an example of the nature-culture divide, where "nature" is seen as benign, and "human culture" is striving toward creating their perfect niche *in* this pre-given natural world. However, the Findhorn texts imply a more co-creative interpretation of the will of the whole, namely that "nature" and "humans" have more fluid boundaries and are working together toward a greater goal of ultimate oneness, which does not preclude the extermination of humans.

according to the good of the whole, in that they direct their energy toward the materialization of their potential patterns. Nature spirits also create according to the good of the whole by following these devic patterns in their etheric materializations. Interestingly, though, "While the devas are anxious to cooperate but are rather detached from the results of their work, the nature spirits are more susceptible to direct influence by man and thus can get upset when he interferes with their work" (Findhorn Community 1975, 17). Apparently, devas and nature spirits create according to the good of the whole because they are still attuned to the "Cosmic oneness", but the individuality of humans has resulted in "separation, polarity and duality" (Findhorn Community 1975, 134). Because humans have lost sight of their oneness, they act in selfish ways (Findhorn Community 1975, 94), but they can learn to tune in to the good of the whole by communicating with the Nature Kingdom: "Man only acts from a limited point of view, resulting in imbalance, whereas man in communication with nature, in attunement with the oneness, has access to information about what results his actions will have, so he can express those actions cooperatively and with more love and foresight" (Findhorn Community 1975, 142-143). For example, we learned above that Peter attempted to make decisions based on his intuition, which was his method of connecting with nature and working for the good of the whole; yet at times, he reverted to working in limited ways by ignored these intuitions and simply performed the gardening techniques that he had been accustomed to utilizing in the past.

Luckily, because of the oneness of all life, humans will be naturally connected with the devas simply by learning to connect with their own inner divinity: "As our consciousness grows, we cannot help but be aware of the devas, for contacting them is basically the same as being in contact with our true selves" (Findhorn Community 1975, 73). Thus, communicating with devas is a deep communication with ourselves, and ultimately with the whole universe, enabling humans to step into their role as co-creators (MacLean 1981, 4). Through deep experiences of joy and beauty, the devas are constantly reminding us of the oneness of life, and when we come to accept this oneness more fully, which also means recognizing our inner divinity, then we can learn to act in a way that is in balance with all life (Findhorn Community 1975, 76). Being in balance means acting fluidly in recognition of oneness, and "true balance is not a position of rigidity but one of great ease, a flowing with every moment, giving, taking and adjusting, constantly seeking oneness" (Findhorn Community 1975, 84). The Rain Deva explains how to achieve balance: "If you are powerful but selfish and not thinking of the whole, what you invoke and receive will be out of balance. But if you desire God's perfection for all, you will invoke and receive that perfection individually and collectively" (Findhorn Community 1975, 94). Humans, however, have typically not learned how to act in wholeness from their divine selves; according to the Good King Henry[66] Deva:

> And in our adherence to our pattern we wonder how so often you do not comply with yours. We see these magnificent patterns of light that humans have, and we see them covered and ignored. Some of the devas help build your patterns for you and work to keep them pure

[66] Good King Henry is an herbaceous plant.

> while, on the whole, you go your way with your real selves unborn, always there to be but never actually being. It is very strange. (Findhorn Community 1975, 98)

So where does this leave the relationship between humans and the Nature Kingdom? As Sir George Trevelyan said,

> The picture the devas give is that from their viewpoint the world situation is critical. The world of nature spirits is sick of the way man is treating the life forces. The devas and elementals [nature spirits] are working with God's law in plant growth. Man is continually violating it. There is real likelihood that they may even turn their back on man whom they sometimes consider to be a parasite on Earth. This could mean a withdrawal of life force from the plant forms, with obviously devastating results. (Findhorn Community 1975, 22)

But, at least at the time of the Findhorn Garden collaboration, the devas and nature spirits were still willing to attempt to create a new balance by collaborating with humans.

3.2.6 Collaboration in the garden

Because humans do not customarily consider the possibility of collaborating with plants, they are generally not aware of any lack thereof, but the devas are. For example, the Cypress Tree deva lamented that it had a large and expansive pattern to fulfill (the cypress tree pattern) but that the Findhorn gardeners kept it constrained in a hedge: "We of the plant world have our pattern and destiny, worked out through the ages, and we feel it quite wrong that, because of man and his encroachment, we and others like us are not allowed to be. We have our portions of the plan to fulfill.… The pattern is ever before us, out of reach, a chimera we are forever growing toward but seldom attaining" (MacLean 1981, 131). The issue is that each plant has a pattern

to follow, and sometimes this pattern is compromised due to circumstances like weather or nutrient availability, but the interventions of humans, as in the above example of the cypress hedge, can cause more drastic and forceful alterations that persist over time. This forceful treatment of the plants is unnecessary, however, if humans learn to collaborate with the plant devas. The idea is that humans could attempt to initiate the modification of the cypress tree pattern into a cypress hedge pattern, and if the devas agree, a new pattern could be created that would fit the humans' needs while also allowing the new pattern to express itself more fully. It may seem as if this kind of collaboration already occurs regularly when humans create new plant varieties through genetic manipulation. While it is true that devas have in the past worked with horticulture experts on creating new plant forms, this was not a proper collaboration because these experts did not work with nature as an equal partner but instead imposed their will on nature, making nature respond to their designs (Findhorn Community 1975, 63).

According to the devas, there are no pre-established rules for collaboration. That is, in order for it to be a true collaboration, the methods and the results must be co-created by humans and the Nature Kingdom (MacLean 1981, 50). There are, however, some helpful facts and guidelines. First it is useful to know that the devas hold the (potential) patterns but they are not able to initiate any changes in these patterns, nor can they create new ones: "Eagerly we follow our plan of perfection, but we cannot reach down and control the material plane. That is the work of man. We simply use conditions to bring about evolution. But man is capable of changing

these conditions" (Findhorn Community 1975, 82). Second, by the power of their thoughts, humans can create patterns that can be materialized by the devas and nature spirits: "When humans wish to create with controlled thought,[67] according to how strongly they hold the pattern in their thoughts, the process can be speeded up and the necessary elements materialized almost out of time and space. This is what the cooperation between humans and our kingdom can bring about" (Findhorn Community 1975, 85). However, not any pattern can be materialized – humans must first learn to act from a place of oneness with the plants. That is, the human alone acts from a limited point of view, potentially resulting in imbalance, whereas the human in communication with the Nature Kingdom, in attunement with the oneness, acts from a more whole point of view that yields foresight about the consequences that various actions could bring. Cooperation is about acting with more love and foresight (Findhorn Community 1975, 142-143). Then, instead of *imposing* their vision on the devas and nature spirits by manipulating the physical forms and compromising the work of the devas in the process, the humans can simply *present* their vision to the devas and request a collaboration. In the ensuing collaboration, the human has done their part of creating the vision, and the human will also do any necessary manipulations in the "outer" physical realm, while the Nature Kingdom will work from the "inside" to manipulate the patterns accordingly (Findhorn Community 1975, 140).

[67] This is another example of a problematic New Age assertion, in the sense that human thoughts are supposed to be able to create material reality, where thoughts and reality are usually considered to be separate. In contrast, with agential realism, thoughts and reality are not separate, and a (material-discursive) thought could act as a conditioning factor (along with other factors and constraints) in shaping material-discursive reality.

Many different types of collaboration occurred at Findhorn. A powerful form of collaboration is the eventual possibility of creating new plant forms that are "expressive" of both the plants and the humans. For example, humans are accustomed to pruning sweet pea plants rather heavily in order to produce beautiful large flowers, but it turns out that this practice offends the nature spirits. One solution is that the human can learn to appreciate the beauty of the sweet pea in its natural form instead of attempting to create larger flowers. Alternatively, or in conjunction, the human can request a change in the sweet pea pattern, which can be accomplished internally by the devas. This is an example of working cooperatively with the "inner spirit of the plant" to make a change in the pattern, rather than manipulating the outer form through physical techniques like pruning (Findhorn Community 1975, 29). In the experience of the Findhorn gardeners, not every request of the human was acted upon by the Nature Kingdom, but "if our faith was strong enough and the change was clearly for the good of the whole, they would cooperate to bring it about" (Findhorn Community 1975, 29). Note that this collaborative work is a gradual process, and it is acceptable for humans to continue with some of their old ways (like heavy pruning) while learning to bring about the new. Eventually, the hope is that a collaboration will develop in which the Nature Kingdom makes changes in the plant forms, and the humans learn to modify their concept of beauty, where this all occurs in consideration of the whole (Findhorn Community 1975, 29).

There are other simpler examples of collaboration as well. For example, in order to produce good soil, humans can attempt to achieve the proper balance by

testing the soil and adding in any necessary supplements, though it is doubtful that the perfect balance can be achieved in this way. However, working in cooperation with the devas and nature spirits, the devas can tell the humans the appropriate materials to add into the existing soil, and the nature spirits will properly integrate them. Even without these physical additives, Peter said, "The devas had told us that if the soil was deficient, they, with the help of the nature spirits, could produce from the ethers the elements needed for perfect growth" (Findhorn Community 1975, 16), though the process takes longer this way. Another example has to do with simply forewarning plants before manipulating them. If the human tells the plant they will be transplanted or pruned or harvested from, the plant will be able to prepare properly (Findhorn Community 1975, 19), for example by shifting their life force from the part of the plant that will be removed to another part of the plant. It is not sufficient, however, to simply tell the plant what is happening; one must also listen for a response in case there is a reason not to proceed. For example, Peter intended to remove a broom plant because it was smothering a black currant bush that was needed for their nourishment, but the broom plant was in full bloom, and it is generally offensive to the nature spirits to remove plants while in full bloom. He was told that he would not regret leaving the broom plant alone, so he decided they would do without the black currants that year, in order to respect the nature spirits. But it turned out that although black currants generally did not do well that year in their surrounding area, their particular black currant bush produced an overflowing harvest despite being smothered by the broom plant – this collaboration resulted in beneficial

results for both the humans and the Nature Kingdom (Findhorn Community 1975,19). Finally, collaboration also means simply not counteracting the work of nature: "Man counteracts our work not only by the poisons he purposefully puts forth but also by the many ways in which he breaks cosmic law in his selfishness" (Findhorn Community 1975, 16), where cosmic law seems to refer to acting in the interest of the whole as opposed to selfish, or egoic, interests.

3.2.7 Summary

Thus was the Findhorn garden initially established as a collaboration between humans, devas, and nature spirits, eventually producing "sixty-five different vegetables, forty-two herbs, and twenty-one types of fruit", including a 42-pound cabbage[68] and a 60-pound broccoli plant, in the sandy soils and the cold, windy climate of northeastern Scotland (Hawken 1975, 5). This remarkable result confounded soil experts like the Soil Association consultant Professor Lindsay Robb, who concluded there must be something beyond "the application of any known cultural methods of organic husbandry" going into their garden (MacLean 1981, 66).[69] This extraordinary growth in unlikely conditions did not continue indefinitely, however. As the later Findhorn head gardener Matthew said,

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[68] According to Castro (1996), the enormous size of these vegetables is not in itself sufficient proof of devic intervention, because apparently in 1988 a 70-pound cabbage was grown by the Durham Agricultural College through the use of extensive amounts of manure but with no devic assistance (4). While this is an interesting fact, it does not negate the possibility that devas were still active in the Findhorn garden. Moreover, we cannot rule out the possibility that, unbeknownst to the Durham Agricultural College, the devas were in fact assisting with the growth of their 70-pound cabbage.

[69] According to other opinions, it is the unique microclimate in Moray (the region of Scotland in which the Findhorn garden is located) that enables this remarkable growth (McCarthy 2001). However, if all

> The growth here was fantastic to demonstrate to Peter Caddy and to others that it was possible. Now we know it is possible to work with the Nature Kingdom, but we no longer have the need to produce a plant where it won't normally grow. Just because some of these plants were growing in the middle of the cold in the dry sand didn't mean that they were happy about it. They were there to show the power and potential of cooperation. (Hawken 1975, 28)

When Dorothy and Roc, the original Findhorn gardeners who communicated most closely with the devas and nature spirits, were no longer active at Findhorn, nobody was left who could directly communicate with the Nature Kingdom. This initially led to conflicts regarding how or whether to collaborate with the plants, until the later Findhorn gardeners realized that it was not necessary to continue with the particular collaborative techniques used during the early years. Instead, it was most important that they worked in the proper consciousness, expressing their love for nature (Findhorn Community 1975, 150-152): "To place the emphasis on the form of the experiment rather than the essential message would be to miss the point. God, the devas and the nature spirits are all aspects of one life, the same life we are expressing. They are, in fact, within us, and each of us has the power to work with these forces…" (Findhorn Community 1975, 152). In this sense, cooperating with nature is simply about recognizing the oneness and the divinity within all, while learning how to experience wholeness (Findhorn Community 1975, 162). Specifically, these later Findhorn gardeners focused on connecting with the devic aspect within themselves, which allowed them to be intuitively guided in their gardening. For example, the

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of Moray (more than 2000 square kilometers) has this unique micro-climate, then why has there been no extraordinary growth outside of the Findhorn Foundation gardens, and why did this extraordinary growth not continue at the Findhorn Foundation gardens beyond the 1960s?

gardeners told some bushes with deep roots that they would have to be moved in a few days, and why; when they went back a few days later to move them, the bushes could easily be pulled out, while other similar bushes that had not been told could not be pulled out in this way (Hawken 1975, 29). Thus, there was still a collaborative spirit in the later Findhorn garden, though the primary focus shifted to the establishment of a spiritual retreat center (Chryssides 1999, 325).

The main Findhorn message remains the same for these later spiritual seekers as it was in the early gardening days – divinity is not external but is within each of us, and we must connect with and release our inner divinity (Sutcliffe 2003, 72). In this way we become whole, living consciously within the oneness. The relation to our current ecological situation is that we are beginning to recognize the interrelatedness of life, and we are attempting to keep the environment in balance, but we are missing the parts of nature that are beyond physical form and beyond materialized form altogether, as well as the important relationships between humans and the Nature Kingdom as they were demonstrated at Findhorn (Findhorn Community 1975, 128). The original Findhorn garden collaboration is "a living demonstration of a trans-physical reality, anchored in tangible manifestation" (Findhorn Community 1975, 128), reminding us that to work toward oneness means including entities such as devas and nature spirits. We need to move beyond the human as having dominion over Earth, where nature is a mere resource or commodity (Findhorn Community 1975, 129), and we need to bring back the intelligence and divinity within the oneness

of all life, including the possibility of a spirit that informs nature (Findhorn Community 1975, 130).

4. Making Sense of Plant-Human Collaboration

The recounting in Chapter 3 of Findhorn's plant-human collaboration with its devas and nature spirits has likely left the reader with a sense of either excitement or disbelief, or perhaps even anger or fear at the possibility of allowing entities such as devas and nature spirits into an analytical project. But our anthropological discussion in Chapter 2 has made it clear that in the context of this project, we must suspend our disbelief (or whatever other reactions we might be having) in order to engage as fully as possible with Findhorn's web of intra-action. In this chapter, we will determine that plant-human collaboration as it occurred at Findhorn does not fit into a modernist onto-world, but that while the New Age onto-world overcomes the modernist restrictions that preclude plant-human collaboration, it implicitly retains modernist tendencies that limit its usefulness when further investigating plant-human collaboration. Finally, we will sketch out how agential realism can overcome the limitations of these modernist assumptions, preparing us for the following chapters, in which we will make sense of Findhorn's plant-human collaboration in an agential realist onto-world.

Based on the data of Findhorn's plant-human collaboration as it was described in Chapter 3, we need to make sense of a multi-realm cosmology of collaborative beings including devas, nature spirits, and the God within. For the Findhorn gardeners, the physical realm is where plants materialize in spacetime, not only according to physical conditions and constraints, but also through the causal action of the devas and nature spirits. The nature spirits exist in an etheric realm, working with

the etheric counterparts of the physical plants, while devas hold potential patterns "beyond" spacetime, directing their "energy" to the spacetime materialization of these patterns. These various entities are not ultimately separate from one another, but they are all one, within the whole of the Findhorn Garden that also includes humans, insects, rocks, weather, land formations, etc. Findhorn's God within is the core of everything, speaking through everything and uniting everything in an ultimate oneness. To make sense of Findhorn's plant-human collaboration, we must accommodate collaborating beings other than humans, realms other than the physical, and an ultimate oneness that encompasses everything.

We will begin in §4.1 by reviewing some background information and definitions of key terms that were introduced in Chapter 1. Then, in §4.2, we will examine the ways in which the modernist onto-world cannot make sense of Findhorn's plant-human collaboration, and we will find that this is due to several key modernist assumptions: that humans have a privileged role with respect to the rest of "nature", that matter and meaning have no necessary relation to one another, that individual, pre-existing entities are the fundamental existents, and that in order for something to be real, it must be ultimately reducible to a physical basis (physicocentrism). Next, in §4.3, we will discuss the ways in which Findhorn's New Age onto-world expands upon modernism by including non-physical entities, non-human collaborators, and non-reductionistic components, while however implicitly retaining key modernist assumptions that are evidenced in problematic practices, thus making the New Age onto-world an undesirable platform for a further investigation

of plant-human collaboration. Finally, in §4.4, we will sketch out how these key modernist limitations can be overcome in an agential realist onto-world, such that we are not precluded from being able to make sense of Findhorn's plant-human collaboration.

4.1 Definitions and Background

In order to examine whether devas and nature spirits can be accommodated in our various onto-worlds, it is important to be clear about the physicocentrism of the modernist onto-world, which was introduced in Chapter 1. To briefly review, the ultimate entities of a modernist onto-world are fully-formed, fully-determinate, separate pre-existing individuals, which we are referring to as "determinate individuals". These determinate individuals do not include any form of objective possibility or indeterminism by virtue of which they must undergo a process of formation or differentiation in order to exist. Moreover, these determinate individuals consist only of physical matter, where the term "physical" designates what is generally considered to be scientifically real in a modernist onto-world. To be physical, something must be perceptible through the use of the physical senses and their technological extensions, and must ultimately be measurable. One necessary component of measurability that is relevant to this project is that to be measurable, something must exist in, or be reducible to something that exists in, a metrically defined spacetime. When using the term "realm" in association with the modernist and New Age onto-worlds, we can say that the modernist onto-world has only a

physical realm, and that matter is equated with the physical (the measurable), while the New Age onto-world has additional realms, such as the (transphysical) etheric realm. Finally, it is generally assumed that the modernist physical realm is causally closed, such that physical reality is not affected by any non-physical causes.

In contrast to the modernist onto-world with its determinate physical individuals, the ultimate entities of an agential realist onto-world are in/determinate phenomena, as part of which there are no pre-existing separate individuals, nor is anything ever fully determinate (or fully indeterminate). Thus, in an agential realist onto-world, in/determinate matter always includes possibility, but in an inseparable and dynamic manner. While matter in a modernist onto-world exists in a pre-given, independently-existing, physical spacetime realm – which is characterized by a metrical geometry in order to permit measurement – matter in an agential realist onto-world is not pre-existing but is differentially constituted along with space and time, such that neither space nor time are pre-given or limited to any particular configuration. Thus, an agential realist onto-world need not be limited to physical spacetimematterings (enacted along with metrical spacetime), but can also include transphysical spacetimematterings, where the term "transphysical" designates any spacetimemattering that is enacted according to configurations other than the physical (metrical). Yet with agential realism, there are no pre-determined, independently existing realms populated by different types of beings, nor are realms iteratively created in such a way that they become stable entities that are causally closed with respect to other realms. Instead, we can talk about different sets of material-

discursive practices that tend toward certain patterns of spacetimemattering, all of which are thoroughly entangled, and none of which result in anything separate or fixed. In this way, the agential realist onto-world with its in/determinate phenomena can overcome the physicocentrism of the modernist onto-world, because spacetimematterings need not be limited to physical configurations, and matter is never a fully determinate fact.

We will also review our use of the term "collaboration" that was introduced in Chapter 1. In a modernist onto-world, collaboration is an interaction between (human) individuals that is usually some kind of a bargaining agreement with stakes and returns that either do or do not benefit the individual. But in an agential realist onto-world, the meaning of collaboration shifts because there are no pre-existing separate individuals between whom collaboration can occur. We will begin by analyzing the notion of plant-human collaboration from within a modernist onto-world, for the purpose of which we are defining collaboration as minimally requiring some sort of intelligence, knowledge, agency, and the ability to communicate. For communication, we are focusing on the presence of intentionality, intersubjectivity, and an exchange of jointly meaningful information. While in a modernist onto-world this is framed in terms of individuals to whom these particular attributes and abilities do or do not belong – e.g. humans are intelligent and are able to create meaning, but plants are not – this notion of attributes and abilities as belonging to individuals is reworked in agential realism.

In this initial section, we have already established some of the major differences between the modernist and agential realist onto-worlds, foreshadowing the reasons why making sense of plant-human collaboration will require a move to an agential realist onto-world. In the following section, we will begin by situating ourselves within the modernist onto-world, addressing the variety of reasons that make it difficult to make sense of plant-human collaboration.

4.2 Findhorn's plant-human collaboration in a modernist onto-world

We will begin in §4.2.1 by considering the general requirements for collaboration within a modernist onto-world, determining that non-humans such as plants are not the kinds of collaborators that show up in a modernist onto-world. Next, in §4.2.2, we will discuss how devas and nature spirits, along with their associated forms of causality and communication, do not exist within a modernist onto-world. Finally, in §4.2.3, we will see how the fundamental oneness that ties together the various entities of Findhorn's onto-world, including the God within, is not compatible with a modernist onto-world. We will conclude in §4.2.4 that in order to begin making sense of Findhorn's plant-human collaboration within a modernist onto-world, we need to question key modernist assumptions: human exceptionalism, reductionism, the dualism between matter and meaning, the metaphysics of individualism, and physicocentrism.

It is also important to note, as we discussed in Chapter 2, that these fundamental features of the modernist onto-world are expressed not only in the

philosophical and scientific systems – which are the focus in this project – but also in the political and economic structure of the modernist onto-world. That is, the banishing of spirits that occurred along with the view of nature as agency-less and de-spirited was accomplished in conjunction with the enclosure of the common lands, the eradication of non-dualist practices, and the rise of the market economy in seventeenth century Europe. Thus, the question of bringing devas and nature spirits into a modernist onto-world is not simply a philosophical issue or a matter of scientific validation, but it also requires an engagement with the entangled social, political, and economic issues.

4.2.1 General requirements for collaboration

In a modernist onto-world, plants are generally considered to be living, physical objects that provide us with food, enjoyment, inspiration, and raw materials, not to mention having significant effects on our landscapes and climate. Yet the topic of plant-human collaboration does not generally arise in a modernist onto-world. In order for such a collaboration to be considered, there would need to be some reason why humans would want to collaborate with plants. Regarding the ecological crises we are facing, it is not unreasonable to claim that we need a radically new approach, which could include asking the plants themselves for assistance. However, this option would arise only if we believed that plants have some kind of knowledge or intelligence worth sharing, plus the agency to be able to partner with us in a co-creative way. Additionally, we would need to be able to engage in two-way

communication of some sort. Communication in itself is not sufficient for collaboration, because collaboration additionally requires the sharing of agency and the creation of common goals, but it seems to be a necessary component. We will begin with a general, modernist definition of communication – an intentional, intersubjective engagement in which some kind of jointly meaningful information is exchanged between individuals through physical methods – in order to capture the elements that we believe to be necessary for collaboration.

A core assumption of modernism is that humans are privileged in having attributes such as knowledge, intelligence, agency, intentionality, and subjectivity, which eliminates non-humans such as plants from being considered as collaborative allies.[70] It is interesting to note, however, that the modernist attitude toward plants has been shifting, as evidenced by the large and growing body of research providing scientific and philosophical evidence and arguments for including plants among the sentient beings, as presented in Appendix A. This research is being conducted with modernist scientific approaches and rigor, yet it remains on the fringe and tends to be dismissed or even ridiculed by mainstream modernists, likely because the very idea of plant sentience – for example the idea that plants have feelings and can communicate – does not cohere with modernist assumptions. We will consider several examples of this research below, but here we are making the point that despite this research, the modernist attitude toward plants is that they do not have attributes such as knowledge,

[70] When we consider this point from within an agential realist onto-world, the discussion will shift entirely, as there are no pre-existing individuals – whether humans or plants – to whom attributes do or do not belong.

intelligence, agency, intentionality, and subjectivity, which we have defined as necessary for collaboration.

In addition to these attributes, we have defined collaboration as requiring an exchange of information that is physically mediated and has a shared meaning for the communicators. First, consider an exchange of information that is physically mediated but that we would not generally consider to be a meaningful communication. We could say that an exchange of information occurs when two billiard balls collide with one another, because the momentum from each ball is transferred to the other, informing both trajectories. This type of information exchange between objects also holds for two human bodies, considered only as physical bodies, colliding with one another. Even without direct physical contact, an information exchange between human bodies can be mediated by, for example, sound or light waves, informing the physical sense organs by impinging upon them and effecting a physical change. This kind of information exchange also functions between humans and other entities, such as plants. Although such interactions are more complex than collisions between billiard balls, the modernist assumption is that complex interactions can eventually be explained by reduction to their component interactions.[71] A basic assumption of the modernist onto-world is that the ultimate entities are pre-existing determinate individuals that have no necessary relation to one

[71] Some of the most fundamental component interactions, such as between two electrons, result in quantum mechanical issues that require a reconsideration of the underlying assumptions of the modernist onto-world, including the assumption that matter is composed of determinate individuals. In an agential realist onto-world, which builds on these quantum mechanical findings, we do not begin with individual objects (or subjects) that interact with one another, but both objects and subjects emerge during intra-action, radically altering the concept of information exchange. This will be considered below.

another. The only way to exchange information between such individuals is through external mechanisms,[72] such as via physical contact or as mediated by the physical sense organs. Note that this is an example of both the metaphysics of individualism and the physicocentrism of the modernist onto-world.

Next, consider a meaningful communication between subjects, which includes not only an exchange of information between their physical bodies but also a shared meaning. While an exchange of information between physical bodies is (to some degree) explicable in terms of a physical medium of transfer, for example via a physical impact as described above, the communication of meaning between subjects does not have an obvious explanation in a modernist onto-world. We must consider both the generation and the sharing of meaning. Regarding the latter, in a modernist onto-world, separate determinate individuals have no inherent connection to one another and are thus limited to exchanging meaning through external mechanisms, which because of physicocentrism must occur via an exchange of physical matter between the physical bodies of the subjects. However, in a modernist onto-world, there is no necessary connection between physical matter – e.g. sound waves traveling from the mouth of one subject to the ear of another – and the meaning it is supposed to convey. To complicate matters, with communication between human subjects, the notion of the human "mind" obscures these issues by making it seem as if a mind is required in order to generate meaning. This will be further discussed

[72] The term "external" is being used here to make the point that pre-existing individuals, because they are already fully-formed, can only relate to one another externally, through either direct or mediated physical contact. In contrast, internal relatedness occurs when entities are not pre-existing, but when they co-constitute one another as they mutually come into being, thereby having the potential to inform one another internally, or as part of their process of coming into being.

below, but for now we can say that in a modernist onto-world, it is generally assumed that the meaning generated by the mind is somehow based on or related to the physical matter of the brain – e.g. mental representations grounded in neural anatomy – despite the fact that matter and meaning have no necessary ontological relation in our scientific understanding. Finally, it is assumed that humans are privileged in having minds and thus in being able to generate and share meaning, thereby excluding plants, but because we cannot explain this generation and sharing of meaning in the first place, it is unclear why plants should be excluded. To probe this multilayered issue, let us examine several possible scenarios of meaningful communication: communication between plants and humans; communication between plants; communication between plants and non-humans such as insects; communication between humans. As mentioned above, the privilege of being a subject that can generate meaning is usually granted only to humans in a modernist onto-world. But in the context of this project, we must also examine whether non-humans such as plants are capable of meaningful communication.

One possible scenario in which plants might be communicating meaningfully with humans is by expressing their need for water through visual cues such as the wilting or drooping of their leaves. Note that this kind of visual cue does not necessarily indicate the need for water, as some plants let their leaves droop during the heat of mid-day and then perk back up when it cools down, and it is actually deleterious to water them while they are hot and drooping. But even if the wilting truly were a sign that the plant needed water, the wilting could be explained as a

biochemical response of the plant to the lack of water, not as a meaningful communication intended for humans.[73] This biochemical explanation does not preclude the possibility that the plant is also intentionally communicating its need for water to us, but this latter explanation is not necessary, and the biochemical explanation is more satisfying in a modernist onto-world. In other similar scenarios, we would find that there is usually a modernist interpretation that reduces the scenario to a physical mechanism that does not carry an intentional meaning.

Next, consider the possibility of meaningful communication between plants, as well as between plants and non-human animals such as insects. One description of what is required for plant communication involves "the intentional transfer of some kind of information or signal that benefit both the emitter and the receiver" (Gagliano 2013, 789), where the signal must have evolved to carry a specific meaning for the purpose of communication with a particular targeted audience, as opposed to being an incidental feature of the plant's interaction with the environment (i.e. a "cue"). A communicative signal could be a chemical that is emitted from one plant and received by a neighboring plant, where this chemical causes a change in the neighboring plant that benefits both plants, and is therefore meaningful. Or, a well-known example of plant-insect communication is through a chemical emitted by a plant that attracts a particular insect, such that the insect receives food from the plant and in turn pollinates the plant.

[73] This applies to humans as well – we can explain some aspects of human behavior as results of biochemical or other physical processes, but when it comes to the question of meaning, we are limited by the fact that there is no necessary relation between matter and meaning.

In this way, meaningful communication between non-humans such as plants and insects need no longer be dependent upon a human standard of intelligence, nor does it require the kind of mind or physical sense organs that are possessed by humans. In fact, plants have numerous physical senses of their own, which allow them to physically sense their own internal state as well as their external environment (Karban 2017, 11). This type of plant communication, which is presented in more depth in Appendix A, has been confirmed by multiple studies in diverse conditions (see Gagliano 2013 and references therein). However, it should be noted that there is no clear modernist explanation for how meaning is connected to the physical signal that is said to have evolved for the purpose of carrying that meaning. Moreover, one might argue that the kind of meaning being ascribed to the exchange of information between plants, simply because both plants benefit from the exchange, is not equivalent to the meaning that humans share during communication. In order to address this question, we must first be able to clearly define "meaning" in terms of how it is generated and shared by humans in a modernist onto-world.

Considering a meaningful communication between humans is different from our above examples, because we start with the modernist assumption that humans are subjects who can generate and share meaning. The common-sense modernist understanding is that humans generate meaning with their minds, where minds are generally granted only to humans. However, this assumption raises issues, not only regarding human exceptionalism, but also in terms of what a mind is and how it is related to the matter that forms the basis of our scientific understanding. In a

modernist onto-world, despite the common-sense understanding by which we "know" that humans have minds that can meaningfully exchange information with one another to at least some degree, there is no philosophically sound way in which to prove this, nor is there a generally accepted resolution to the issue of how mind and meaning are related to matter.[74] But whether mind and matter are both considered to be real, or whether mind is reduced to matter or completely "eliminated", the crux of the issue is that for modernists, mind is either "explained away", or there is no necessary ontological relation between mind and matter. In other words, modernist approaches to mind do not postulate an inherent togetherness of matter and mind, in the sense that neither matter nor mind can exist without the other.[75] In this project, we are not concerned with defining the concept of "mind", especially in the sense that minds are granted only to humans, but we are working with the modernist dualism

[74] The modernist onto-world includes a variety of conflicting philosophical approaches to the mind/matter issue. With Cartesian dualism, mind and matter are distinct substances, and it is not clear how they can causally interact (Descartes 1998). Moreover, mind cannot be scientifically investigated, and we cannot even be sure that other humans have minds, except via an inference based on their physical behaviors. With behaviorism, there is no mind as such, but the mind is understood as a collection of physical behaviors, which is scientifically investigatible (Ryle 1984). With the more extreme eliminativist approach, the mind is eliminated altogether, and anything we would consider to be a mental process is construed as a purely physical process (Churchland 1981). Other approaches recognize the mind (or mental states, or mental processes) as real, where mind is connected to matter in various ways. For example, with some forms of representationalism, the mind is construed as performing a set of functions using mental representations, which are unobservable but real functional states internal to the human (Fodor 1987). With the dynamical approach, mind corresponds to the physical behavior of dynamical systems (Van Gelder 1995).

[75] These modernist approaches of either separating mind from matter, eliminating mind (with respect to matter), treating mind as sets of behaviors or functions, or otherwise reducing mind to some aspect of matter, have been challenged by a variety of "embodied", "interactive", and "enactive" philosophical approaches (see, for example, Chemero 2013; Gallagher and Zahavi 2012; Thompson 2007; Varela et al. 1993). In such approaches, meaning is not transferred between subjects through mental representations, but intersubjective meaning emerges from a joint communicative encounter in which the mind and body are not entirely separate. An agential realist onto-world takes insights from such theories to the next level by reworking the concepts of "matter" and "meaning" such that they are inseparable and dynamic parts of material-discursive intra-activity.

between matter and meaning. Thus, we can say that in a modernist onto-world that is based on a dualism between matter and meaning, where only matter is considered to be scientifically real, we cannot truly explain how meaningful exchanges occur between humans.

Yet, it is still part of the modernist common-sense understanding that humans have minds that can generate and share meaning, while plants do not. Even if plants could be said to communicate with other plants by sharing meaningful information through physical methods such as the transfer of chemicals, this concession would simply equate plants with humans in terms of exchanging information through physical methods, where the question of meaning still remains. Perhaps one of the reasons that it is difficult to accept the possibility of plants as communicators of meaningful information in a modernist onto-world is that it would lead to a deeper questioning about what exactly the human mind is, and whether it is even necessary for the generation of meaning, which would threaten one of the key features of humans that delineates them from the rest of "nature". Because of this, the issue of whether plants can generate and share meaning is foremost an issue of human exceptionalism, because the necessary attributes and abilities are simply denied to plants. Even if human exceptionalism were overcome, we would still have the issue of the generation and sharing of meaning between any subjects, be they plants or humans. In summary, we tend to grant humans knowledge, intelligence, agency, intentionality, subjectivity, and the ability to create, understand, and exchange meaning, but none of these attributes or abilities is typically applied to plants. Thus, a

modernist onto-world that is limited by the metaphysics of individualism, the dualism between matter and meaning, physicocentrism, and human exceptionalism, cannot make sense of plants as possible collaborative allies.

To conclude this subsection, we will examine the repercussions of living in a modernist onto-world that does not recognize non-humans such as plants as collaborative allies. When we begin with the modernist assumptions that humans are privileged in having attributes such as knowledge, intelligence, agency, intentionality, and subjectivity, and that there is no obvious way in which plants and humans can share meaningful information with one another, collaboration between plants and humans seems neither possible nor desirable. Specifically, if plants are mere commodities – unintelligent objects with no value or purpose for themselves – then it is reasonable to conclude that it must be up to humans to make decisions regarding their placement, growth conditions, and use. This situates the human in the role of a steward (or possibly a tyrant) toward plants and toward "nature" more generally, which tends to reduce nature into a mere "backdrop" for human activities, reflecting the nature-culture divide that is characteristic of a modernist onto-world. A further assumption is that humans, according to their human goals, have not only the responsibility but also the wisdom to make the appropriate decisions regarding the part of "nature" that is under their control. All these assumptions taken together leave no room for the possibility of a meaningful collaboration between plants and humans.

Then again, how can we explain the fact that some people have "green thumbs", in the sense that they consistently know how to care for their plants such

that the plants thrive, while other people in similar situations consistently end up with dying plants? We cannot rule out the possibility that the plants are somehow providing them with this information, and that indeed they are providing all of us with this information, but some of us do not (yet) have the ability or awareness to take it in. If this were the case, we should be seriously questioning not only our assumption that humans have the sole ability (and therefore responsibility) to make decisions regarding the non-human world, but also our assumption that humans have sufficient wisdom and appropriately far-reaching goals to succeed in such a role. As discussed above, the current scientific and philosophical research on plant sentience (presented in Appendix A) is questioning some of these assumptions. This research investigates how plants communicate with one another physically, for example through chemicals or possibly sound, and this research could be extended to question how humans might, through their physical sense organs, be able to receive communications from plants. But additionally, there is an opportunity to communicate with plants as was done in the plant-human collaboration at Findhorn, namely by communicating with the devic and etheric aspects of plants. Next, we consider devas and nature spirits from within a modernist onto-world.

4.2.2 Devas and nature spirits

In Findhorn's New Age onto-world, it is not a physical plant on its own that collaborates with humans, but it is the devas and nature spirits that collaborate with humans on behalf of, or as part of, the physical plant. Despite the fact that there is a

certain familiarity with angels and spirits in the modernist onto-world, such entities are not considered to be scientifically real. In this section we will review some of the characteristics of the devas and nature spirits, including how they relate to plants and humans, in order to understand why we cannot make sense of them within a modernist onto-world. Instead of therefore negating the existence of devas and nature spirits, we will analyze the modernist assumptions that foreclose this possibility in order to determine whether some of these assumptions might need to be reconsidered. In this subsection, we will be dealing mostly with the concepts of matter, spacetime, and causality.

Let us briefly review from Chapter 3 what we learned about Findhorn's devas and nature spirits. Devas exist "outside" of spacetime, holding the potential forms or patterns of a particular plant type and directing their "energy" toward the spacetime materialization of this form. Nature spirits work in the etheric realm, using the "energies" channeled to them by the devas to build the "etheric counterpart" for each physical plant, which supplies the plant with "life force", and within which the plant grows and develops. In this way, both devas and nature spirits play a causal role in the materialization of the physical world. That is, Findhorn's onto-world includes a process of materialization, or the coming into being of matter in spacetime, such that a physical entity can be causally affected while it is in the process of materializing, thereby influencing the way in which it comes into being.[76] Since devas and nature

[76] This process of materialization is *not* what might be referred to in a modernist onto-world as a "dynamic" system, in which the variables are continuously changing over time, for example as represented by a set of equations describing the nonlinear dynamics of fully-formed bits of matter

spirits are not physical entities, we can say that Findhorn's physical realm is not causally closed, because the devas "outside" spacetime and the nature spirits in the (transphysical) etheric realm causally influence the way in which physical matter comes into being.

To review from Chapter 3, Findhorn's etheric realm is closely tied to the physical realm, but it is "intangible" and "nonmaterial"[77], variously described as being constituted by "a fine energy substance", "energy", "life force", "force fields", or "patterns of forces". Etheric bodies can sometimes be "seen" by humans, though not with the physical eyes, which means that etheric bodies are not perceptible with the physical senses alone. There seems to be an attempt with the etheric realm to move away from the solid substance of the physical realm while still needing something out of which a "body" can be formed. In contrast to the etheric and physical realms in which bodies are materialized in spacetime, the devas are not materialized at all, but they hold the potential forms or patterns for anything that ever has been or ever could be materialized in spacetime. These realms and entities are not ultimately separate, but they are different forms of the same underlying "energy". As the Findhorn gardeners say, in addition to the "outer" physical form of a plant, there is also its "inner" activity corresponding to the devas and nature spirits, where "inner" and "outer" are not separate.

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moving through spacetime. In contrast, the Findhorn texts seem to imply a process in which matter comes into spacetime existence, in the sense that matter is not always already fully formed but that there is some sort of process of coming-into-being.

[77] The Findhorn texts use words such as "nonmaterial" and "intangible" to describe the etheric realm, which exposes their implicit physicocentrism, namely the assumption that matter exists only in the physical realm. This will be further discussed below in the context of the modernist tendencies inherent in the New Age onto-world.

In a modernist onto-world, as discussed in Chapter 2, the ultimate existents are individual bits of matter that are fully determinate at any given moment, that occupy a definite location in universal space and that persist through universal time, that are intrinsically characterized by various measurable qualities, and that are externally related to one another in ways that can be adequately expressed by mathematical relations. Moreover, modernist causality is limited to the strict determinism of mechanical interactions between these individual bits of matter, including field effects. If we attempt to make sense of Findhorn's devas in the modernist onto-world, the first thing to note is that the determinate individuals of modernism do not include objective possibility as integral to their existence, thereby excluding entities such as devas that operate in a realm of possibility. Another interesting observation is that because devas are not materialized entities in spacetime, they cannot engage in modernist causality by affecting physical entities mechanically or through field effects.[78] Yet according to Findhorn, the potential forms of the devas play a causal role – along with other conditions and constraints – in the materialization of physical forms. This devic causality cannot be explained by the causality of a modernist onto-world, in which a physical form is created by the association of pre-formed entities under the influence of physical forces through a deterministic process according to so-called "natural law"; there is no potential

[78] Interestingly, though, we learned in Chapter 3 that devas manipulate "forces" into patterns that they channel to the nature spirits, who then build physical forms through "force fields". Since modernist causality includes not only mechanical forces but also field effects, it would be interesting to investigate the relationship between these modernist fields and the "force fields" of the devas and nature spirits.

pattern or form influencing this modernist process.[79] Thus, because a modernist onto-world does not recognize objective possibility, and because devas operate in a realm of possibility that moreover must be able to causally influence the process of materialization in spacetime, we cannot make sense of devas in a modernist onto-world.

In order to address nature spirits and their efficacious relationality with the physical realm, we must investigate how Findhorn's etheric realm, where the nature spirits do their work, could make sense in a modernist onto-world. In a modernist onto-world, reality is composed of only one causally-closed realm that is characterized by its pre-given physical spacetime in which measurement is possible.[80] Although the modernist onto-world in some cases also includes a belief in the existence of some sort of spiritual realm, only the physical realm is considered to be scientifically real. One way in which to make sense of Findhorn's etheric realm in a modernist onto-world is to recognize it as a spiritual realm that is not scientifically real, but this approach would not further our purpose of engaging with Findhorn's plant-human collaboration in a way that can be connected to our scientific theories. Alternatively, as discussed next, we can investigate whether Findhorn's etheric realm

[79] Yet there are issues with this modernist explanation, for example in cell development, as there is no known mechanism for cell differentiation, or for how a cell "knows" what kind of a cell it should become. If each cell had an etheric counterpart that provided it with the appropriate devic pattern to follow, our understanding of this issue would shift.

[80] Note that this physical spacetime can be described by various metrical geometries. According to Reichenbach, as explained in Sklar (1974), we must choose the particular geometry that corresponds to the physical world by *convention*, because there are multiple consistent geometries – e.g. Euclidean, spherical, hyperbolic – that are compatible with the different possible ways of interpreting our experience (89-94). With agential realism, we will see below that the structure of spacetime is not pre-given but is *enacted*, so we no longer need to ask what the "actual" structure of spacetime is.

could be understood as part of the modernist physical realm without eliding the important differences between them.

Several factors support the hypothesis that the spacetime geometries of the physical and etheric realms differ from one another, suggesting that the etheric realm cannot be understood as part of the modernist physical realm. The fact that the etheric realm cannot be perceived with the physical senses nor measured by any known, generally accepted, physical process[81] suggests that it is a non-physical, non-measureable realm – a transphysical realm. In a modernist onto-world we are not accustomed to thinking about the existence of multiple realms with different spacetime compositions, but it is common in the New Age onto-world to refer to multiple realms of existence besides the physical. For example, the Theosophists, whom we will discuss below, refer to seven interpenetrating realms with seven different types of matter: physical, emotional/astral, mental, intuitional, spiritual, monadic, and divine (Leadbeater 2006, 23-25). Rudolf Steiner also mentions seven realms, with three "higher" realms and four realms that correspond specifically to the human: physical, etheric, astral, ego-organization (Steiner 1966, 32-33). Such distinctions between realms are not unique to the New Age onto-world, but can be found in numerous cultures and religions throughout history (Poortman 1978). For these reasons, and to preserve maximum flexibility, we will assume that the physical

[81] This is a controversial point. For example, in the scientific literature on complementary and alternative medicine, Rubik (2002) introduces the concept of the "biofield", which is a "complex, extremely weak electromagnetic field of the organism hypothesized to involve electromagnetic bioinformation for regulating homeodynamics" (703), with the intent of linking the concept of subtle energy bodies, such as etheric bodies, to solid biophysics principles. But this entails at most that the *effects* of etheric bodies are being measured. In Chapter 7, we will discuss the logistics of connecting physical measurements in a laboratory to transphysicality (such as etheric bodies).

and etheric realms are characterized by different spacetime configurations, which we will examine in more depth in Chapter 6. Therefore, a modernist onto-world, which is limited by its physicocentrism, cannot accommodate nature spirits, which require a transphysical etheric realm.

Finally, it is worth briefly considering whether it is possible, in a modernist onto-world, to make sense of the fact that the Findhorn gardeners were able to communicate with devas and nature spirits. In Findhorn's onto-world, communications from devas and nature spirits can appear within the human in various ways, for example as an "inner voice" that is not audible to the physical ears, or as "images in the mind's eye" that are not visible to the physical eyes, or alternatively as a "knowing" or "intuition" or "feeling", which is a complex gestalt that cannot be fully captured in words or images. Sometimes this mode of communication is described as "intuition" or "telepathy" or "empathy". But telepathic and even empathic communication, in the sense that thoughts or feelings or even entire experiences could be directly transmitted from one individual to another (be they human or deva), are impossible in a modernist onto-world because there is no mechanism for exchanging information between determinate individuals without some sort of physical mediation. This limitation of the modernist onto-world is due both to physicocentrism and to the assumption that individuals are the ultimate entities between which communication occurs.

In summary, devas and nature spirits, with their efficacious relationality to the spacetime materialization of physical entities, are excluded from a modernist onto-

world that is limited to determinate physical individuals. Re-thinking modernist matter in order to make sense of devas and nature spirits would require not only the inclusion of transphysical matter, objective possibility, and a process of coming-into-being, but also the necessary causal relations and communicative abilities between these various forms of matter.

4.2.3 Oneness and the God within

Up to this point, we have focused mainly on devas and nature spirits as the vital components of Findhorn's plant-human collaboration, but we must note that the God within is also an important part of Findhorn's cosmology. As we discussed in Chapter 3, Findhorn's God within is the divinity that unites the New Age onto-world in its ultimate oneness, in alignment with the good of the whole. In order to determine whether it is possible to make sense of Findhorn's God within in a modernist onto-world (and below, in an agential realist onto-world), it will be sufficient to focus on the fact that this concept of God requires oneness and wholeness. In this subsection, we will discuss the New Age concept of oneness, including an analysis of the wholes that are utilized in Findhorn's onto-world, in order to determine whether or not they can be made sense of within a modernist onto-world.

In Chapter 3, we learned that in a New Age onto-world, oneness is a togetherness and interdependence of all existence, in which greater wholes encompass what we think of as separate parts, and there are no distinct boundaries

separating "inner" and "outer". Some examples from Findhorn included the Earth as a single organism that encompasses everything on Earth,[82] overlighting devas such as the Findhorn Angel that are not separate from the whole of the Findhorn Garden for which they hold the matrix of possibilities (with their potential forms), and the oneness between God and the world, as well as between God and the human self. These various examples have some common threads. Multiple entities that appear to be separate and are able to interact with one another ultimately have a togetherness in which they are not separate but are "one", without any distinct boundaries or inner/outer delineation. Furthermore, wholes are composed of parts that are not dualistically separated, where these wholes include not only entities that have materialized in spacetime, both etherically and physically, but also possibilities, such as the potential devic forms that are "beyond" spacetime. Any "higher" entities such as God or overlighting devas are not "outside of" or "prior to" the whole but are one with and dependent upon the whole.[83] Finally, it is possible to tune in to the good of the whole, which the Findhorn gardeners referred to as following "God's will", or as making choices in alignment with the best interest of the whole, where the whole could be a garden, a country, or the entire universe.

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[82] This idea of the Earth as a single organism is especially interesting because it anticipates Lovelock's "Gaia theory", first published in the 1970s: with all its organic and inorganic component parts, the Earth is recognized as a single, living, complex, self-regulating system, where the system as a whole seeks to create an environment for its own flourishing (Lovelock 2000). But while Gaia theory refers to a determinate whole, or a whole that is made up of determinate entities and their interactions, Findhorn's wholes include indeterminacy by virtue of the devas with their potential forms (at least in my interpretation of devas, as we discussed in Chapter 3). We can think of devas as holding the matrix of possibilities for all the myriad ways in which their corresponding whole ever has or ever could materialize.

[83] This is consistent with Rigby's (1974) interpretation of Findhorn's God (172) as being an immanent, not a transcendent, God.

In order to accommodate Findhorn's beings that have some sort of character or will of their own while also being one with the whole of which they are a part, we need a framework of overlapping, relational, fully interdependent wholes, where wholes are more than some particular set of determinate individual interacting parts. However, as we discussed in Chapter 2, a modernist onto-world is characterized by the assumption that the ultimate truth can be arrived at through reduction, namely that whatever might appear to be "whole" or "one" can be taken apart and analyzed until its ultimate constituents (fully-formed, pre-existing bits of physical matter) are discovered.[84] In other words, in a modernist onto-world, the ultimate constituents are determinate individuals, and there is no way in which to add these individuals together to make the kind of whole that has its own irreducible character. Moreover, the presence of devas as vital components of Findhorn's wholes means that these wholes include possibility, or indeterminacy. That is, Findhorn's wholes are not a summation of individual determinate parts, but they include potential patterns designating how structures within the whole have been and could be materialized within and as part of the whole. Yet a modernist onto-world is not inclusive of objective possibility.

One might still claim that oneness, as we have described it in order to accommodate the ways in which the Findhorn gardeners interfaced with their garden, is compatible with a modernist onto-world because of complex systems theory. A

[84] The point here is not about whether atoms or subatomic particles are the ultimate "whole" constituents. The point is that any so-called "whole" is analyzed in terms of its component parts without the additional recognition that there is something to the whole that is beyond any analysis of any particular set of parts into which it can be split.

complex system is composed of many interacting parts with complicated relationships including feedback loops and nonlinear dynamics. Such systems are said to result in emergent properties, or properties that are not specifically contained in the parts but that are said to emerge as a result of the functioning of the system as a whole. For example, a complex system as a whole can be said to exhibit behaviors with respect to its environment (Jantsch 1980). Systems theory is touted as an alternative to reductionism, but as we will discuss further in Chapter 6, it does not go far enough to accommodate the practices of Findhorn's onto-world. That is, a complex system is not inclusive of possibility (e.g. devas) and does not acknowledge the oneness between the parts and the whole, but it still seems to be based on individual determinate parts that interact with one another within the system as a whole.[85]

In summary, in a modernist onto-world that is based on reductionism and on determinate individuals as the ultimate existents, it is not possible to work with oneness, including the kinds of wholes that are implicated in oneness, in a way that can make sense of Findhorn's onto-world. Without an ultimate oneness and the corresponding good of the whole, we are thus unable to accommodate Findhorn's God within.

4.2.4 Concluding remarks

In Chapter 2, we learned that the ontological turn in anthropology results in the understanding that it is not necessary to judge the practices of a different onto-

[85] In Barad's (2007) language, complex systems theory does not include the nonseparability and topological dynamics of intra-activity (393).

world as being either valid or invalid from the context of our own onto-world, but that we can simply accept the fact that different onto-worlds enact different objects and beliefs. Additionally, we can be open to the possibility that having learned about these different objects and/or beliefs, or having engaged with these different material-discursive practices, might cause us to reconsider some of the fundamental practices of our own onto-world. For a modernist studying the plant-human collaborative practices of Findhorn, we have determined that fundamental modernist assumptions would need to be challenged in order to accommodate devas and nature spirits, where the problematic assumptions include human exceptionalism, reductionism, a dualism between matter and meaning, a metaphysics of individualism, and physicocentrism (which includes the understanding of matter as fully-formed, or not requiring any process of coming-into-being or differentiation).

Considering these significant hurdles to making sense of devas and nature spirits in a modernist onto-world, what are the possible next steps for a modernist engaging with Findhorn's plant-human collaboration? If, as modernists, we have properly suspended our disbelief and acknowledged the existence of multiple onto-worlds with different yet valid practices, we would accept that devas and nature spirits are real in Findhorn's onto-world, although they are not real in our modernist onto-world. We would furthermore recognize that if we wanted to experience devas and nature spirits ourselves, we would need to immerse ourselves more fully in Findhorn's onto-world, so that what is real for them could potentially become real for us. Next, we would be faced with the option of allowing our own modernist practices

to be affected in meaningful ways by this engagement with Findhorn's plant-human collaboration. At this point, we might decide that this would require an untenable shift in our fundamental modernist assumptions, and the engagement would end. However, in this project, we will indeed be studying how our modernist assumptions have been limiting us – at least in terms of the possibility of plant-human collaboration.

It is also instructive to consider the possible reaction of a modernist who has not been able to suspend their disbelief regarding the existence of devas and nature spirits in Findhorn's onto-world. Without recognizing the practices of Findhorn's onto-world as valid in their own right, the modernist would likely react by attempting to explain away the presence of devas and nature spirits by reducing them to something that can be made sense of within the confines of the fundamental modernist assumptions.[86] For example, consider a modernist reacting to the idea that matter is neither fully physical nor fully determinate, but exists inseparably from and in dynamic relationality with both transphysical matter (nature spirits) and patterns of possibility (devas) that causally influence its ongoing spacetime materialization. Perhaps the modernist would reply that the Findhorn gardeners were simply mistaken in their interpretation of the ongoing materialization of physical form under the influence of devas and nature spirits. We could still accommodate the devic patterns as participating in the formation of matter, the modernist would continue, if the nature

[86] Note that similar moves are made regarding the status of the human mind in the modernist onto-world, when for example the mind is "explained away" by its reduction to sets of physical behaviors or functions.

spirits were simply moving existing physical matter around into new configurations within pre-given spacetime, instinctually urging the fully-formed, physical building blocks into configurations according to so-called "natural law", which happens to match the devic patterns. And these devic patterns, as well as the etheric bodies of the nature spirits, could be posited as being composed of some kind of physical matter or physical fields that have not yet been scientifically measured, and that function according to natural laws that have not yet been discovered. In this way, the modernist onto-world would remain more or less intact in its presupposition of individual fully-formed bits of physical matter as the ultimate building blocks.

This "explaining away" of the devas and nature spirits by reducing them to the physical might be a natural response for a modernist who is not interested in seriously questioning their own practices. But this modernist interpretation misses the significance of thinking about matter in a completely new way. Instead of recognizing only fully-formed matter located in a pre-existing spacetime container, with Findhorn we can become aware that matter includes a process of formation in which potential forms are materialized in spacetime. Plant-human collaboration, as I am construing it in this project (with agential realism as my guiding framework), is about being involved in and partially responsible for the process of coming-into-being, in terms of what matters and what is excluded from mattering. Thus, after considering in the following section why the New Age onto-world is not itself suitable for a further scientific investigation of Findhorn's practices, we will turn to the agential realist onto-world.

4.3 Findhorn's plant-human collaboration in a New Age onto-world

In Chapter 3, we introduced the New Age onto-world mostly in the context of the early Findhorn years, but in this section it will be necessary to engage in a more thorough examination of the New Age as it has continued to be reconfigured in the almost six decades since Findhorn's 1960's plant-human collaboration. While Findhorn's New Age onto-world reaches beyond the modernist restrictions that preclude plant-human collaboration, it implicitly retains modernist tendencies that limit its usefulness in further investigating plant-human collaboration. These modernist tendencies are evident not only in the philosophical structure of the New Age, which is the main focus in this project, but also in its social and political practices. In this section, we will show how the New Age is striving to overcome modernist limitations yet unconsciously continues to participate in the same modernist practices that they purport to overcome. Specifically, we will examine how the New Age onto-world attempts to overcome reductionism and the metaphysics of individualism with their foundation of oneness, while however remaining individualist in a manner that is problematic due to the lack of responsibility for the constitution of the self. We will also discuss their struggle with the dualism between matter and mind in the New Age context of thoughts as creative of reality, which likewise leads to problematic outcomes, again based on an inherent individualism. Finally, we will closely examine the New Age onto-world's partial rejection of physicocentrism. These examples will show how the New Age onto-

world disrupts but does not fully overcome these key modernist assumptions, leading to confusing language and problematic assertions not only in the context of Findhorn's plant-human collaboration, but also in current New Age practices, contributing to the negative stigma often associated with the New Age by modernists. The aim here is not to perform a thorough critique of the New Age, but to remain open to the new practices suggested by Findhorn's plant-human collaboration while showing where responsibility must be taken for some of the old contexts in which the New Age remains immersed. Before analyzing these three modernist assumptions in the context of the New Age onto-world, we will consider the New Age more generally in terms of its heterogeneity and its overall character.

First, we must distinguish between Findhorn's 1960's plant-human collaboration – which as mentioned in Chapter 3, can be seen as part of the initial formation of the New Age – and the New Age as it has been engaged with more recently, and of which the current Findhorn Foundation is still an active part. The overall trend since the 1960s represents a transformation of the New Age from being aligned with and partly fused with "the anarchist, anti-capitalist, and anti-modernist hippie and commune movements" to a character that is decidedly less "counter-cultural" and less "anti-modernist" (Höllinger 2004, 292). This shift has also been described in terms of a comparison between the early "idealistic world-reformers" who, rooted mostly in England, were focused on the coming of a "New Age", to the more "classic" New Age that emerged in the United States in the late 1970s and early 1980s, that began to be commercialized beginning in the mid 1980s, and that was

then increasingly assimilated into the mainstream (Hanegraaff 2007, 27-30). Findhorn's 1960's plant-human collaboration is part of the early, anti-modernist, idealistic world-reformer movement, while the classic New Age that is targeted today tends to be seen in terms of its uncritical consumption of esoteric methods, its lack of political and social engagement, and its narcissistic, hedonist, and authoritarian attitudes (Höllinger 2004, 306). According to Hanegraaff (2007), "One might say that the New Age movement has become the victim of its own success: far from having fundamentally changed our materialist consumer society, it has itself become merely another manifestation of that same society. New Age ideas and practices have succeeded in reaching a mass audience, but at the price of being assimilated into the very 'system' that the original pioneers had wanted to replace" (31). In fact, people such as David Spangler and George Trevelyan, who are associated with the early Findhorn years, distance themselves from the New Age label because of its current practices – specifically, its commercialization (Hanegraaff 2007, 28). That being said, the current Findhorn Foundation, which is interested in re-opening the possibility of plant-human collaboration on a larger scale (Findhorn Foundation 2018), is considered to be a New Age community, and must therefore take responsibility for their situatedness as part of the current New Age, whether or not they choose to identify with this label.

Regarding the current New Age, we will be treating it as a whole with a general character when analyzing its implicit modernist limitations below, but in order to avoid an unconscious essentializing and homogenizing of the New Age, we

will also briefly examine some of the diversity present within the current New Age. Höllinger (2004) conducted a quantitative analysis to investigate how the political, social, and moral attitudes of New Agers compare to those of the general population:

> Contrary to the widespread claim that involvement with spiritual and esoteric methods goes hand in hand with a lack of interest in social and political matters, our studies show that New Age followers read political newspapers and magazines, listen to radio and TV news, and discuss political matters somewhat more frequently than the rest of the population. Furthermore, New Age followers have significantly higher rates of reported participation in political protest activities and solidarity campaigns, they also participate somewhat more frequently in political party activities, such as election campaigns, than those who are not engaged in New Age activities. Thus, we can say that the general level of social participation and activism among New Age activists is above the population mean. (304-305)

Furthermore, Höllinger (2004) found that New Agers (who as a whole group are more politically aware than non-New Agers) could be roughly divided into two groups, one that is more "progressive", continuing to critically represent the counter-culture, while the other is more "conservative", uncritically consuming esoteric methods, conforming to the status quo (of the New Age), and acting in hedonistic and authoritarian ways (307). This suggests that, while it is important to critically address the social and political attitudes of any group, New Age or not, the New Age as a whole should not be uncritically demonized. That is, the fact that New Agers are reacting against modernist systems (Hanegraaff 2007, 38) gives them a greater responsibility (than non-New Agers) for taking account of the manner in which they continue to unconsciously (or consciously) participate in these systems, but the "widespread claim" of the lack of such social and political engagement – which is

partially responsible for the negative stigma associated with the New Age – seems to correspond to the "conservative" New Age group, not to the New Age as a whole.

Finally, Partridge (2007), in an analysis of the New Age as compared to postmodernism, points out that some contemporary New Agers are using the tools of deconstruction to critique the New Age (along with their critiques of modernism) (242-243). For example, Monica Sjöö and Starhawk, eco-feminist neo-Pagans who are associated with the New Age, seek to distance themselves from the New Age because of its patriarchal character, including the fact that it is authoritarian, reactionary, hierarchical, racist, and misogynist (Partridge 2007, 242, 250). Thus, while taking account of these problematics of the New Age, we must acknowledge that not all individuals or groups associated with the New Age are subject to the same criticisms. In the rest of this section, I will be referring to New Age practices as a whole, except when I specifically refer to the plant-human collaborative practices of the early Findhorn years.

It is also important to discuss the general use of science in New Age practices. Up until the mid-1970s, the New Age attitude toward mainstream science was scornful, but with the publication of Fritjof Capra's *The Tao of Physics* in 1975, it became recognized by New Agers that modern physics – especially quantum physics – could be utilized to legitimize the New Age worldview (Lewis 2007, 218-219). However, this attempt at legitimization is seen by scholars as incorrectly appropriating the principles of science: "No doubt, scholars of New Age spirituality are keenly aware that New Agers use language that *sounds like* science, but they

rarely say that New Agers *do* science" (Cochran 2017, 182-183).[87] The underlying issue here is not simply that New Age references to quantum physics are vague, but that they often refer simultaneously to multiple conflicting interpretations of quantum physics (personal communication from Karen Barad to the author on Jan 20, 2019). This is an example of how the New Age tends to appropriate a practice – quantum physics in this case – without critically assessing it, forming a coherent interpretation of it, or taking responsibility for the effects of its misappropriation.[88] In the discussion that follows, we will continue to point out this misappropriation of quantum physics, in order to begin thinking about the ways in which agential realism – which provides a coherent interpretation of quantum physics – provides the opportunity to critically assess these practices (not only scientifically but also ethically, politically, etc.).

With these initial considerations, we will now examine the relevant (to our discussion on plant-human collaboration) modernist assumptions at play in the New Age onto-world: the metaphysics of individualism, the dualism between matter and mind, and physicocentrism. Despite the wide range of practices within the New Age, Hanegraaff (2007) has shown that "all forms of New Age thinking are concerned with developing alternatives for the basic, accepted values of modern western society"

[87] This is not to imply that there are no New Agers who have a scientific understanding of quantum physics, or that the New Age was not at all involved in advances in quantum physics (see, for example, Kaiser 2011), but to make the point that the general modernist attitude toward New Agers as a whole is that their use of quantum physics is not scientifically rigorous.

[88] Another example is the New Age's colonialist appropriation of an essentialized homogenized version of various Eastern traditions. As Hanegraaff (2007) puts it, the New Age created "a romantic vision of 'the East', and of India in particular, as the homeland and treasure house of a superior spiritual wisdom" (44-45); this assimilating of Eastern traditions into Western New Age frameworks distorts and in some cases is even antithetical to the original practices (45).

(38), and that "all New Agers would agree that modern western society is dominated by two pervasive tendencies: dualism, on the one hand, and reductionism, on the other" (38-39). Regarding dualisms, New Agers seek to overcome the dualism between matter and mind, the dualism between nature and culture, and the dualism between humans and God; regarding reductionism, New Agers do not accept the reduction of spirit to matter, nor do they accept that reality can be understood as a whole by reducing it into component parts (Hanegraaff 2007, 39). Both dualism and reductionism can be overcome, according to New Agers, by instead positing an ultimate oneness (also called holism), where this oneness encompasses not only matter but also spirit. How exactly this is accomplished by the New Age follows many diverse paths (Hanegraaff 2007, 39-40) that we will not attempt to trace here, but we will look instead at the manner in which these modernist limitations remain implicit in the New Age.

First, we will address how the modernist metaphysics of individualism remains implicit in the New Age despite the New Age's focus on oneness. In the Findhorn literature, as reviewed above, oneness is a togetherness and interdependence of all existence, in which something is considered to be whole even as it is made up of separate parts. But how exactly these separate parts are thought of is crucial to whether or not the metaphysics of individualism can be fully overcome. As we know from agential realism – as based on (a coherent interpretation of) quantum physics – determinate individuals exist only in relation to the phenomenon as part of which they are relationally differentiating-entangling. The New Age may refer to quantum

entanglement in support of their underlying foundation of oneness, but without a coherent interpretation of quantum physics and a further study of how the concept of the (modernist) individual must shift when oneness is fundamental, a lack of responsibility for the constitution of the individual results. With agential realism, in contrast, using entanglement as supportive of an ultimate oneness – or, rather, a dynamic in/determinate oneness – would require the whole concept of the individual to shift as well, because entanglement is not a relationship between pre-given autonomous individuals. Moreover, and crucially, with agential realism, this philosophical issue of defining the individual (in relation to oneness) is inseparable from the social and political forces that are partially constitutive of the individual and must therefore be included in the discussion.

Philosophically, the New Age understanding of the self remains essentially modernist, despite superficial differences. Regarding some of the differences, Partridge (2007) talks about the "sacralised self" of the New Age, which is not limited to the human reason of modernity but has direct access to the nature of reality, to the infinite, and to the spiritual (237). In fact, this self is able to find truth and authority within themselves, although there are conflicting interpretations regarding whether truth and authority are within the individual itself, or whether there is something greater than the individual self that the individual can access (Partridge 2007, 238). In either case, however, the notion of the modernist self is not overcome, because even if in some cases the New Age self is recognized as being socially constructed, it is constructed based on a modernist narrative: "New Agers are thus

clearly working with the modernist subject—the autonomous self constructed in the post-Renaissance western world" (242). Without properly deconstructing the individual self, which remains either pre-given or constructed according to some particular narrative – and without more generally overcoming the metaphysics of individualism (i.e. going beyond the human) – it is incoherent to talk about a fundamental oneness and interconnectedness.

An important repercussion of not recognizing the constructed nature of the self is that New Agers do not (as a whole) take responsibility for the fact that they are constituted by the same systems of oppression and domination that are productive of the situations against which they are reacting. For example, according to Partridge (2007), New Agers react against hierarchical systems and external truth and authority, yet they construct their own hierarchical systems in which certain gurus are catered to and revered for their truth and authority: "Although it is often argued that, for example, teachers and texts are not to be understood as external authorities, but rather as aids to help people experience the truth within, it is hard to ignore the impression that there are some teachers and writings understood to be more than simple aids. Their declarations are often invested with more authority than a papal bull" (248). In Chapter 7, we will discuss another example, in the context of the holistic healthcare movement, of the contradictory practices that result from the implicit individualism of the New Age. Providing a proper understanding of oneness requires a thorough overcoming of the metaphysics of individualism, not only in philosophical and

scientific terms, but with a recognition of and a taking responsibility for the global forces that are involved in the constitution of the self.

Another key aspect of the New Age onto-world is the causally efficacious relationship between mind and matter, or the idea that thoughts create reality. We encountered this in Chapter 3 with Findhorn's practice of following the Law of Manifestation, which dictates that whatever we think becomes manifested in reality (as long as it is for the good of the whole). This New Age "law", through the recognition that matter and mind are not separate, and that mind causally affects matter, challenges (but does not overcome) the modernist dualism between matter and mind.[89] A typical New Age explanation of the efficacy of human thoughts on material reality includes vague reference to quantum physics, for example by claiming that because the outcome of experiments in quantum physics is dependent upon the scientists' observation of the experiment, human consciousness must determine material outcomes (e.g. by causing the collapse of the wave function). However, bringing matter and mind together by asserting the causal efficacy of mind on matter – even if this connection is said to occur via quantum physics processes – does not explain what it is about matter and mind that enables their efficacious interaction. Moreover, the very framing of the Law of Manifestation implicitly assumes that matter and mind are separate to begin with, because the mind seems to be taken as pre-given instead of as also coming-into-being in relation with matter;

[89] Hanegraaff (2007) explains the New Age solution to the dualism between matter and mind: "Mind and matter, firstly, are merely different manifestations of one fundamental substance. This substance is usually thought of as spiritual in some sense, meaning that matter is essentially one of the manifestations of 'mind'" (39).

thus, this dualism is not fully overcome. Whether or not it could be possible to create a rigorous understanding of the Law of Manifestation by overcoming this dualism in a philosophical sense, it is crucial to recognize that the assertion that human thoughts create material reality is deeply problematic in regards to its social and political effects.

One problematic example is the 2006 documentary film "The Secret", in which various physicists, psychologists, philosophers, theologians, etc. speak out in support of the Law of Manifestation, also called the Law of Attraction, largely in the context of how to become wealthy (Heriot 2006). Not only does the context of the film – becoming wealthy – perpetuate the notion of the importance of personal gain and prosperity, but the practices in this film can easily be misconstrued or utilized in abstraction from their larger context, resulting in problematic outcomes. For example, if one believes that thinking positively about becoming a millionaire every day is *all* that is required in order to gain wealth, one might stop pursuing other important forms of self-development. Alternatively, a cancer patient could be led to blame themselves for their illness, furthermore fearing that any negative thoughts on their part will worsen their condition.[90] But whatever the outcome, the focus in this film is on giving the individual permission to create their own individual reality (more money, a new romantic partner, better health, etc.) without taking into account the various social and political forces that are responsible for producing the individual

[90] As Hanegraaff (2007) says, "In combination with the belief in the mind as the ultimate source of healing (as well as of illness), this way of thinking [that healing is part of spiritual growth] frequently leads to the belief that everybody has created his or her own illnesses, and can thus 'take responsibility' for his or her healing by positive thinking" (34).

along with their particular desires for wealth, love, health, etc., and without taking into account how the reality that they seek to create will feed back into this system, perpetuating problematic practices.

That being said, with Findhorn it was of utmost importance that the Law of Manifestation could function only if it was sanctioned by the divine, or in other words, only if it proceeded according to the good of the whole. As we discussed in Chapter 2, the devas and nature spirits taught the Findhorn gardeners that humans need to stop functioning from their limited individual perspectives in order to co-create for the good of the whole. While this notion of the good of the whole is itself problematic, as we will discuss in Chapter 5, the point to make here is that according to Findhorn, they did not utilize the power of creating their own reality in service of individual desire, but in contrast, it was in service of something greater than the self. However true this might have been in the early Findhorn years, this framing has obviously become distorted as part of general New Age values, for example as judging from the following quotation: "Strict concentration on personal spiritual development rather than on communal values is therefore not considered a reflection of egoism but, rather, of a legitimate spiritual practice based on 'listening to your own inner guidance': only by following one's inner voice one may find one's way through the chaos of voices that clamour for attention on the spiritual supermarket, and find one's personal way to enlightenment" (Hanegraaff 2007, 48). That is, the individual is not deemed "egoic" for focusing on personal spiritual development, which is an important New Age practice. Moreover, according to this quotation, the current New

Age focus is on "personal" enlightenment, or specifically on the individual, in contrast to the early Findhorn practice of following the good of the whole, or of acting in accordance with the best possible outcome for the interconnectedness of all beings.

Regarding the Law of Manifestation, then, we can minimally say that during the early Findhorn years, their intention was not individualistic but was in service of something greater (the good of the whole). However, this "law" is framed in a problematic manner and, as we have discussed, remains implicitly based on both the metaphysics of individualism and the dualism between matter and meaning. Moreover, the problematic way in which this practice has been construed by the current New Age, for example with the film *The Secret*, shows that it is of utmost importance to completely recontextualize this practice. In an agential realist sense, we could say that while it is important to acknowledge that "we" are partially responsible for the reality in which "we" participate, this reality is an ongoing iterative co-creation among and for all relational beings that are co-constituting as part of this reality, and "we" are not given as such but are responsible for "our" iterative relational co-constituting within and as part of this reality.

Finally, we will examine the pernicious role that physicocentrism plays in the New Age onto-world; we will be focusing heavily on the philosophical underpinnings of physicocentrism, which is central to our engagement with plant-human collaboration in this project. One of the most dramatic differences between the modernist and New Age onto-worlds is the latter's inclusion of "spiritual" or

otherwise non-physical realms populated by various kinds of beings that are able to interface with the physical realm as well as communicate with humans. The Findhorn Garden with its devas and nature spirits is one example of this, as based on Theosophical ideas (Hanegraaff 2007, 28). The Theosophists, according to Leadbeater (2006), describe the realms in which entities such as devas and etheric creatures live in terms of varying "density" and "vibration" of matter (25). What we think of as one world is in fact multiple "interpenetrating worlds, all occupying the same space",[91] where the densest matter with the lowest vibration comprises our physical realm, or "the type of matter which we see all around us" (Leadbeater 2006, 25), and arrayed out from this physical center – in ever larger concentric spheres of ever finer matter with ever higher vibrations – are the other realms (Leadbeater 2006, 24).[92] Thus, the Theosophists simply add other realms to the physical realm, describing them in terms of different kinds of matter, but their basic conception of matter as consisting of pre-existing individual entities occupying particular spacetime positions seems to remain modernist. This is another example of the New Age onto-world's vague usage of physics terminology – "it's all vibrations", or similarly, "it's

[91] These multiple realms can occupy the same space unimpeded by one another. The explanation for this is as follows: for any given substance, the space between atoms is so large compared to the size of the atoms, that there is sufficient room between the atoms for the matter of the other realms to situate itself and move about (Leadbeater 2006, 24). This explanation relies on both pre-existing matter and pre-existing spacetime, in contrast to the relational performativity and enfolding of matter in agential realism.

[92] For the Theosophists, there is a definite hierarchy associated with these realms, with an evolutionary impetus from the "lower", "simple" forms of the dense, physical matter, to the "higher", "complex" forms of the fine, spiritual matter, where these forms are all animated with an inner divine life force. Humans are situated "above" plants and animals, and are striving toward "higher" expression in the spiritual realms (Leadbeater 2006, 30-31). This is an example of how hierarchical structures and evolutionary narratives centering on the human as an exceptional ontological being are part of the New Age.

all energy" – to explain, in this case, how different types of matter can be interconnected yet differentiated from one another.[93]

Neither the Theosophists nor the Findhorn gardeners created their descriptions of other realms and entities theoretically, but through their own experiences of and connections with beings in these realms (Leadbeater 2006, 9-10, 19-20). The Findhorn gardeners seem to have a somewhat similar conception to that of the Theosophists, though they break away from the rigid and spatially construed conception of these realms as all being composed of matter and located in a single space. For example, for the Theosophists, as portrayed by Leadbeater (2006), a deva would be composed of a very fine matter and located in the same space as the physical plant with which it is associated, although the devic matter would radiate out farther than the physical matter. In contrast, Findhorn's devas are "beyond" spacetime. Furthermore, in Findhorn's onto-world, physical matter is brought into spacetime existence instead of pre-existing in spacetime, suggesting a more dynamic conception of matter and the possible need to rework the modernist understanding of spacetime as pre-existing.

As part of our ongoing discussion regarding physicocentrism, I have made several distinctions to help us engage with Findhorn's devas and nature spirits with minimal confusion: first, between the determinate individuals of modernism that are fully physical and not inclusive of possibility, and the in/determinate phenomena of

[93] This is not to say that these vague characterizations entirely lack importance or relevance. But in order to make a meaningful difference, at least in the context of this project, it would be necessary to define terms such as "vibration" and "energy" more rigorously and in connection with both scientific and New Age practices.

agential realism that include possibility in an integral and dynamic manner; second, between spacetime materializations that can occur either physically or transphysically. With these distinctions, we have been referring to the devas with their potential forms as associated with possibility/indeterminacy, and to the etheric nature spirits as transphysical instead of physical spacetime materializations. This clarification makes it seem as if we are moving beyond physicocentrism. However, these distinctions are not available in the New Age onto-world, so while the New Age does seem to have the intention of overcoming physicocentrism through its inclusion of entities such as devas and nature spirits, their confused use of language and concepts demonstrates their implicit physicocentric tendencies. For example, let us examine the following quotation that was received by the Findhorn gardeners from the Apple Deva:

> Remember, this is a process; the pattern is apparent everywhere in the ethers, held by the angels [devas] and made manifest beyond time. Then at the appropriate opportunity, through the ministrations of the nature spirits, it appears in time and place, in the beauty of the blossom and the succulence of the fruit. (Findhorn Community 1975, 83-84).

First, they refer in this quotation to the potential patterns of the devas as being "made manifest beyond time". If only spacetime materializations are considered to be objectively real, and the devas are real beings that are however "beyond" spacetime, then we are limited to saying that they manifest or materialize "beyond time", but what can this mean? In this project, we have been clarifying statements such as these with the recognition that objective reality includes possibility, where possibility is not

itself materialized in spacetime.[94] Then, instead of devic patterns that are "held by the angels [devas] and made manifest beyond time", we would have devic patterns that are held by the devas as patterns of possibility (as opposed to being manifested or materialized in some kind of spacetime).

Second, in the above quotation, they say that the devic pattern, after passing through the nature spirits, finally "appears in time and place", suggesting that the physical realm with its physical entities – "the beauty of the blossom and the succulence of the fruit" – is the exclusive locus of time and place. While this does not foreclose the possibility that time and place could also exist in other realms, the Findhorn literature does not directly mention spacetime materialization in connection with the etheric realm. This confusion is also evident when the Findhorn gardeners refer to the etheric realm as "nonmaterial", which suggests that only the physical realm can be "material". The issue here is that it is being implicitly assumed that anything that is materialized in spacetime, or any spacetime itself, must be physical; this makes nature spirits and the etheric realm seem "mysterious and "intangible" because they are not physical. In contrast, with the distinction between physical and transphysical spacetime materializations, we can consider multiple different types of spacetime materializations, such that we can refer to the nature spirits as transphysically materializing in the spacetime of the transphysical etheric realm. Thus, the New Age onto-world's inclusion of "spiritual" or otherwise non-physical

[94] With agential realism, possibility is a dynamic part of in/determinate matter, and it is not a question of whether possibility itself is materialized or not, because possibility cannot be separated out in this way. Instead, we can say that possibility is inseparable from and engaged in a dynamic intra-play with spacetimematterings.

entities and realms pushes beyond physicocentrism, but leads to confusion because the fundamental constituents of reality remain modernist instead of being recognized as including both objective possibility and various different kinds of materializations. Moreover, the New Age onto-world implicitly accepts the modernist notion of a realm as a fixed structure populated by entities (whether they are physical entities, etheric entities, spirit entities, etc.).

In summary, despite the attempts of the New Age onto-world to move beyond the modernist limitations of the metaphysics of individualism, the dualism between matter and mind, and physicocentrism, New Age practices are implicitly informed by these modernist assumptions, resulting not only in confused or incoherent language and concepts, but also in problematic practices that unconsciously reinforce the limitations they seek to overcome. This analysis is not intended to completely negate the practices of the New Age onto-world, but to illuminate, on the one hand, the need for the New Age to take responsibility for the problematic outcomes of their practices, and on the other hand, the need to fully disrupt these implicit modernist assumptions in order to frame New Age practices such as plant-human collaboration in a coherent manner that can be worked with responsibly. Regarding science, we have discussed that while science is not considered to be an ultimate (external) authority for the New Age, they do utilize references to quantum physics in order to seek legitimization of their practices. In order to take practices such as Findhorn's plant-human collaboration seriously, which might seem outrageous from within a modernist onto-world, it is important not only to become aware of and shift the

limiting modernist assumptions, but also to connect these practices with scientific theories, as well as to take responsibility for the contexts within which these practices are framed. In order to address these interrelated issues, we turn to the agential realist onto-world.

4.4 Findhorn's plant-human collaboration in an agential realist onto-world

In the above sections, we discussed both why Findhorn's plant-human collaboration cannot be made sense of in a modernist onto-world, and how Findhorn's New Age onto-world cannot be used in a rigorous manner to work with Findhorn's collaborative practices because of its implicit modernist assumptions, its vague references to multiple conflicting interpretations of quantum physics, and more generally, its problematic practices. In this section, we will introduce the agential realist onto-world as being able to overcome the limitations of these implicit modernist assumptions, thereby allowing for the possibility of coming to terms with the efficaciousness of Findhorn's plant-human collaborative practices. Moreover, because agential realism (among other features) proposes a coherent interpretation of quantum physics, there is a possibility of placing these collaborative practices on scientific grounds, making them susceptible to scientific investigation. In conjunction, agential realism requires an ethical engagement that inquires into the social and political forces that are intra-actively implicated as part of this philosophical and scientific engagement. The following three chapters will go into

depth about Findhorn's plant-human collaboration in an agential realist onto-world;[95] here, we will simply introduce how the agential realist onto-world is able to overcome the relevant modernist limitations. We will show that while the agential realist onto-world does not explicitly include plant-human collaboration or entities such as devas and nature spirits, neither does it exclude them in the way that the modernist onto-world does.

In Chapter 2, we learned that in contrast to a modernist onto-world based on pre-existing individual entities where human minds are the only knowers situated in an external physical world, an agential realist onto-world is based on a relational ethico-onto-epistemology in which subjects (not limited to humans) and objects, as well as space and time, do not individually pre-exist but are iteratively enacted in relation to one another, within and as part of entangled in/determinate phenomena. This includes a reworking of key concepts such as matter, causality, space, time, objectivity, agency, and ethics. It is not without precedent for our understanding of "matter" to shift when new evidence becomes available. Historically, what is meant by "materialism" has shifted such that "matter" is taken to mean whatever our most recent scientific findings suggest it to be (van Fraassen 2002, 49-60). Due to the challenge that quantum physics poses to the modernist imagination, however, the modernist common-sense conception of matter has not yet caught up with these advances in quantum physics. In contrast, the concept of matter in an agential realist

[95] Chapters 5 and 6 are composed of an in-depth philosophical examination of Findhorn's plant-human collaboration in an agential realist onto-world, and Chapter 7 engages scientifically with Findhorn's plant-human collaboration, also including brief sketches of how interrelated ethical and political issues could and should be included in a more thorough agential realist analysis.

onto-world is based on a coherent interpretation of the results of quantum physics, and is moreover inclusive of insights from a host of other disciplines, which for agential realism means that matter is agential, dynamically in/determinate, relationally whole, materially-discursively performative, co-constituted along with space and time, and not inclusive of any exceptional ontological status for humans (or for any other entity). This conception of matter overcomes the specific modernist limitations that we have been addressing in regards to Findhorn's plant-human collaboration, as follows.

Plant-human collaboration depends upon the existence of collaborators other than humans. Above, we described collaboration as requiring attributes such as knowledge, intelligence, agency, intentionality, and subjectivity, as well as the ability to physically exchange meaningful information, where none of these attributes or abilities is typically applicable to plants in a modernist onto-world. In an agential realist onto-world, however, we need no longer debate whether attributes should or should not be granted to plants, because this formulation is based on the assumption that we can start from plants as things that have attributes, or more generally on the assumption that individual physical entities with attributes are the fundamental existents. It is also based on the assumption that humans have a privileged ontological status, or that there is some line that can be drawn between humans and non-humans, specifically in the sense that humans are granted attributes that are withheld from non-humans such as plants. But an agential realist onto-world is based on fundamentally different assumptions: the human no longer has a privileged status

as an exceptional ontological being, and the ultimate entities are relational, in/determinate phenomena. Thus, there are no pre-given individuals (human or otherwise) to whom attributes can belong. Instead, as will be developed in depth in Chapter 5, these "attributes" can be re-framed as dynamic features of intra-action, regardless of whether or not a human is involved.

As for the ability to physically exchange meaningful information, our understanding of how information is exchanged and how meaning is communicated between any two entities likewise shifts in an agential realist onto-world, because agential realism fully overcomes both the metaphysics of individualism and the dualism between matter and meaning (thereby shifting our understanding of both matter and meaning). Thus, we need no longer debate whether or not plants can generate and share information that is meaningful to humans (and vice versa), because this formulation is based on the assumption that interactions occur between individuals. With such a formulation, individuals must not only be able to send information back and forth between their physical bodies, but they must also somehow bridge the gap of meaning between separate individuals. In contrast, every agential intra-action, whether or not a human is involved, is a material-discursive relational differentiation from an ontologically inseparable whole, in which the materiality of the enacted individuals is inseparable from the meaning-making. Moreover, the presence of physical sense organs – whether human or otherwise – is not necessarily required. These details will be fleshed out in Chapter 5, allowing us to conclude that in an agential realist onto-world, collaboration need not be limited to

humans. At the same time, what we mean by collaboration shifts: with agential intra-action as the relational differentiating-entangling of ontologically inseparable entities (agential realist wholes), collaboration is no longer an interaction between separate determinate individuals, but it can be re-framed in terms of mutually intra-acting agencies jointly taking responsibility for, or enabling new responses toward, the iterative enaction of a livable common world. This notion of collaboration is moreover consistent with Findhorn's collaborations, in which humans work with devas and nature spirits not based on their individual stakes and returns, but as a co-creation that benefits the good of the whole.

With Findhorn's onto-world, we have been working with a multi-realm cosmology of collaborative beings including devas and nature spirits. In an agential realist onto-world, however, there are no pre-determined, independently existing realms populated by different types of beings, nor are realms iteratively created in such a way that they become stable entities that are causally closed with respect to other realms. Instead, we can talk about different sets of material-discursive practices that tend toward certain patterns of spacetimemattering, all of which are thoroughly entangled, and none of which result in anything separate or fixed. In Chapter 6, we will discuss nature spirits in terms of etheric spacetimematterings. Agential realism does not refer specifically to transphysical beings or to etheric spacetimematterings, but it does not preclude the possibility of particular material-discursive practices involving a multiplicity of beings that are engaging in efficacious collaborations as part of their iterative enaction along with multiple different patterns of

spacetimematterings. Moreover, the reality of objective possibility that is implied by the existence of devas with their potential forms does have its place in an agential realist onto-world, where possibility is a dynamically inseparable part of in/determinate phenomena. This will allow us to talk about devas in terms of indeterminacy.

Regarding the efficacious and intra-active relationality of the devas and nature spirits to the spacetime materialization of physical entities, the notion of causality is completely reworked in an agential realist onto-world. As we will discuss in Chapter 6, agential realist causality occurs between entities as they co-constitute one another within intra-action, providing the needed connection between causality and the process of coming-into-being. This revised notion of causality can be used to accommodate the relationality between physical and etheric spacetimematterings that are enfolded through one another. The devas, because they do not materialize in spacetime, are not part of this spatiotemporally enacted causal structure of intra-action, but we can accommodate devic causality in terms of how patterns of possibilities are constitutive of spacetimematterings within phenomena. Thus, an agential realist onto-world can fully overcome physicocentrism when we make the following explicit: spacetimemattering is an iterative process of coming-into-being; objective possibility is an inherent part of matter; spacetimematterings can include the transphysical in addition to the physical.

Finally, the oneness of Findhorn's onto-world can be expressed and clarified in an agential realist onto-world. Whereas a modernist onto-world is reductionistic

and based on determinate individuals that have no necessary connection to one another, and whereas Findhorn's onto-world is based on a oneness in which individuals are supposed to be interconnected and interdependent (while however remaining rooted in an individualist metaphysics), the entangled intra-active relationality of the agential realist onto-world goes beyond mere interconnectedness or interdependence between individuals, because there are no pre-given or fixed individuals, boundaries, or inside/outside delineations. Instead, what we think of as individuals iteratively co-constitute one another in an inherent mode of dependence and connectedness, and these relationally enacted individuals do not exist on their own but only in relation to the phenomenon – the whole – of which they are a part. Agential realist phenomena are entangled in/determinate wholes that do not have pre-determined parts but that are dynamically reconstituted according to how the "parts" are iteratively enacted. These "parts" include both physical and transphysical spacetimematterings (such as etheric nature spirits), as well as indeterminacy (related to devas), and these are inseparable from one another in their iterative dynamic intra-activity. Because phenomena are the fundamental existents in an agential realist onto-world, the wholeness of phenomena and the oneness of any potentially intra-acted "parts" are fundamental and irreducible.

In summary, the thesis of this project is that we can turn to agential realism in order to make sense of plant-human collaboration by overcoming limiting modernist assumptions that are implicitly retained in New Age constructs. Moreover, because agential realism is an ontological framework that proposes a coherent interpretation

of quantum physics, it is more likely to allow for the possibility of coming to terms in a scientific way with the efficaciousness of Findhorn's practices of plant-human collaboration. In this section, we have made the point that agential realism overcomes the limitations imposed by modernist assumptions, and we have foreshadowed how agential realism, with its matter as fundamentally in/determinate and iteratively spacetimemattering, will be able to accommodate an efficacious collaboration of humans, devas, and nature spirits. In Chapter 5, we will address the fact that humans are not the only collaboratively enacted beings in an agential realist onto-world; in Chapter 6, we will present a possible way in which to make sense of Findhorn's devas and nature spirits in an agential realist onto-world; in Chapter 7, we will explore scientific issues, along with a sketch of some of the interrelated ethical and political issues, that arise as part of plant-human collaboration.

5. Collaboration in an Agential Realist Onto-World

> The very nature of materiality is an entanglement. Matter itself is always already open to, or rather entangled with, the "Other." The intra-actively emergent "parts" of phenomena are co-constituted. Not only subjects but also objects are permeated through and through with their entangled kin; the other is not just in one's skin, but in one's bones, in one's belly, in one's heart, in one's nucleus, in one's past and future. This is as true for electrons as it is for brittlestars as it is for the differentially constituted human. (Barad 2007, 392-393)

Plant-human collaboration depends upon the existence of collaborators other than humans. But in Chapter 4, we determined that non-humans such as plants are not the kinds of collaborators that show up in a modernist onto-world, which is limited by the metaphysics of individualism, the dualism between matter and meaning, physicocentrism, and human exceptionalism. In order to continue working constructively with Findhorn's plant-human collaboration, we have therefore determined that it is necessary to look more closely at these modernist assumptions, understanding why they might be limiting and how it might be important to reconsider them. This has been accomplished by bringing in agential realism, an ethico-onto-epistemology that questions and shifts these fundamental assumptions as part of creating a coherent interpretation of quantum physics while also including a consideration of ethical and political issues. As was discussed in Chapter 2, agential realism proposes a shift from a modernist representationalist framework based on pre-existing, determinate, individual entities situated in an external physical world where human minds are the only knowers, to a relational ethico-onto-epistemology in which subjects (not limited to humans) and objects, as well as space and time, do not

individually pre-exist but are iteratively and material-discursively enacted in relation to one another, within and as part of in/determinate phenomena. In this chapter, we will examine why collaboration in an agential realist onto-world need not be limited to humans.

We have defined collaboration in a modernist onto-world as an interaction between individuals that minimally requires agency, knowledge, intelligence, and the ability to communicate. For communication, we are focusing on subjectivity, intentionality, and the ability to physically exchange meaningful information. As was discussed in Chapter 4, in a modernist onto-world, humans are generally granted agency, knowledge, intelligence, subjectivity, intentionality, and the ability to generate and exchange meaning, but none of these attributes or abilities is typically applied to plants. Moreover, even if plants were considered to be capable of exchanging meaningful information in a collaborative relationship, the generation and sharing of meaning between any individuals, even humans, does not have a clear explanation in terms of the modernist concept of matter, because matter has no necessary relation to meaning. As we will show in this chapter, considering collaboration from within an agential realist onto-world changes the discussion entirely. We will begin in §5.1 with a general discussion regarding the dynamic in/determinacy of an agential realist onto-world. Then, in §5.2 through §5.4, we will discuss how agency (and responsibility), knowledge, intelligence, subjectivity, and intentionality take on new meanings and functions in an agential realist onto-world. In §5.5, we will address the issue of communication more generally, including an

analysis of how the physical exchange of meaningful information can be reworked in an agential realist onto-world. Finally, in §5.6, we will develop the notion that in an agential realist onto-world, collaboration is enacted as part of mutually intra-acting agencies (not limited to humans) jointly taking responsibility for, or enabling new responses toward, the iterative enaction of their common world.

5.1 The dynamic in/determinacy of an agential realist onto-world

As was introduced in Chapter 1 and has been elaborated further in several contexts, the ultimate entities of a modernist onto-world are determinate individuals, which are not inclusive of any process of coming into being, nor do they include any form of possibility or indeterminacy as integral to their existence. For a modernist who has been educated in terms of modernist science, this is routinely confirmed by our personal engagement with what seem to be the determinate individuals of our world – not only humans and trees and cars, but also cells, electrons, and planets. But as described in Chapter 2 in the context of agential realism, the puzzling outcomes of quantum physics experiments trouble this modernist understanding. Agential realism, among other features, provides a coherent interpretation of quantum physics, in which the ultimate constituents are not determinate individuals but are in/determinate phenomena, such that matter is never a fully determinate fact but always includes some degree of indeterminacy in the form of dynamically shifting alternative possibilities; this challenges us to find new ways in which to make sense of our

experience.[96] We will begin in this section by engaging more closely with in/determinacy.

One way in which to understand the fundamental in/determinacy of matter is in terms of Barad's (2007) resolution to the "measurement problem", one of the mysteries of quantum physics. The intent here is not to thoroughly describe this issue, but to convey enough of an understanding to permit a fruitful discussion about the nature of in/determinacy. With quantum physics, Newton's laws of classical mechanics are supplanted by the Schrödinger equation (Barad 2007, 249).[97] While classical mechanics is deterministic, in that one can calculate the entire past and future of a given particle according to its initial conditions, quantum mechanics does not offer deterministic predictions (Barad 2007, 251). Instead, when the Schrödinger equation is solved according to a set of initial conditions, it results in a "wave function", which yields not deterministic predictions but only probabilities for where and when a particle might be found (Barad 2007, 251).[98] The wave function is an entangled quantum state, also called a superposition of states, which means that the

[96] The process relational philosophy of Whitehead (1978) is another example of an ontological framework that includes possibility as an integral component of matter. For Whitehead, actuality and possibility constitute separate categories of existence, but neither possibilities nor actualities exist except in relation to one another, and some entities are part actual and part possible. The ultimate constituents of Whitehead's system – "actual entities" or "actual occasions" – are constituted by both possibility and actuality.

[97] The matrix mechanics of Heisenberg is a mathematically equivalent formulation to Schrödinger's wave mechanics (Barad 2007, 249-250); we are here focusing the discussion on Schrödinger's formulation.

[98] This interpretation of the meaning of the wave function is according to the so-called Copenhagen interpretation, which is the agreed upon method of performing quantum mechanical calculations; but in fact, what the wave function actually represents is an open question among physicist, with multiple conflicting interpretations existing (Barad 2007, 251). Moreover, the Copenhagen interpretation, although it provides for computational and technological successes, is not a coherent interpretation of the quantum issues (Barad 2007, 252-253), which is why it is significant that Barad (2007) does advance a coherent interpretation.

values of particular properties are indeterminate, or that no determinate values can be assigned to the properties in question (Barad 2007, 265, 280). The measurement problem exists because the wave function describes the (indeterminate) state of a system between measurements, but the Schrödinger equation does not account for the process of measurement itself, or for the abrupt transition from indeterminacy to determinacy, in which indeterminate quantum states are resolved into determinate values (i.e. measurements) (Barad 2007, 280-281). A variety of different resolutions to this issue have been proposed (Barad 2007, 286-287); we will consider one popular interpretation, in which the wave function and its resolution into a determinate value upon measurement are interpreted physically, such that there is a so-called "collapse" of the wave function (from indeterminacy to determinacy) upon measurement (Barad 2007, 285).[99] In other words, according to this interpretation, the measurement process somehow causes a superposition of possibilities to collapse, such that one of these possibilities becomes actualized while the others disappear.

As discussed in Chapter 1, agential realism does not subscribe to this collapse interpretation of the measurement problem, but instead introduces intra-activity as the ongoing dynamism of in/determinacy. With agential realism, the enactment of determinacy is a contingent, relational resolution of the indeterminacy, which does not result in a physical collapse of the entanglement, but rather reconfigures and redistributes the entanglement (Barad 2007, 345). In other words, measurement does

[99] As a contrast, it is also possible to interpret the wave function not physically, but epistemically, in the sense that it describes the information pertaining to a particular system, where a measurement corresponds to a change in knowledge regarding that system; Schrödinger's interpretation fits in here (Barad 2007, 286). Heisenberg's uncertainty principle is also epistemically based (Barad 2007, 261).

not produce determinate values at the expense of the rest of the possibilities disappearing or the entanglement dissolving, but instead, the entanglement is extended in order to account for the new correlations produced by that measurement:

> There is no 'collapse' – no additional physical mechanism (beyond that governed by the quantum theory) – that transforms a superposition or entanglement that exists before the measurement into a definite state upon measurement. Rather, *what is at issue is the proper accounting of agential cuts within the specific phenomenon in question.* The key point is that *agential separability is enacted only within a particular phenomenon*. (Barad 2007, 345).

That is, boundaries and properties are made determinate by the agential separability that is enacted by the agential cut within a phenomenon, thereby resolving the ontological indeterminacy, but only within the phenomenon, and only in conjunction with a shifting of the associated possibilities – the indeterminacy is never resolved once and for all (Barad 2007, 348). Thus, the agential cut allows for determinate values to be measured, or for a contingent resolution to be enacted within a phenomenon, but even as one set of possibilities becomes determinate within a particular phenomenon, the entanglement is extended in order to account for the new correlations produced by that cut. This is the dynamism of in/determinacy.

Another way in which to understand the fundamental in/determinacy of matter is through quantum field theory. In addition to working with Bohr's insights regarding quantum physics, Barad is currently engaged in a project of expanding agential realism to include quantum field theory; this project includes a philosophical, ethical, and political articulation of what quantum field theory means and what it entails (personal communication from Karen Barad to the author on Feb. 24, 2019).

We will be working with Barad's (2012, 2014b) initial publications as part of this project. While particles, fields, and the void are treated as "separate" entities in classical physics, quantum field theory uncovers the intra-active relationships between them; one such intra-active relationship, between particles and fields, can be understood in terms of particles being the "quanta" of fields (Barad 2014b, 4). Less commonly discussed – and important for our discussion regarding in/determinacy – is the fact that particles are constitutively entangled with the void, as opposed to existing *in* the void (Barad 2014b, 4). To understand what this entails, we need to take a closer look at the void, or the vacuum. Classically, the vacuum is understood to be empty and have no energy of its own. But Barad (2007) explains that according to quantum electrodynamics, the vacuum is "a state in which everything that can possibly exist exists in some potential form" (92); and because of this indeterminacy, or this "lively potentiality", the vacuum creates "vacuum fluctuations" (92). Vacuum fluctuations are the indeterminate vibrations of the vacuum, meaning that there is no determinate fact as to whether the vacuum is still or not (whether it has zero energy or not), which furthermore means that the vacuum can no longer be said to have a determinate value of zero energy (Barad 2012, 8-9). Barad (2012) refers to vacuum fluctuations both as "indeterminacies-in-action" and as "virtual particles" (11),[100] terms that I will use interchangeably.

[100] The reason that virtual particles are equivalent to the indeterminate vibrations of the vacuum, or the indeterminacies-in-action, is because of the following. With Einstein's special relativity that equates mass and energy, each discrete energy state in a field (of vibrations) can be converted to a mass value, such that "a field vibrating at a particular frequency or energy is equivalent to the existence of particles of matter with a particular mass" (Barad 2012, 10-11).

So the void, or the quantum vacuum, turns out not to be empty, but to be full of virtuality (Barad 2014b, 4), and this virtuality is inseparable from matter. What is important for our discussion is that *non*-virtual particles such as electrons exist inseparably from a "cloud" of virtual particles that represent all of the (infinite) virtual intra-actions this electron could have, though there are constraints, according to which certain possibilities are excluded: "There are an infinite number of im/possibilities but not everything is possible" (Barad 2012, 12). These virtual particles, though they do not exist in spacetime (Barad 2012, 12), are still considered to be "real" because, through their virtual intra-actions, they are implicated in the mass of non-virtual particles (Barad 2012, 13-15).[101] In other words, "Each 'individual' is made up of all possible histories of virtual intra-actions with all Others" (Barad 2012, 15). This means that what we think of as a Self is not separate from all Others, and that any entities with which we engage, even if they appear to be determinate individuals, are partially constituted by their associated "cloud" of possibilities (Barad 2012, 15). With the in/determinacy of agential realism, neither fully determinate nor fully indeterminate particles or entities exist in themselves. For example, when "we" intra-act with what seems to be a determinate entity – such as a chair – we-in-the-process-of-becoming are intra-acting with the chair-in-the-process-of-becoming – including virtual intra-actions with our clouds of possibilities – as both "we" and "chair" are resolving into contingent determinacy, in conjunction with the

[101] More specifically, the (finite) empirical value of a particle's mass matches the value obtained after a (mathematical) renormalization process in which "the infinity of the 'bare' point particle cancels the infinity associated with the 'cloud' of virtual particles" (Barad 2014b, 6).

shifts in our clouds of possibilities that constrain and enable our further intra-action. Agential realist phenomena are "contingent conditions of mattering" (Barad 2012, 7), in that they are constitutively entangled with the void, or with the indeterminacies-in-action that embody different possibilities for mattering.

It is crucial to recognize the difference between the fully-determinate matter of a modernist onto-world, which is pre-given in a spacetime container and endowed with particular attributes (and not others), and matter in an agential realist onto-world, which is not pre-existing but is differentiating-entangling along with space and time through an iterative process in which particular determinacies are enacted at the exclusion of others (which remain indeterminate). But it can be challenging to talk about in/determinate agential realist phenomena in a modernist language that wants to point to and enumerate particular determinate individuals, because in/determinacy troubles the very notion of singular or multiple: "Quantum entanglements are not the intertwining of two (or more) states/entities/events, but a calling into question of the very nature of two-ness, and ultimately of one-ness as well" (Barad 2014a, 178). Moreover, the in/determinacy of matter is not something we tend to notice as we engage with the entities of our world[102] – we look around at a world that seems to be external to ourselves, making our self seem private and individual, and we see what seem to be determinate individual objects located in a spacetime that seems to form a fixed reference point for our experience. Moreover, we expect these seemingly

[102] Although Barad (2007) makes the point that though we seem to see sharp boundaries that mark determinate individuals, upon closer inspection it becomes evident that these boundaries are in fact indefinite, as made evident by diffraction effects (380).

determinate individual objects to be perceived similarly by determinate individual subjects located in different spatiotemporal positions. This process of perception (or other types of interactions) between determinate individuals must be completely reimagined in an agential realist onto-world, in which determinacy is contingently enacted within and as part of phenomena, while phenomena as a whole remain in/determinate. While we may notice only what seem to be determinate individuals, both subject and object are fundamentally relational and partially constituted by indeterminacy. That is, when an agential cut produces determinate subjects and objects, they exist only in relation to one another and to the phenomenon of which they are a part, including all of its entanglements: "Objects are not already there; they emerge through specific practices" (Barad 2007, 157). Moreover, subjects and objects are relationally enacted along with space and time, such that we can replace our notion of a "determinate individual" with the notion of a "spacetimemattering", recognizing that these spacetimematterings do not "sit still" (Barad 2007, 376), but that they are iteratively reconfigured as part of the dynamic intra-play of in/determinacy.

Let us review and deepen our understanding of intra-action by considering a variety of spacetimematterings: a cup, a plant, a dog, a planet, an electron, an apparatus designed to measure momentum, my body, a thought in my head, a feeling in my heart, "you", "I". First, we must recognize that any of these spacetimematterings is made determinate only within phenomena, or only in relation to the material-discursive context of the set of intra-actions through which it is

produced, including constitutive exclusions. Second, the differentiation of a spacetimemattering entails new entanglements, shifting and extending the indeterminacy even as determinacy is contingently enacted. Third, because phenomena are iteratively reconfiguring, no determinacy is made once and for all, but neither is it unmade. That is, spacetimematterings are sedimented out of intra-actions and folded back into the inherent indeterminacy (Barad 2007, 170). Fourth, these *spacetime*matterings are not changing configurations of matter placed in a pre-given space at an instant of universal time, but space and time are also iteratively reconfigured through intra-action (Barad 2007, 180). Fifth, it is not possible to objectively interact with these determinacies-within-phenomena as an impartial observer from some position "outside" of the phenomenon, but we-in-the-process-of-becoming necessarily entangle with the whole phenomenon, re-constituting it according to these new entanglements (of which "we" are a part) (Barad 2007, 345). Sixth, lest this seems like complete chaos that does not support the fact that a cup seems to persists through time in our awareness, "Matter is [both] a stabilizing and destabilizing process of iterative intra-activity" (Barad 2007, 210), in that particular spacetimematterings are sedimented out through the process of spacetimemattering. These are not particular *determinacies* that persist, but *patternings* that are constantly shifting yet still recognizable, similar to patterns of sand on the beach that shift with every ocean wave or wind or footstep but are still recognizable as patterns of sand.[103]

[103] As Barad (2007) says regarding a similar metaphor, the metaphor is not intended "to capture an idea but to evoke further thought". Such metaphors are limited because "the motion seems to come from the outside, the indeterminacies don't appear to be evident, the possibilities come across as less lively,

Seventh, the material-discursive practices that we engage in and are shaped by have a role in shaping the sedimentation that is our world, making us partially responsible for this world of which we are a part (Barad 2007, 390). Finally, any spacetimemattering that we recognize and take responsibility for as a sedimented set of iteratively reconstituting and re-enfolding patterns of relational differentiating-entangling, is what it is only by virtue of the entire in/determinate universe that participates to at least some degree (even if only by virtue of its exclusion) in every intra-action.

Understanding in/determinacy and its contingent resolution through intra-action is important for making sense of how the relationality of agential realism overcomes the metaphysics of individualism. In a modernist onto-world of determinate individuals, we are generally unaware of the iterative process of coming-into-being by which certain determinacies are enacted at the exclusion of others. This is exacerbated by the fact that the physical entities of our world (i.e. everything that we can see and/or measure, including with our technological extensions) tend to be enacted according to the same patterns, making it appear as if they are determinate individuals.[104] Yet any determinate entity is what it is only by virtue of its relational differentiating-entangling from and as part of the entire universe, and it could have been and could be enacted differently (i.e. it is partially constituted by alternative

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fresh, and exuberant than they are", so they do not capture "the complexity of the topological dynamism of mattering" (439).

[104] This will be more fully discussed in Chapter 6, when we look more closely at physicocentrism.

possibilities). And importantly, "we", as iteratively enacted beings, share in the responsibility for what comes to be as well as for what is excluded from being.

This discussion is relevant to the topic of this chapter, both because it will help us understand how communication and collaboration shift in an agential realist onto-world, as will be discussed in §5.5 and §5.6, but also because it changes the discussion regarding whether particular attributes should or should not be granted to particular types of individuals. We have been investigating agency, knowledge, intelligence, subjectivity, and intentionality in relation to both humans and plants, where these attributes are typically granted to humans but not to plants in a modernist onto-world. But we need no longer debate whether these attributes should or should not be granted to plants, because this formulation is based on the assumption that determinate individuals with attributes are the fundamental existents. Instead, with in/determinate phenomena as the fundamental existents of agential realism, any so-called "attributes" do not pre-exist but are enacted as part of the relational differentiating-entangling of both subjects and objects. In the following sections, we will examine how modernist attributes belonging to determinate individuals can be reworked as dynamic features of agential intra-action.

5.2 Agency and responsibility in an agential realist onto-world

Because of the fundamental in/determinacy of matter, the strict determinism of a modernist onto-world is replaced with the constrained freedom of an agential realist onto-world. Strict determinism is precluded from an agential realist onto-

world because of exclusions that provide for an open future (Barad 2007, 177). That is, when the position of a particle is made determinate, the possibility of simultaneously determining the momentum is materially excluded, and because both position and momentum are required for strict deterministic causality, an element of freedom emerges (Barad 2007, 436 n79). Yet, absolute freedom is not the case either, because possibilities are iteratively reconfigured as part of intra-action, creating constraints as to what is possible or impossible for any given intra-action (Barad 2007, 177). When the notion of constrained freedom is considered *from within a modernist onto-world,* it might seem to imply that humans have the agency to choose from a constrained sets of possibilities, making humans responsible for their actions. However, from within an agential realist onto-world, there are no pre-given humans that can be said to "have" agency or responsibility (or any other attribute), and so the nature of both agency and responsibility must be reworked.

In a modernist onto-world with its determinate individuals, we are accustomed to the subject – the human subject – having the sole agency with which to act upon an external world that is filled with objects. Agency is typically defined as the manifestation of the ability to act, in the sense that an agent has intentionality towards and has causal effects upon an external world (Schlosser 2015). In a modernist onto-world, agency is exhibited by an individual agent that persists through time and is fully-formed at any instant of time. But in an agential realist onto-world, there are no pre-existing, fully-formed individuals who can "have" agency, because both subjects and objects are relationally differentiating-entangling within phenomena. In other

words, we cannot point to either a human or a plant and say, "that human has agency", or "that plant does not have agency", but we must change the discussion entirely. Instead of asking who or what has agency, we must understand that *agency is what the universe does*. Agency is the dynamism by which phenomena continue to be reconfigured, or by which the world is iteratively reconfigured: "The universe is agential intra-activity in its becoming" (Barad 2007, 141). Not only is matter fundamentally in/determinate, but it is also agential, where this agency drives matter toward iterative spacetimemattering, or the iterative reconfiguring of its indeterminacies, such that the boundaries between subjects and objects are never static but are iteratively made and remade. Agential realism does not simply argue against humans as being the sole players with agency, but it shows us that no individual – whether human or plant – has this function in a possessive way, because it is the agency inherent within the intra-action, or "…the ongoing dance of agency immanent in its material configuration" (Barad 2007, 246), that makes the agential cut, or the boundary that marks off what is human, or what is plant, in any given intra-action. This is an example of how, with respect to agency, the human no longer has a privileged status as an exceptional ontological being in an agential realist onto-world.

Similarly, any agential intra-action entails responsibility, whether or not we are aware of our participation: "We are responsible for the cuts that we help enact not because we do the choosing (neither do we escape responsibility because 'we' are 'chosen' by them), but because we are an agential part of the material becoming of

the universe. Cuts are agentially enacted not by willful individuals but by the larger material arrangement of which 'we' are a 'part'" (Barad 2007, 178). But if the responsibility for these cuts precedes the formation of an individual subject or any kind of conscious intentionality (Barad 2007, 392), then what does it mean for "us" to be responsible, and how can "we" learn to take conscious responsibility for our part in this process? Several ways are pointed out by Barad (2007): we can recognize that humans are not the only agential and responsible parts of intra-action (218-219); we can pay attention to that which matters and that which is excluded from mattering by critically assessing the boundaries, constraints, and exclusions of particular material-discursive practices (219-220); we can take account of how self and other are entangled (394); we can be "alive to the possibilities of becoming", responding to those possibilities that lead to a mutual flourishing of our entangled selves (396). For example, taking responsibility as part of this study of plant-human collaboration requires careful attention to how my intra-active participation in this project materializes the world (including myself) in specific ways and not others; this moreover requires accountability for the relevant entangled material-discursive apparatuses – philosophical, scientific, ethical, political, etc. – in the specificities of the work that they are doing as part of this project. Through such material-discursive practices, "we" are not making choices as fully-formed individual subjects, but we-in-the-process-of-becoming are staying aware and alive to this process of becoming, affecting the way in which we are constituting, and further affecting which possibilities are available and which are excluded. Neither subjects nor intra-actions

have agency or responsibility, but every intra-action, every subject-in-the-process-of-becoming, participates to some degree in its own differentiating-entangling.

These reformulations of both agency and responsibility are important for our discussion of plant-human collaboration. We will discuss responsibility further in §5.6, as part of reworking the notion of collaboration in an agential realist onto-world. Agency is one of the features that we designated as necessary for collaboration, and with agential realism, instead of debating whether or not plants have agency, we can say that agency – "The world's effervescence, its exuberant creativeness…" (Barad 2007, 177) – is a fundamental feature of the universe. Thus, all intra-actions are agential and entail responsibility, whether or not a human subject is enacted. We could reformulate the above definition of agency – "Agency is typically defined as the manifestation of the ability to act, in the sense that an agent has intentionality towards and effects causality upon an external world" – to say that agency is the manifestation of the universe's creativeness, in the sense that every agential intra-action sets up an intentional[105] causal structure that reconfigures the in/determinacy within phenomena.

Similar to this shift in the meaning and function of agency, our other necessary features of collaboration – knowledge, intelligence, subjectivity, and intentionality – can also be reconceived as dynamic features of agential intra-action instead of belonging to determinate individuals. For the purpose of this project, it is not necessary to give full reworked accounts of these philosophical concepts, but

[105] In §5.4, we will discuss how the nature of intentionality shifts in an agential realist onto-world.

simply to insure that anything available as part of the enaction of humans is also available as part of the enaction of plants, at least to some degree. We will consider subjectivity and intentionality after dealing with knowledge and intelligence.

5.3 Knowledge and intelligibility in an agential realist onto-world

As discussed in Chapter 2, the modernist onto-world is characterized by a separation between the active human mind and the passive external world, resulting in a representationalist epistemology: the human mind forms "representations" of the external world about which it seeks knowledge, but there is no way to prove that these representations accurately reflect the world. Moreover, with determinate physical individuals as the ultimate entities of the modernist onto-world, there is no inherent connection between individuals, for example between a set of objects and a subject who seeks knowledge about these objects. In contrast, with the in/determinate phenomena of agential realism, the subject is differentially co-constituted along with the objects about which they are seeking knowledge. That is, instead of seeking knowledge about a fully-formed external world from the outside, the agential realist subject knows from within and as part of a dynamically reconfiguring world, or a "world-body space in its dynamic structuration" (Barad 2007, 341). In this way, knowing occurs as a part of coming-into-being, which is how epistemology and ontology become inseparable. As subject and object are relationally differentiating-entangling within phenomena, they are constitutively engaging with one another, and part of what ends up as the subject is the knowing of the object.

Agential realism addresses not only issues with representationalist epistemologies, shifting from static knowledge about an external world to knowing as a material-discursive practice of coming-into-being in relation to and as part of one's world, but it also moves beyond the human exceptionalism of the modernist onto-world. In an agential realist onto-world, humans are not the only knowers, and brains are not required for knowing. Barad (2007) uses the example of the brittlestar, an invertebrate sea creature that lacks both brain and eyes, but that can nevertheless take part in knowing by engaging in differential responses and accountability within intra-action: "Brittlestars intra-act with their ocean environment and respond to differential stimuli made intelligible through these intra-actions, adjusting their positions and reworking their bodies in order to avoid predators or find food or shelter, all without brains or eyes" (379). While the participation of a brain may be implicated in some forms of knowing, knowing is not mediated by a brain but is a material engagement with the world that occurs as part of relational differentiating-entangling. Again in reference to the brittlestar, Barad (2007) affirms that "…'mind' is a specific material configuration of the world, not necessarily coincident with a brain. Brain cells are not the only ones that hold memories, respond to stimuli, or think thoughts" (379). Thus, knowing does not require the kind of cognition we associate with humans, but neither is knowing a simple matter of responding differently to different stimuli. Instead, knowing requires differential responses that matter; for example, the brittlestar engages in knowing by responding in such a way that it is able to recognize and evade its predators (Barad 2007, 380).

If knowing is "an ongoing performance of the world" (Barad 2007, 149) that is not dependent on human involvement, what can we say about intelligence, a characteristic that is bound up with the human in a modernist onto-world? Although we can talk about different kinds of intelligence even with regard to humans – mental intelligence, emotional intelligence, bodily intelligence – the modernist concept of intelligence is predominantly associated with the abstract analytical capacity of the brain. Thus, even the most amazing capabilities of plants are not likely to be considered intelligent, because plants do not have brains. With agential realism's commitment to moving beyond human exceptionalism, intelligence is redefined in terms of *intelligibility*. Whereas intelligence belongs to determinate (human) individuals, with agential realism, individuals do not pre-exist their intra-action, and intelligibility is part of how individuals (human or otherwise) are differentially enacted within phenomena. Specifically, the enaction of ontic and semantic determinacy within a phenomenon means that one part of the world has *become intelligible* to another part of the world (Barad 2007, 148, 335), where intelligibility neither belongs to a pre-given individual nor requires a human agent: "…intelligibility is an ontological performance of the world in its ongoing articulation. It is not a human-dependent characteristic but a feature of the world in its differential becoming" (Barad 2007, 149).

With intelligibility referring to the ontic and semantic determinacy that is enacted within phenomena, and knowing as a differential response that comes along with being, we can say that knowing is the response that happens along with

intelligibility during intra-action: "Knowing is a specific engagement of the world where part of the world becomes differentially intelligible to another part of the world in its differential accountability to and for that of which it is a part" (Barad 2007, 379). In an agential realist onto-world, plants are not excluded from participating in knowing and intelligibility.

5.4 Subjectivity and intentionality in an agential realist onto-world

In a modernist onto-world, it is not generally acceptable to consider plants as subjective or intentional beings. In fact, subjectivity and intentionality tend to be hallmark characteristics of human experience. The Stanford Encyclopedia of Philosophy lists both subjectivity and intentionality as features of consciousness, where subjectivity has to do with qualitative, phenomenal experience, or what-it's-like for the subject, and intentionality is what this experience is about, or that to which it refers (van Gulick 2018). Typically, intentionality is framed in a representationalist manner, in terms of the intentionality of a mental state toward an object in the external world; in this sense, we can note that mental states, or minds, are implicated in intentionality. Phenomenologists such as Gallagher and Zahavi (2012) claim that subjective experience and intentionality are intertwined: because every experience is an experience of some thing in some context for some one, it is not possible to separate what an experience is *like* from what the experience is *of* (120). For the purpose of this discussion, we will consider that in a modernist onto-world, subjectivity is the experience of the subject, and intentionality is what the

experience is about, where these features typically require human minds. Because of their intertwined nature, I will analyze subjectivity and intentionality in terms of experience more generally, but first we will examine how these concepts show up in agential realism.

In an agential realist onto-world, we have seen that humans are no longer endowed with an exceptional ontological status, in terms of certain qualities being attributable only to humans. While knowing and intelligibility are thoroughly reworked by Barad (2007) in conjunction with agential intra-activity, subjectivity and intentionality come up only tangentially. Barad (2007) tells us that "Agency is not aligned with human intentionality or subjectivity" (177), to make the point that agential intra-action does not require a human participant, where intentionality and subjectivity are being utilized as the classic marks of humanism. In order to overcome the prejudice against plants not being able to intersubjectively and intentionally communicate with humans, however, it seems relevant to point to a way in which these concepts could be separated from their humanist connotations.

As we have already discussed in various contexts, there are no pre-determined subjects in agential realism, and thus, subjectivity and intentionality cannot be attributed to subjects, human or otherwise. Instead, both subjectivity and intentionality could be reconceived as dynamic features of agential intra-action, in such a way that they become part of the determination of subjects. Barad (2007) does not address the topic of subjectivity further, but does briefly address the topic of intentionality. Based on Barad's (2007) interpretation of Bohr's account of

intentionality, it is clear that "intentions are not preexisting determinate mental states of individual human beings" (22), and therefore, that the very nature of intentionality needs to be reworked (22), specifically by reconceiving it as a material intra-action (407). Because of the association of intentionality with mental states or minds, it is also worth repeating that in an agential realist onto-world, what we would consider to be a "mind" or a "mental state" need not be associated with a brain, but could potentially be part of any material configuration (Barad 2007, 379).

For the purpose of this project, it is not necessary to give complete reworked accounts of subjectivity and intentionality, but only to be clear that when we utilize these terms in relation to the agential realist onto-world, we are acknowledging that they can be reworked as features of agential intra-action that are not dependent upon human minds. I will, however, delve a bit more deeply into the nature of subjectivity and intentionality in terms of *experience* – above, we noted that subjectivity and intentionality are both elements of experience more generally – by analyzing how the element of experience could be added to the existing agential realist framework. Barad's (2007) focus is *not* on experience, and specifically not on human experience, but is on the (post-humanist) ontological aspect: "…what is at issue and at stake is a matter of the nature of reality, not merely a matter of human experience or human understandings of the world" (160). But once we have an ontological framework such as agential realism that is not based on human exceptionalism, we can revisit the fact of human experience. That is, part of what it is to be enacted as a human is to have what we call experience, which means that to some degree, experience must be a

part of intra-action more generally (or enacted humans would be exceptional in having experience). We will briefly consider how experience could be included as part of intra-action, in order to get a feeling for how experience could be possible without necessarily being linked to human minds, or to minds at all.

In a modernist onto-world, philosophers often refer to experience in terms of "what-it's-like-ness", coined by Nagel's (1974) article "What is it like to be a bat?" We know that it feels like something to be a human, and philosophers such as Nagel question whether particular non-humans have a similar element of experience.[106] Extending Nagel's analysis to plants, we would need to question what it could possibly be like to be a plant, and whether this is even plausible (from our human perspective, that is). The approach we are considering here is different. From within an agential realist onto-world, we are not asking what it feels like to *be* a human or a bat or a plant, because humans and bats and plants are not pre-existing determinate individuals and therefore cannot be said to *have* experience. Instead, we can ask what it feels like *to become constituted as* a subject – any subject. What does it feel like to be in the process of becoming, to be differentiating from the universe while also forming new entanglements, to become "this" at the exclusion of "that"? And what does it feel like, while constituting as a subject, for the world to become intelligible to us as something that is "other", as something "we" could be said to have

[106] Note that Nagel's (1974) approach is a theoretical "armchair" philosophizing, as opposed to the possibility of examining the experience of non-humans by directly participating in their lifestyles. For an example of this latter type of examination, see James Inabinet (2011), who spent many years experientially immersing himself in the lifestyles of non-human animals. Whereas Nagel thought about the potential experience of bats and concluded that bats do have experience but humans cannot know it, Inabinet utilized alternative modes of engagement in order to participate experientially in these non-human experiences.

intentionality towards? In this way, we can make experience ontological: I would like to suggest that experience is what-it's-like-to-be-a-subject-in-the-process-of-becoming, which includes the "subjectivity" of becoming a subject and the "intentionality" in relation to other. This is quite a rich notion of experience, considering that it includes our differentiating-entangling within and as part of the entire universe.

This interpretation of experience is supported by Whitehead's (1978) relational process metaphysics, which is compatible with agential realism in many ways, but in contrast to agential realism, is explicitly experiential. For Whitehead (1978), there is no existence without experience. To experience is to become, and to become is to experience: "Process is the becoming of experience" (166). Whitehead's fundamental "atom" of reality is called an "actual occasion" or an "actual entity". If we think of an actual entity as an agential realist subject-in-the-process-of-becoming, and if we take the phrase "is qualified by" to refer to the process of bodies being enacted with marks, we can understand Whitehead's (1978) claim, "The way in which one actual entity is qualified by other actual entities is the 'experience' of the actual world enjoyed by the actual entity, as subject" (166), to mean that experience is what-it's-like for a subject-in-the-process-of-becoming to be affected by its co-constituting world, or to have its enacting body marked by other subjects-in-the-process-of-becoming (including subjects-that have-already-become

and subjects-that-will-become).[107] This includes both experience as differentiating, and experience as entangling, or more accurately, experience as differentiating-entangling.[108]

Although the notion of experience is not explicitly included in agential realism, it is relevant to this project because subjectivity and intentionality, which are intertwined aspects of experience, are factors in collaboration. Thus, as supported by Whitehead's inclusion of experience as a fundamental component of his metaphysical system,[109] I am proposing to include experience as a fundamental component of agential realism along with ontology, epistemology, and ethics, resulting in an ethico-experio-onto-epistemology. The length of this phrase is a testament to the intra-connectedness of the agential realist onto-world. Including experience as part of agential intra-action helps create a firmer basis for the inclusion of subjectivity and intentionality, although further work needs to be done to establish the details. But for the purpose of this project, we have presented a way of construing subjectivity and intentionality such that they need no longer be considered as exclusively human characteristics.

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[107] I have only mentioned "subjects" here (as opposed to "objects"), because for Whitehead, all actual-entities-in-the-process-of-becoming are subjects-in-the-process-of-becoming. But actual entities that are no longer in-the-process-of-becoming can also be intra-acted with as "objects", though only within the context of other subjects-in-the-process-of-becoming. This does not mean that anything we would consider to be an object (in a modernist sense) was once a subject, because for Whitehead, objects are abstractions that exist only in relation to a subject-in-the-process-of-becoming.

[108] Similarly, Whitehead (1978) refers to two intertwined modes: "causal efficacy" and "presentational immediacy". Briefly, the former is the raw experience of the world impinging upon the subject-in-the-process-of-becoming (entanglement), and the latter is the experience of particular features of the world being made determinate as particular spacetimematter configurations (differentiation).

[109] Whitehead's (1978) metaphysical system includes ontology, epistemology, experience, ethics, and aesthetics as fundamental and inseparable components.

5.5 Communication in an agential realist onto-world

We have defined communication as requiring subjectivity and intentionality, as well as the ability to physically exchange meaningful information. In the previous section, we considered subjectivity and intentionality from within an agential realist onto-world, and here we will discuss the nature of communication more generally, as part of which we will examine how the notion of physically exchanging meaningful information shifts in an agential realist onto-world. To briefly review, in a modernist onto-world where interactions occur between determinate individuals, these individuals must not only be able to send information back and forth between their physical bodies, but they must also somehow bridge the gap of meaning between separate individuals. In Chapter 4, we showed how this formulation is based on the modernist assumptions of physicocentrism, the metaphysics of individualism, and the dualism between matter and meaning, not to mention the human exceptionalism by which mind and meaning-making are given only for humans.[110] We also showed how these assumptions are overcome in an agential realist onto-world, radically altering what is meant by a physical exchange of meaningful information, and by communication more generally. In this section, we will consider the nature of

[110] If we assume that meaning is given for humans – for example, by making meaning inherent in mental representations while limiting these representations to human minds – we end up applying an anthropocentric concept of communication to plants, measuring plants' ability to communicate (or not) by human standards. Bringing in agential realism removes this anthropocentric bias, because meaning is no longer dependent upon human participation but is enacted with any intra-action. One might attempt to argue that we are still being anthropocentric if we start from our human experience of communication and then extend this experience to all intra-action. However, since we are not making our human experience exceptional but are simply using it as a starting point for all intra-action, we are not being anthropocentric, but simply anthropomorphic. Since our human experience is the only experience we *can* start with (even a drug-induced experience of oneness, or of the consciousness of other beings, is still filtered through our human experience), there does not seem to be any way of avoiding some sort of anthropomorphism, nor does it seem necessary to do so.

communication in an agential realist onto-world in terms of (i) the inherent connectedness of the entire universe through entanglement, (ii) the co-constitution of mutually intra-acting subjects as not requiring a physically mediated exchange of information, (iii) the meaning-making that is an inseparable part of material-discursive intra-action, and (iv) iteratively enacted patterns of meaning-making that enable meaningful communication.

5.5.1 Inherent connectedness through entanglement

In §5.1, we discussed the dynamic in/determinacy of the agential realist onto-world, recognizing that every intra-action, which is a contingent resolution of the indeterminacy, includes the entire universe to at least some degree (even if only by virtue of its exclusion). That is, each phenomenon entails a specific configuring of the universe where not everything is equally important, and where there are always constitutive exclusions. This can help us better understand what is meant by "oneness" or "interconnectedness", which is referred to by the New Age, as well as by many other traditions. If we consider these terms from within a modernist onto-world with its metaphysics of individualism, we might wonder how it could be that as determinate individuals, we are supposed to be connected with everything else, when these other things seem to be separate entities that are far away from us and have no apparent connection to us. But with in/determinate phenomena, "we" are not separate to begin with, and "we" are iteratively made determinate only in relation to one another. This makes interconnectedness much easier to understand, because it is not

about separate entities somehow being connected after the fact of their being has already been established; instead, we can say that any entities that ever have been or ever could be enacted within and as part of phenomena (agential realist wholes) are inherently connected by virtue of their entanglement. Because this discussion is about communication (between subjects), we will focus on the inherent connectedness of subjects-in-the-process-of-becoming, as well as subjects-that-have-or-could-become, which I will refer to collectively as "potential subjects". Because in/determinate phenomena (as opposed to determinate individual subjects) are the ultimate entities in an agential realist onto-world, all potential subjects, which are potential "parts"[111] of these wholes, are fundamentally one, or inherently connected by virtue of their entanglement. Through intra-action, these potential subjects are relationally differentiating-entangling, or come into being in inherent intra-connected relation with one another, within the context of the phenomenon as a whole.[112] Not only is any potential subject inherently connected to any other potential subject by virtue of entanglement, but it is inherently connected to the entire universe in its specific ongoing materialization, though some aspects are more relevant for that potential subject than others.

[111] By "parts" I do not mean pre-existing determinate parts, but relationally enacted parts – parts-in-the-process-of-becoming and parts-that-have-or-could-become.

[112] In Chapter 4, we mentioned that in a New Age onto-world, concepts such as oneness and interconnectedness are often vaguely explained in terms of quantum entanglement. In contrast, with agential realism, we have concretely related these concepts to a coherent interpretation of quantum physics. We can say that oneness is the togetherness of an in/determinate whole – a phenomenon – where the "parts" of this whole, or any potential entities that can be relationally differentiated from this whole, are intra-connected and intra-dependent by virtue of their inseparability within and as part of the whole.

This inherent connectedness of intra-acting entities is also illuminated by Barad (2014b) in terms of "touching": "In an important sense, in a breathtakingly intimate sense, touching, sensing, is what matter does, or rather, what matter is" (7). As we discussed above with quantum field theory, matter constitutively includes all of its associated possibilities in the form of virtualities, or virtual histories of what could be or could have been, such that "materiality 'itself' is always already touched by and touching infinite configurings of other beings and other times" (Barad 2014b, 7). In other words, phenomena are thoroughly entangled, both spatially and temporally (Barad 2007, 316-317), where entanglement is not an interweaving or interconnectedness of separate states that are touching one another externally (through a pre-given spacetime), but entanglement is the extending of indeterminacy between mutually intra-acting agencies, or it is the internal touching of entangled states as part of in/determinate phenomena, where these entangled states cannot be separated into multiple determinate states. In this way, simply by virtue of relationality and entanglement, any potential subject has access to an infinity of "things", though not to "everything", because each potential subject is entangled in specific ways that entail specific constitutive exclusions.[113]

But how can we make sense of the fact that any potential subject is in inherent connection with the entire in/determinate universe, when in a modernist onto-world, it seems as if connection occurs between determinate individuals, for example as bits of

[113] Additionally, it is not possible to step outside the universe to reflect back on the universe as a whole; instead, it is always one part of the universe making itself intelligible to another part of the universe (Barad 2007, 351).

information that are communicated between determinate individuals? When we consider communication in a modernist onto-world, we tend to think of a specific piece of information coming in through a specific sensory organ, for example some sounds that my ears take in, or some visual data being sensed with my eyes. Then, this physical information can be processed and refined, until ultimately – perhaps through a series of mental inferences (depending on our preferred theory of perception) – it becomes something meaningful to us, though we can never be sure that this meaning is the same for the other individuals with whom we are communicating. But if we think more closely about taking in information through our sensory organs, we can become aware of the complexity of this process – I do not simply hear some sounds with my ears, but I am taking in a whole gestalt, of which the sounds are only one part that is focused on by my ears. We can think of this gestalt as including, for example, particular feelings, memories, and desires that accompany the sense perception. But each of these components is also linked to past experiences and future possibilities – both my own and those of others. If we think about it in this way, we can say that, ultimately, the gestalt includes the entire universe, at least to some degree, and that moreover, this gestalt has a particular relation to me, such that it would not be the same gestalt for someone else. This seems incredibly complex when considered from within a modernist onto-world.

In contrast, when we start with agential realism, the "complexity" of the in/determinate whole is our starting point, and it becomes a matter of relationally differentiating from the in/determinate complexity of this whole in order to create

something intelligible for and as part of some subject-coming-into-being. That is, it is not necessary for a complex gestalt to be somehow taken in and comprehended by a subject that already exists as such (and certainly it need not be cognitively comprehended), but instead, the world becomes intelligible as part of the coming-into-being of the subject. It is also important to note that although the entire in/determinate universe participates to some degree in intra-action, it is not the case that the universe is an "open book"; we do not have access to everything by virtue of our entanglement, because there is no objective "we" that stands outside the universe (or outside any phenomenon). Instead, we-in-the-process-of-becoming always intra-act the universe in a unique manner, thereby creating further entanglements.

5.5.2 The physical exchange of information

Bringing the discussion back to the nature of communication, we need to figure out what a physical exchange of meaningful information means in terms of agential realism, which we will do by considering the following points: the "exchange" is part of intra-action; the physical sensory organs could be any material arrangement (not necessarily physical); meaning is an inherent part of the material-discursivity of intra-action; sustained meaning-making requires the formation of patterns through iterativity. (The last two points, regarding meaning, will be considered in the following subsection.) First, an "exchange" of information implies an exchange between separate determinate individuals, which relies on a metaphysics of individualism. But with the relationality of agential realism, there are no pre-given

separate individuals between whom an exchange must occur, because any potential subjects are fundamentally inseparable within in/determinate phenomena. In terms of quantum physics, "For Bohr, the so-called instantaneous communication between spatially separated systems is explained by the fact that these allegedly separated states are not really separate at all, but rather 'parts' of one phenomenon" (Barad 2007, 174). That is, with agential realism, we are not talking about communication between separate determinate individuals, because when properly referred back to the phenomenon as a whole, where phenomena are the fundamental existents, they turn out to be fundamentally inseparable (or inherently connected) "parts" of in/determinate phenomena. Instead of an "exchange", then, it is through intra-action that subjects co-constitute one another, and we could say that particular information becomes part of the constitution of these subjects, as they mutually co-constitute one another. In other words, as potential subjects are relationally differentiating from the whole (of which they are inseparable parts), these enacted subjects become materially-discursively intelligible to one another.

Next, in a modernist onto-world, the exchange of information occurs physically, notably with the use of physical sensory organs. Although we have addressed the "exchange" already, we must still understand how and whether physical sensory organs, or physicality more generally, are implicated in communication in an agential realist onto-world. Consider how, in an agential realist onto-world, we would talk about a human subject receiving an auditory communication with their ear (a physical sensory organ). It is helpful to have the language of "marks on bodies" to

talk about the causality that is involved, where "What is a 'cause' and what is an 'effect' are intra-actively demarcated through the specific production of marks on bodies" (Barad 2007, 236). We must be careful to understand Barad's (2007) phrase "marks on bodies" not as marks applied to pre-existing bodies, but as bodies that are enacted with marks. In our example, the sound wave is a *cause* that has a particular (vibratory) *effect* on the eardrum, such that the resulting vibration is the mark with which the eardrum is constituted; this causal relationship is not between pre-existing entities but is enacted as part of intra-action. We can think of sensory organs as apparatuses similar to Bohr's laboratory instruments, where sensory organs are sets of material-discursive practices that resolve indeterminacy in the particular manner that is appropriate to that sensory organ. In a modernist onto-world, we would say that a pre-existing sensory organ records information about the external world, but in an agential realist onto-world, we can say that sensory organs are enacted with marks (i.e. the vibration on the eardrum) regarding how some part of the universe has been made intelligible for that (enacted) sensory organ, as part of intra-action. Such marks on bodies are the determinacies with which the modernist begins their analysis of sense perception, leaving out the complex material-discursive process by which these marked sensory organs are co-constituted along with their "cause".

During this discussion about sensory organs, the reader will likely have been envisioning human sensory organs such as eyes and ears, but any spatiotemporally enacted body – or any spacetimemattering – can potentially act as a sensory organ. Barad (2007) uses the example of the brittlestar, a sea creature that is "brainless and

eyeless", but whose skeleton turns out to be covered with crystals that function like microlenses, such that the brittlestar can "see" with the surface of its body (369-370). Regarding plants, Baluška and Mancuso (2016) have proposed something similar, namely that the cuticle, epidermis, and mesophyll layers of plants are, respectively, cornea-like, lens-like, and retina-like. In this way, the plant would "see" with its body, as does the brittlestar. Thus, sensory organs in the way we usually conceive of them are not necessary, but any spacetimemattering functioning as the "effect" in the enacted causal structure within intra-action is constituted with marks recording how the world (the "cause") has been made intelligible for (and as part of) it. Additionally, because space and time are enacted along with matter and are not constrained to physical configurations, these marked bodies could potentially be transphysical spacetimematterings such as etheric spacetimematterings (as will be further discussed in Chapter 6), thereby overcoming the physicocentrism of the modernist onto-world.

5.5.3 Intelligibility and patterns of shared meaning-making

The remaining issues we must consider in order to make sense of communication in an agential realist onto-world have to do with the notion of meaning, which in a modernist onto-world provides a challenge because of the lack of any inherent connection between matter and meaning. But in an agential realist onto-world, communicating subjects mutually co-constitute one another not only materially, but materially-discursively, such that meaning is a constitutive part of

their enacted materiality. With agential realism, the term "meaning" no longer refers to something conceptual that is separate from the material reality of the world, nor is meaning limited to its linguistic form or in any other ways constrained to human use: "Meaning is not a property of individual words or groups of words but an ongoing performance of the world in its differential dance of intelligibility and unintelligibility" (Barad 2007, 149). We need to shift our mindset from thinking about meaning as purely linguistic, to recognizing that meaning is materially enacted. With agential realism, meaning is reframed in terms of material-discursive practices, where "discursive practices are the material conditions for making meaning" (Barad 2007, 148, 335), and neither material nor discursive can be articulated without the other. Discursive practices are implicated not only in meaning-making, but more generally in the ontic and semantic determinacy that is enacted through the process of relationally differentiating. But specifically regarding meaning, every agential intra-action, whether or not a human is involved, is a material-discursive relational differentiating-entangling from an ontologically inseparable whole, in which the materiality of the enacted individuals is inseparable from meaning, which is what enables intelligibility. In this way, as was stated above, the inherent connection of potential subjects can be parsed into something intelligible for and as part of mutually intra-acting subjects by becoming ontically and semantically determinate (within phenomena).

While mutually intra-acting subjects could be construed as engaging in a sort of communication, because they are becoming materially-discursively intelligible to

one another, this would be at most a trivial sense of communication that would apply to any part of the universe being made intelligible to any other part of the universe. So how does the meaning that is implicated in intra-action become the kind of sustained, shared meaning-making by virtue of which we can say that a meaningful communication is occurring? This includes both meaning-making practices that are sustained through iterative intra-action, for example when a particular type of enacted sound becomes and remains recognizable for an iteratively enacted subject, and also meaning-making practices that are shared by mutually intra-acting subjects, for example when mutually intra-acting subjects exchange a "knowing glance" with one another because the particular situation they are co-constituting within and as part of is enacting shared meaning-making. Such meaning-making practices require patternings of meaning-making that link particular types of enacted sounds or enacted facial gestures to particular meanings, for (and as inseparable parts of) particular enacted subjects. This is not to say that meaning is separable from materiality, but that there is no material-discursivity in isolation from the phenomenon as a whole, which includes the enacted subject (not necessarily human) for whom this meaning matters. In order to be able to conclude that humans are not the only communicators in an agential realist onto-world, we need to specify the conditions under which patternings of meaning-making can be sustained for and as part of iteratively enacted subjects.

With agential realism, the agency of the universe is such that the universe expresses itself iteratively – matter is iteratively differentiating-entangling. This

iterativity of matter can result in patternings, where a patterning refers to some kind of ordering that endures despite iterative reconfiguration. However, not all iterativity results in patterning, and more specifically, in sustained meaning-making patterning, so we must analyze how various configurations of iterativity relate to patterning. Given that there are no determinate individuals in agential realism, we have to carefully choose the appropriate unit of analysis. As we have discussed, the ultimate entities of agential realism are in/determinate phenomena, which are wholes whose intra-acting "parts" are ontological inseparable. However, quantum entanglements trouble the notions of unity, duality, and multiplicity (Barad 2010, 251), such that phenomenon/phenomena cannot be clearly designated as either singular or multiple. Although we can say that phenomena iteratively reconfigure, it is not clear how to analyze iterativity in relation to phenomena when we cannot point to one particular phenomenon in relation to another. In contrast, the agential cut by which a contingent determination is made and possibilities are shifted – despite the fact that this determination is only contingent and is always associated with indeterminacy – results in a discrete definiteness, or in marks on bodies that have further effects. By using an intra-action – and more specifically, the agential cut – as the unit of analysis, we can question how particular sets of agential cuts must be linked to one another in order for patternings to develop and be sustained. While all intra-action occurs iteratively, not any given set of iterative intra-actions results in the patternings that we would associate with the type of meaning-making that is necessary for communication. The question then becomes how we can designate the necessary

conditions for iterative intra-action to result in patternings of meaning-making, without recourse to designating particular types of enacted beings as ontologically exceptional. To do this, we need to examine how different types of relationality between sets of intra-actions could result in different kinds of patterning.

We have already shown that meaning and intelligibility are implicated in intra-action, and some form of patterning must be implicated as well. No intra-action occurs in isolation, and in order for any intra-action to occur at all – as driven by the agency inherent in matter – in/determinate phenomena must be configured with some minimal patterning according to which an intra-action can proceed. This includes both the associated possibilities, which are configured as they are by virtue of how other intra-actions have produced marks on bodies, and any associated apparatuses (themselves constituted by intra-actions), which further constrain and enable how the agential cut can be made. Thus, every intra-action is to some extent patterned by other intra-actions, and moreover, every intra-action participates to at least some extent in ongoing patterning, because of its influence on further intra-actions. But although every intra-action thus participates to some degree in patterning, not every given *set* of intra-actions forms patterns in the sense that sustained meaning-making is possible. That is, all intra-actions are intra-connected, but they do not all have the same relationality with respect to one another, restricting the possibility of sustained meaning-making. To further investigate the different kinds of relationality with which intra-actions can be associated with one another, it will be helpful to discuss how memory and historiality function in agential realism.

As with the attributes we considered in the preceding sections, with agential realism, memory does not belong to a determinate individual, but "Memory – the pattern of sedimented enfoldings of iterative intra-activity – is written into the fabric of the world. The world 'holds' the memory of all traces; or rather, the world is its memory (enfolded materialisation)" (Barad 2014a, 182). Furthermore, memory is not limited to humans and does not require minds: "…memory and re-member-ing are not mind-based capacities but marked historialities ingrained in the body's becoming" (Barad 2007, 393). The oak tree in my yard (as iteratively enacted within phenomena)[114] has historiality ingrained in its iterative becoming, by the way in which each intra-action is sedimented into further intra-actions, writing its memory into the becoming of its oak-tree-body. This also applies to each cell that is iteratively enacted as part of the oak tree, and it applies even to electrons: "Electrons as phenomena carry the traces of their enfolded becoming within them, just like any other phenomena" (Barad 2007, 472). This concept of memory suggests that particular sets of intra-actions, not limited to human intra-actions, must be linked together in a special manner by virtue of maintaining "their" historiality as part of "their" iteratively enacted body. There are several interesting points to discuss concerning what I will refer to as "historic sets of intra-actions", or iteratively enacted

[114] I am referring here to "cells" and "trees" and "electrons", but these are all to be taken as iteratively enacted within phenomena that are enfolded through one another, not as determinate individuals.

bodies that are constituted by sets of intra-actions that share historiality. The details follow.[115]

First, consider the above quotation in which electrons (as phenomena) carry the traces of "their" enfolded becoming within "them". This does not mean that there are electrons-as-subjects that persists through time and to whom "their" historiality belongs in any possessive sense, yet it does suggest that the particular agential cuts implicated in the historiality of an iteratively enacted electron are linked together in such a way that they form a historic set that collectively re-members the patterning of this iteratively enacted electron. By using the term "re-members", I am suggesting both that the patterning never "sits still" but is iteratively reconfigured, and also that the patterning remains indicative of the historiality of this particular historic set of intra-actions. For the oak tree outside my window, each electron and each cell that is iteratively enacted as part of this oak tree, as well as the oak tree as a whole, enact their own patterning as an expression of their own historiality; even while participating in one another's iterative becoming, these iteratively enacted electrons, cells, and tree maintain their own patterning. The point is not to separate out individuals, but to identify relevant patternings within entanglement, in order to make sense of a world in which communication occurs. What we can say, then, is that

[115] My analysis of iteratively enacted bodies as constituted by sets of intra-actions that share a particular relationality with one another due to their common historiality is heavily influenced by Whitehead's (1978) notion of "personal order" (where "personal" does not refer exclusively to humans). The details are complex and would require substantial background explanations to properly discuss, but the general idea is that in order for Whitehead's actual occasions to form groupings ("societies") that are recognizable as what seem to us to be "enduring objects" or "enduring creatures", a set of actual occasions must sustain a common character, where the common characteristic is "inherited" from the "past" along a serially-ordered, or "historic", route of actual occasions.

particular sets of intra-actions – and not others – iteratively enact their own particular patterning as an expression of their own historiality. These historic sets of intra-actions are not closed off with respect to other intra-actions, but they are identifiable by virtue of the patterning that they iteratively express.

Second, we can say something about how this patterning endures for particular historic sets of intra-actions, or how historiality plays a role in the continued patterning of the further intra-actions that constitute part of a historic set. Each agential cut results in "marks on bodies", where these marked bodies do not exist in any kind of a determinate individual sense that persists through time, but they do have a determinate effect by shifting the possibilities for further intra-action in a determinate manner. That is, an agential cut influences (all) further intra-actions by opening certain possibilities while foreclosing others. This shifting of possibilities does not fully determine the material-discursive specificities of further intra-actions, but it does play an important causal role, where this causal role is stronger in some cases than in others. Because of the patterning that is iteratively expressed in historic sets of intra-actions, I am suggesting that the material-discursive specificities of these intra-actions are more strongly conditioned by the agential cuts belonging to the same historic set – i.e. the enfolded traces of their own historiality – than by the agential cuts that are not part of the same historic set. This helps to explain why cells, for example, tend to be iteratively enacted as cells instead of taking on the patterning of electrons, because although cell intra-actions are influenced by the whole universe to some degree, they are most intimately constrained and enabled by the patterning from

the cell intra-actions constituting their own historic set. With this analysis, I am not answering the question of *why* further intra-actions in a historic set are strongly conditioned to continue enacting a similar patterning, which is also part of the more general question about why it is that any given intra-action occurs or that any particular cut is made; I am simply pointing out that because we know empirically that stable configurations are enacted – which we are referring to as historic sets of intra-actions – we can say that particular intra-actions must be conditioned to continue enacting a similar patterning.

Finally, we can make one more stipulation regarding the relationality of historic sets of intra-actions: the enacted patterning is sustained only as long as the marks on bodies resulting from the agential cut for each intra-action in that set configure the possibilities for a further intra-action that then enacts the same patterning. It may also be necessary to stipulate that a historic set of intra-actions is serially ordered, not in the sense that intra-actions are arranged according to a pre-given linear temporality, but that they follow one another in such a way that the patterning is sustained from one agential cut to a further agential cut within the same historic set. When this patterning is no longer enacted via a further intra-action as part of this historic set, this would mark the "end" of the iteratively enacted body, although the corresponding phenomena would continue to be enfolded through other phenomena. Thus, we can say that an iteratively enacted subject constituted by a historic set of intra-actions participates in the patterning that is part of its historiality, where this patterning includes meaning-making practices. This goes beyond the mere

intelligibility that is implicated in any one intra-action, because the meaning-making that is enacted by and as part of a historic set of intra-actions is sustained as long as further intra-actions in that set continue to enact the same patterning.

In summary, within the ontological framework of agential realism, we can propose that the type of iterativity associated with historic sets of intra-actions enables particular meaning-making practices to be sustained for and as part of iteratively enacted subjects despite their dynamic differentiating-entangling. Specifically, the intra-actions constituting a historic set (i) collectively re-member, or sustain, their common patterning as an expression of their own historiality, (ii) transmit this patterning between one another because the marks on bodies resulting from the agential cut of any given intra-action in the historic set shift the possibilities in such a way that the material-discursive specificities of further intra-actions in the set are strongly conditioned to enact the same patterning, and (iii) form a series such that this patterning is sustained from one agential cut to a further agential cut. With patternings that are sustained by historic sets of intra-actions, we can say that meaning-making practices – for example, when particular meanings are habitually associated with particular materialities, be they words or sounds or facial expressions – can be sustained for and as part of iteratively enacted subjects. When such meaning-making practices are shared by mutually intra-acting subjects, mutual meaning-making, or communication, can be said to occur in more than a merely trivial sense.

While there is further work to be done here, we can minimally say that humans are not the only iteratively enacted subjects that are constituted by historic sets of intra-actions, and that can therefore sustain meaning-making practices. Because this analysis depends on memory, which with agential realism is redefined from being a mind-based activity to being the "marked historialities ingrained in the body's becoming" (Barad 2007, 393), it is interesting to note that recent scientific research on plant sentience suggest that plants are able to store and access memories (see Appendix A). These findings are not, however, necessary for us to be able to conclude that in an agential realist onto-world, non-humans such as plants are not excluded from developing patterns of meaning-making, both in intra-action with other plants and in intra-action with humans.

To conclude this section, we have shown that communication in an agential realist onto-world encompasses a larger set of possibilities than communication in a modernist onto-world does. In an agential realist onto-world, any potential subjects are inherently connected by virtue of entanglement, and their mutual intra-action does not require any physical "exchange", nor does it require human participants, brains, mental states, or physical sensory organs. Moreover, meaning is an inherent part of material-discursive intra-action, though what is required for meaningful communication is the ability to develop patterns of meaning-making, for example by the particular type of iterativity associated with sets of intra-actions that share the same historiality. With the ability to communicate expanded beyond the human, in addition to the recognition that concepts such as agency, knowledge, and intelligence

(intelligibility) can be reworked as dynamic features of intra-action that do not require human participation, we have addressed all the criteria that we designated as necessary for collaboration. Thus, humans need not be the only collaborators in an agential realist onto-world. Additionally, as we will discuss in the following section, the very nature of collaboration shifts in an agential realist onto-world.

5.6 Collaboration in an agential realist onto-world

In the previous sections, we found that in an agential realist onto-world, collaborators need not be limited to humans. Moving beyond the human as the only possible collaborative partner opens up diverse possibilities for new kinds of collaboration, but the focus in this project is on plant-human collaboration. The kinds of collaborations that occurred at Findhorn, between humans and the devas and nature spirits associated with the plants and other entities in their garden, included mutual care and consideration in their striving toward the good of the whole. This presence of wholeness moves in the direction of agential realism, where intra-action is the relational differentiating-entangling of ontologically inseparable entities (agential realist wholes). In an agential realist onto-world, as we learned in Chapter 2, the ethical obligation is not from one determinate individual to another, but it is directed at how individuals differentially come into being in relation to one another. Similarly, collaboration is not between determinate individuals, but it occurs as part of the joint constitution of intra-action, in the sense that mutually intra-acting agencies participate in their joint process of relational differentiating-entangling. But

although anything that shows up in an intra-action is therefore a potential collaborator, simply participating in the co-constitution of another does not necessarily entail collaboration in anything more than a trivial sense. In this section, we will develop the notion that in an agential realist onto-world, collaboration is enacted as part of mutually intra-acting agencies jointly taking responsibility for, or enabling new responses toward, the iterative enaction of their common world, where we can understand this taking of responsibility in terms of being attentive to the possibilities that might lead to mutual flourishing, or in terms of the regeneration of livable common worlds.

In order to create a notion of collaboration that is consistent with Findhorn's collaborations, in which humans work with devas and nature spirits not based on their individual stakes and returns, but as a co-creation that benefits the good of the whole, we will begin by analyzing what the good of the whole means in Findhorn's New Age onto-world, then showing why this notion is problematic in an agential realist onto-world. In the New Age onto-world, as we discussed in Chapter 4, oneness – or wholeness, or holism – is a key concept that is supposed to counteract the dualisms and reductionism of the modernist onto-world. This New Age oneness unites all humans, all of nature, and God; and humans are supposed to be able to have some awareness of this oneness or some connection with the whole. Hanegraaff (2007) says about New Age holism that it "should never be understood as a theory", but that, "At the most, it is a vision; and New Agers try to realize this vision by many different avenues" (40). That is, there is no precise New Age formulation of what a "whole" is

or how it can be accessed (if at all), but we can minimally say that New Agers seek to connect with an interconnected whole of reality that includes the material and the spiritual, the human and the non-human. If we moreover include what we know from Findhorn's plant-human collaboration regarding wholes, as we discussed in Chapter 4, we can say that wholes are composed of parts that are not dualistically separated, where these wholes include not only entities that have materialized in spacetime, both etherically and physically, but also possibilities, such as the potential devic forms that are "beyond" spacetime.

As for the notion of the "good" in the New Age onto-world, as we discussed in Chapter 3, the good is aligned with the God within, or with God's plan of perfection, with which individuals can connect by going within themselves. That is, the New Age seeks to move beyond particular truths or particular notions of the good as imposed by external authorities, which does not mean that they seek to move beyond truth or good per say, but only beyond these as externally dictated. According to Partridge (2007), while objective truth is rejected by postmodernism, the New Age retains a modernist notion of truth, in the sense that there exist "big truths", or truths that are universally valid (235-236), where personal experience can provide access to these truths (243). It is also important to note that this notion of truth is linked to the New Age metanarrative of evolutionary progress, in which humanity is said to be evolving toward a new phase of consciousness (Partridge 2007, 236). We can extend this analysis to the good, in the sense that the New Age retains some notion of a universal good that can be accessed through direct personal

experience and toward which humans are evolving. Thus, we can say that for Findhorn, collaborating for the good of the whole has something to do with attempting to manifest a universal good toward which all interconnected beings are evolving.

Findhorn's notion of the good of the whole, as based on a universal good and a metanarrative of progress, is rooted in modernism; thus, it will need to be reworked in an agential realist onto-world. We will now develop the notion that while Findhorn's collaborations were focused on the good of the whole, collaboration in an agential realist onto-world has to do with a mutual flourishing of entangled beings enacting a common world. First, we will examine how the notion of a common world arises. We have already discussed the fact that in/determinate phenomena are the (dynamically reconfiguring) wholes of agential realism, where phenomena are entangled with one another and cannot be clearly enumerated. We have also noted that for the purpose of a specific analysis, because we cannot include everything that ever was or ever could be enacted as part of the universe, we must limit our analysis by focusing on a workable number of the most relevant apparatuses. Similarly, it is reasonable to suggest that, while any particular collaboration ultimately includes the whole universe (to at least some degree, even if only by virtue of exclusions), any particular collaboration is focused on some relevant part of the whole. In an agential realist onto-world, we could utilize the term "common world"[116] to refer to the enacted part of the ever-shifting whole that is specifically relevant to the particular

[116] I have chosen this term "common world" because it is utilized by Apffel-Marglin (2012), whose work we will address below as part of this analysis.

collaboration, where the common world is enacted for and as part of the mutually intra-acting collaborators. This is not intended to minimize the fact that Findhorn's devas and nature spirits worked for the good of the whole – where the whole interrelated universe is intended – but we must qualify this notion of a whole. With agential realism, as we have discussed, it is not possible to step outside the universe to reflect back on the universe as a whole. Thus, instead of claiming that the whole universe can be taken account of in collaboration, where the collaborators are an iteratively reconfiguring part of the iteratively reconfiguring universe, we are suggesting that the common world enacted as part of collaboration is what is relevant for and as part of any particular collaboration.

Regarding the "good", it is clear that no fixed or universal notions exist in an agential realist onto-world, nor do fixed individuals exist who can act according to some universal notion of good. That is, any enactment of "good" is always in relation to the specificities of some intra-action, by which this enacted good is based on a particular set of apparatuses that make particular exclusions and have particular material consequences. Individuals do not pre-exist their intra-action, and there are no pre-existing ideals toward which to strive. Instead of the "good", we can utilize Barad's (2007) notion of responsibility, where responsibility is not about individuals making choices regarding other pre-existing individuals or things, but responsibility is response-ability, or the ability to develop new responses. This means being accountable for how specific relations are enacted, or being accountable to the "other" as part of intra-action.

Above, we discussed the fact that any agential intra-action entails responsibility, where some methods for actively taking responsibility include recognizing that humans are not the only agential and responsible parts of intra-action, paying attention to what matters and to the making of boundaries, taking account of entanglements, and responding to those possibilities that lead to a mutual flourishing of our entangled selves. As Barad (2007) says, "Intra-acting responsibly as part of the world means taking account of the entangled phenomena that are intrinsic to the world's vitality and being responsive to the possibilities that might help us and it flourish" (396). Because "us" and "it" are mutually co-constituting one another, or iteratively reconfiguring in relation to one another, we are talking about being attentive to the possibilities that might lead to a mutual flourishing of our entangled selves. That is, taking responsibility always occurs in relation to the enacted other because of the mutual co-constitution inherent in intra-action. Although intra-action entails responsibility, not every enacted subject is actively taking responsibility as part of their coming-into-being; thus, we must specify that in order for intra-action to be collaborative, mutually co-constituting subjects must jointly take responsibility, being attentive to the possibilities that might lead to their mutual flourishing.[117] In this sense, we will specify that collaboration is enacted as

[117] It seems that there are different degrees of taking responsibility: the simple recognition that "we" are partially responsible for our actions; the recognition that particular boundaries (and their exclusions) are being iteratively enacted; becoming aware of new possibilities but not responding to them; becoming aware of new possibilities and responding to them; actively seeking out possibilities that lead to mutual flourishing. Similarly, there must be different degrees of collaboration. But as long as mutually intra-acting agencies are actively taking some degree of responsibility as they co-constitute one another, we will say that they are jointly taking responsibility for the enaction of their common world, and are thus enacting collaboration.

part of mutually intra-acting agencies jointly taking responsibility for, or enabling new responses toward, the iterative enaction of their common world, where we can understand this taking of responsibility in terms of being attentive to the possibilities that might lead to mutual flourishing.

Another way in which to understand this notion of collaboration in an agential realist onto-world – especially in terms of collaborations that are enacted along with beings such as devas and nature spirits – is through Apffel-Marglin's (2012) agential realist analysis of the practice of ritual. We will briefly examine a few relevant parts of Apffel-Marglin's (2012) work with ritual, where ritual in this context is a performative practice through which humans, non-humans, and other-than-humans (spirits) co-enact the world (14-15). As we discussed in Chapter 2, a combination of scientific, philosophical, and economic/political factors primarily in seventeenth century Europe resulted in the modernist expression of the nature-culture divide, in which nature was rendered agency-less and de-spirited, practices such as ritual were banished, and it was left to humans to mechanically manipulate their inert world. In contrast to the modernist, representationalist notion of the world as composed of given and knowable facts that are assigned value only in the human sphere, the agential realist account is performative, meaning that the world iteratively comes into being through our collective intra-activity – we do not represent the world, we iteratively generate and regenerate the world (along with space and time) (Apffel-Marglin 2012, 156). Moreover, there are no pre-given boundaries between humans

and non-humans, and values (e.g. what counts as "good") are enacted as part of this process.

Rituals, then, are sets of ceremonial actions, or "carefully orchestrated intra-actions", in which non-humans and other-than-humans (spirits) participate along with humans in order to make a difference in how the world comes into being, or regenerates (Apffel-Marglin 2012, 162). According to Apffel-Marglin (2012), the purpose of ritual is to create a livable common world, where "livable" doesn't necessarily mean harmonious or free of conflict, but it does mean that some sort of inclusive and regenerative pattern is iteratively being created (157); the importance of ritual is that it yields a better chance of the world coming into being successfully, or in a collectively livable manner (162): "What separates out ritual action from everyday action is that in the former, the patterning of actions is designed to focus awareness so as to synchronize the awareness of the different participants – humans, non-humans, and other-than-humans – enabling them to weave each other into a continuous world, a regenerated world" (164). Ritual is how we – where the "we" is not a collection of individual human selves but is "a heterogeneous collectivity of humans, non-humans, and other-than-humans" (Apffel-Marglin 2012, 161) – move in a synchronized and intentional way toward regenerative and livable common worlds.

Thus, ritual as described by Apffel-Marglin (2012) refers to sets of intra-actions in which there is some kind of a joint responsibility being taken by co-constituting subjects (not limited to humans) as part of enacting a livable common world. If we think about ritual as a collaboration that is enacted by mutually intra-

acting humans, non-humans, and other-than-humans, we can get a sense of what it could mean to collaborate with beings other than humans, such as devas and nature spirits. Apffel-Marglin's (2012) analysis of ritual moreover provides insight into what we have been referring to as "mutual flourishing". With Findhorn's good of the whole, there is an obvious connotation of "good" in contrast to "bad". With the mutual flourishing we have been discussing in the context of agential realism, the term "flourishing" might also be seen as having a positive connotation. In contrast, Apffel-Marglin's (2012) use of the term "livable" seems more neutral. That is, the practice of ritual does not necessarily lead to flourishing or even harmonious common worlds, but simply to "livable" common worlds, or to common worlds that are inclusive of and regenerative for the diverse collectivities that are being enacted. Then again, a regenerative world is also one that is to some extent flourishing, if only in the sense that it is not degenerating. Thus, I will continue to use both "mutual flourishing" and "livable common worlds" to express what mutually intra-acting agencies are jointly taking responsibility for during their enaction of collaboration.

In conclusion, we have reworked the notion of collaboration in an agential realist onto-world, and by bringing in Apffel-Marglin's (2012) analysis of ritual, we have included a sense of how collaborators other than humans could be said to participate in collaborations. We have also established that, because Findhorn's good of the whole is a problematic notion in an agential realist onto-world, we can talk about collaboration in terms of jointly taking responsibility for the iterative enaction of a common world, where this responsibility can be expressed in terms of being

attentive to the possibilities that lead to a mutual flourishing, or in terms of regenerating livable common worlds. In contrast to a notion such as "good", which can easily be construed in terms of a fixed essence to which one should conform, notions such as "mutual flourishing", "livable common worlds", and "regeneration", offer greater possibilities for ethical engagement by requiring responsibility for issues such as whose common world is being investigated, whose flourishing is being taken into account, what counts as livable or regenerative (and for whom), and what exclusions are being made.

When we consider the inherent connectedness of any potential subjects in an agential realist onto-world, and when we remember that all enacted entities are inseparable "parts" of a greater whole – in/determinate phenomena – it makes sense that collaboration would be geared toward a mutual flourishing. In other words, if the enacted common world is not livable for all beings that are enacted as part of this common world, then because these beings are inherently connected with and dependent upon one another, it is not ultimately livable for any of these beings. In a modernist onto-world, we tend to be focused on our determinate individuality and on that with which we can physically interact, for example the information coming in through our physical sensory organs. Similarly, in the New Age onto-world, despite its ultimate oneness and its validation of non-physical experience, we have shown that there remains a focus on the self-development of the individual. Such individualistic practices result in a distancing from the inherent participatory entanglement that renders us an inseparable part of a greater whole. As Barad (2007)

says, “Meeting each moment, being alive to the possibilities of becoming, is an ethical call, an invitation that is written into the very matter of all being and becoming” (396). Recognizing our inherent participatory entanglement and allowing ourselves to become alive to the possibilities of our mutual flourishing is a first step toward the increased awareness that is an ethical responsibility in an agential realist onto-world.

6. Devas and Nature Spirits in an Agential Realist Onto-World

> Mystery is alive and well in physics, making its current home in quantum mechanics. There is a tradition of this, despite all attempts to defend physics against "irrationalisms". Spirits were a part of Newton's natural philosophy, if not his natural theology. The chap who would 'feign no hypothesis' was accused of introducing mysticism into physics when he decided to banish the spirits from his natural philosophy, opting instead for spooky action-at-a-distance. Physics has always been spooked. (Barad 2014a, 174)

In Findhorn's onto-world, as presented in Chapter 3, humans collaborate with the devas and nature spirits that are associated not only with plants but also with minerals, weather, land formations, insects, humans, machines, etc. For Findhorn, the nature spirits operate in the etheric realm, causally affecting the physical realm, and the devas exist "outside" of spacetime yet are causally efficacious in the spacetime materialization of entities such as plants. Findhorn's God within is the divinity that unites everything in ultimate oneness, in alignment with the good of the whole toward which the devas and nature spirits participate in collaboration. In Chapter 4, we determined that entities such as devas, nature spirits, and the God within cannot be made sense of in a modernist onto-world that is limited by physicocentrism, reductionism, and the metaphysics of individualism, but that agential realism provides a framework that allows us to move beyond these limitations.

The topic of physicocentrism, which was introduced in Chapter 1 and worked with in Chapter 4, is particularly relevant to this chapter. To briefly review, physicocentrism denotes the privileging of the physical, or the assumption that in order for something to exist and be efficacious, it must have a physical basis. To be physical, something must be perceptible through the use of the physical senses and

their technological extensions, and must ultimately be measurable, which we are construing as existing in, or being reducible to something that exists in, a metrically defined spacetime. In short, physical means metrical. Physicocentrism (and its associated causal structure) is a core part of modernism with its determinate physical individuals, where neither objective possibility nor the transphysical are considered to be scientifically real. In this chapter, we will address in more depth how agential realism, with its dynamically reconfiguring in/determinate phenomena, need not be limited by physicocentrism, because it includes indeterminacy and can also include the transphysical. With these tools, we will then be able to show, in support of the thesis of this project, how in an agential realist onto-world, we are not precluded from making sense of Findhorn's devas and nature spirits. Specifically, we will show how it is possible to make sense of nature spirits as "transphysical beings", and of devas (and the God within) as "virtual beings", where these are not pre-given independently existing "beings" but are differentially constituted and relationally enacted within and as part of the iteratively shifting universe. While the modernist onto-world excludes devas and nature spirits because only the physical is considered to be real, the agential realist onto-world additionally includes the virtual and can be shown to include the transphysical, and is thus not precluded from accommodating both devas and nature spirits.

We will begin in §6.1 with a general discussion regarding spacetimemattering and causality in an agential realist onto-world. First, we will examine how space and time need not be thought of as concrete givens, and then, challenging the concept of

physicocentrism, we will discuss the fact that space and time, which are enacted along with matter in an agential realist onto-world, are not pre-determined to be enacted according to physical (metrical) configurations. We will also discuss how the nature of causality is completely reworked on account of the in/determinacy of the agential realist onto-world. With these tools, we will in §6.2 discuss Findhorn's nature spirits – which are etheric beings, or more generally, transphysical beings – in terms of etheric spacetimematterings, first becoming comfortable with the concept of transphysical spacetimematterings more generally, and then with the specifics of etheric spacetimematterings, including their entangled relationality with physical spacetimematterings. This will include several hypotheses regarding the patterning and functioning of etheric spacetimematterings. In §6.3, we will deal with Findhorn's devas and the God within – virtual beings – which we will determine to be ontologically similar to one another. As part of this discussion, we will address how the oneness of Findhorn's onto-world can be made sense of and clarified in terms of the entangled intra-active relationality of the agential realist onto-world. Then, we will discuss Findhorn's devas in terms of the indeterminacy that is a dynamically inseparable part of in/determinate matter, including a hypothesis regarding how we can make sense of devas as playing a causal role in spacetimemattering. Finally, before some final reflections in §6.5, we will, in §6.4, discuss whether Findhorn's devas and nature spirits, as we are making sense of them in an agential realist onto-world as virtual beings and transphysical beings, can meet the criteria that we set out in Chapter 5 as necessary for collaboration. We will show that transphysical beings

do meet these criteria, while virtual beings are not directly subject to these criteria and thus play a different role in collaborative practices, namely as the very condition for the possibility of these practices.

6.1 Spacetimemattering and causality in an agential realist onto-world

The concepts of matter, space, time, and causality have shifted from ancient to modernist times (LeClerc 1972), and they have complexified further with modern physics (Čapek 1961). While it is beyond the scope of this project to thoroughly analyze these concepts in historical detail, in the context of this project, we are examining the shifts in these concepts between their use in a modernist onto-world and their radical reworking as part of agential realism. In order to prepare for making sense of devas and nature spirits in this chapter, we will in this initial section deepen our understanding regarding spacetimematterings (§6.1.1) and causality (§6.1.2) in an agential realist onto-world.

6.1.1 From space, time, and matter, to spacetimemattering

In the previous chapter, we focused extensively on the iterative spacetimemattering of in/determinate phenomena in an agential realist onto-world; in this subsection, we will more closely examine the concepts of space and time as part of spacetimemattering. For a modernist who is accustomed to assuming that space and time are independently existing features of reality, forming the backdrop against which physical entities exist and physical events occur, it could be challenging to

comprehend how in an agential realist onto-world, space and time are relationally enacted along with matter. In order to develop a clearer conception of spacetimemattering, we will briefly examine the shift in the concepts of space and time between the Newtonian, post-Newtonian, and quantum eras, including Leibniz's and Einstein's conceptions of space and time as existing not independently but only relative to matter.

As discussed in Chapter 2, matter in a modernist onto-world is composed of determinate physical individuals that occupy determinate locations in a pre-existing spatial container at any given instant of pre-existing universal time. Burtt (2003), in examining the metaphysical foundations of modern science (which is consistent with how the term "modernist" is being utilized in this project), explains that it was during the Newtonian era that the concepts of space and time,[118] "which had hitherto been unimportant but were now becoming the fundamental categories of men's thinking", began to be implicitly accepted as ultimate metaphysical constructs along with the concept of matter (33-34). According to LeClerc (1972), there is an important shift in the status of space and time from Newton's formulation to post-Newtonian thought: for Newton, matter is the only physical existent, and space and time are ontologically derivative from God;[119] in contrast, in the post-Newtonian scheme, space and time become independent existents, though it is unclear what exactly their ontological status is, for example whether or not they are additional physical existents along with

[118] Burtt (2003) includes motion along with space and time, but we are here focusing on space and time.
[119] According to LeClerc (1972), "Newton accorded only matter an independent status, as the physical existent, as substance. For him neither space nor time were independent existents; the concepts were abstract derivatives as the 'where' and 'when' of God's activity" (237).

matter (237). The important point for our discussion is that in the modernist onto-world, the concepts of space and time are regarded as ultimate concepts, or as uncontested givens upon which to base scientific analysis, instead of being recognized as associated with an implicit metaphysics.

Although the modernist onto-world is characterized by this conception of space and time as independent existents, several influential thinkers have rejected this conception, including both Leibniz and Einstein. Leibniz critiques the idea of space and time as absolute, or as existing separately from bodies and events, advocating instead for a relational theory of space and time, in which space is the relation between things that exist at the same time, and time is the relation (order) between things that exist successively (LeClerc 1972, 248). Jolley (2005) further describes Leibniz's relational theory of space and time: "That is, to say that bodies are in space is not to say that there is some further ontological entity over and above the bodies; it is simply to say that they are related in certain ways (for example, that body A is to the left of body B). Once again, *mutatis mutandis*, the same story can be told about time and events" (87). Thus, Leibniz recognizes that space and time can be understood as relationships among multiple entities, or in other words, that space and time exist only in relation to a multiplicity. However, while with agential realism, space and time are relationally enacted along with matter, matter for Leibniz is not relationally enacted but consists of bodies that are actual and have determinate parts (LeClerc 1972, 250-251). Similarly, Einstein recognizes the relative nature of spacetime while holding matter as pre-given (although the nature of this pre-given

matter changes). With his theory of special relativity – in which time is conceived as a fourth spatial dimension, bringing space and time together as "spacetime" – Einstein recognizes that spacetime is not absolute but is relative to the motion of an observer (Barad 2007, 437 n82). Moreover, with Einstein's theory of general relativity, in which spacetime is understood as relative to the distribution of matter throughout the universe, spacetime is additionally coupled to matter. However, as Barad (2007) explains, this conception of matter still relies on the existence of determinate individuals, and thus belongs more appropriately to a classical understanding of physics (437-438 n82).

With quantum physics, there is further reason to question the notion of space and time as pre-given, independent existents. According to Barad (2007), the existence of quantum discontinuities – for example, electrons that "jump" between orbitals without occupying any spatiotemporal points in between – disrupts the classical notion of a "continuous trajectory" through pre-given space and time (182). Also with quantum physics, as was discussed in the context of agential realism in Chapter 2, there is reason to question the very nature of matter as determinately given and individually separable. With agential realism, matter, space, and time are all relationally enacted because the fundamental existents are in/determinate phenomena, which relationally differentiate-entangle such that the manifold of spacetimematterings is iteratively reconfiguring through the topological dynamics of intra-activity. Intra-action is the relational differentiating-entangling of the wholeness of a phenomenon into a contingent determinate multiplicity, where this multiplicity is

rendered agentially separable through the agential cut (Barad 2007, 140). As we learned with Leibniz, space and time can be understood as relationships among a multiplicity – that is, the very fact of a multiplicity requires space and time to render it separable. In other words, relational differentiating-entangling requires the co-enaction of spacetime, and mattering is inherently spacetimemattering: "Difference patterns do not merely change in time and space; spacetime is an enactment of differentness, a way of making/marking here and now" (Barad 2007, 137).[120]

Once we recognize the fact that spacetime is enacted along with matter, or in other words, that spacetime is iteratively reconfiguring according to the available possibilities and limited by any existing constraints just as matter is, we can no longer treat spacetime as a given but must take into account the process by which it is constructed and the exclusions that it entails: "In other words, spatiality and temporality must also be accounted for in terms of the dynamics of intra-activity" (Barad 2007, 180). That is, instead of taking it as given that the spacetime of the modernist onto-world is characterized by metrical geometry, we must analyze how this geometry is constructed as part of intra-action, which may require topological considerations (Barad 2007, 245). Approaching the study of space geometrically means thinking in terms of shapes and size, but spatiality can also be approached through the more general study of topology, which deals instead with questions of boundaries and connectivity (Barad 2007, 436 n78). Specifically, concepts such as

[120] Whitehead's (1978) process relational metaphysics also takes the results of quantum physics into account. For Whitehead, each actual occasion is the creation of something new as based on its relationality to the past (the entire past universe) and its possible relationality to the future, such that matter itself (along with space and time) is not pre-given but iteratively comes into being.

size and shape are predicated on certain topological moves having to do with connectivity, boundaries, interiority, and exteriority (Barad 2007, 244). Thus, before helping ourselves to notions of position and location, which require geometrical assumptions that restrict the topological manifold, we must consider how the topological concepts of connectivity, boundary formation, and exclusion give rise to these restrictions (Barad 2007, 240). The important point here is that spacetime is not a fundamental existent without any necessary relations to anything else, but that it is enacted in relation to the phenomenon as a whole, where the in/determinate phenomena are the primary ontological existents.

In summary, while in a modernist onto-world, the existence of physical spacetime is primary, with agential realism, *it is not any particular determinate spacetime configuration but the very fact of spacetimemattering that is primary*. Thus, any spacetime geometry – such as the metrical geometry of the modernist onto-world – is a constructed spatiotemporality that could have been otherwise. Because a modernist onto-world does not recognize this process of construction, starting instead with physical spacetime relations as given, the modernist has lost touch with the fact that we are unconsciously participating in the material-discursive construction of spacetime. To the modernist, it seems as if determinate individuals with fixed boundaries populate a spacetime container with pre-given spatiotemporal relations, such that any changes or differences occur against the fixidity of this spacetime background. Moreover, it is assumed that anything real can be (or can be reduced to other entities that can be) assigned a position within physical spacetime and described

at some spatiotemporal scale, whether microscopic, macroscopic, or cosmological. This eliminates a host of considerations, such as the boundary-making practices (and their associated exclusions) through which these determinate individuals are iteratively rendered separate, and through which these notions of scale are constructed. With agential realism, however, we have learned that this pre-given physical reality of the modernist onto-world is only one way in which to enact spacetimematterings. This discussion will be continued in §6.2 when we consider the fact that spacetimematterings need not be limited to physical configurations.

6.1.2 Causality

In the modernist onto-world, as we have discussed at length in various contexts, the physical realm with its metrical spacetime (which permits measurement) is pre-existing and occupied by individual bits of matter that interact mechanically and through field effects, according to strict deterministic causality. This modernist causality is based on interactions between fully-formed, fully-determinate physical individuals, as mediated through pre-existing space and time. Moreover, as will be relevant to our discussion below regarding the relationality between physical and etheric spacetimematterings, the modernist onto-world is characterized by physical causal closure. According to Wikipedia,[121] physical causal closure means that every physical event can be sufficiently described by only physical causes, where this can be formulated in both a weak and a strong sense. In the strong sense, no non-physical

[121] Wikipedia, The Free Encyclopedia, s.v. "Causal Closure," (accessed March 13, 2019), https://en.wikipedia.org/w/index.php?title=Causal_closure&oldid=887628583

causes exist, while in the weak sense, non-physical causes (such as mental causes) might exist, but will ultimately be reducible to physical causes.

In a modernist onto-world, in which the ultimate entities are determinate individuals that are always already fully-formed, there is no reason to question how these entities become formed, but with the spacetime materializations that occur in Findhorn's onto-world in conjunction with the actions of the devas and the nature spirits, we do need to address the materialization of form, including the causality involved in this process. As was discussed in Chapter 2, agential realism provides a framework in which matter iteratively materializes in a dynamic intra-play of determinism and indeterminism, such that nothing is ever fully determinate (or fully indeterminate). The ultimate units of reality are in/determinate phenomena, which relationally differentiate-entangle, contingently producing particular determinacies at the exclusion of others (that remain indeterminate). In Chapter 5, we discussed how the strict determinism of a modernist onto-world is replaced by the constrained freedom of agential realism. Additionally, as we will discuss in the remainder of this subsection, the notion of causality is reworked. Agential realist causality includes (i) the causal structure that is enacted within phenomena as part of the agential cut, which includes the "marks on bodies" that shift possibilities for further intra-action, (ii) apparatuses that condition the material-discursive specificities of intra-action, and (iii) the causal role of indeterminacy in shaping intra-action. These types of agential realist causality affect entities as they are coming-into-being, which provides the

opportunity to make sense of the causality associated with Findhorn's devas and nature spirits.

Agential intra-actions are causal enactments, which means that bodies are enacted with marks that are indicative of the causal relationship between the enacted bodies: "…what is important about causal intra-actions is that 'marks are left on bodies': bodies differentially materialize as particular patterns of the world as a result of the specific cuts and reconfigurings that are enacted. Cause and effect emerge through intra-actions" (Barad 2007, 176). In contrast to the modernist causality of determinate individual bodies that externally affect one another, or *interact* with one another, the enacted causal structure of agential *intra-action* has to do with the manner in which bodies co-constitute one another through the process of relational differentiating-entangling. Barad (2007) is clear that agential realist causality is enacted within phenomena through the agential separability between the cause and the effect, and that there is no vector-like transmission of causal influence between separate moments, or between separate individuals:

> Future moments don't follow present ones like beads on a string. Effect does not follow cause hand over fist, transferring the momentum of our actions from one individual to the next like the balls on a billiards table. There is no discrete 'I' that precedes its actions. Our (intra)actions matter – each one reconfigures the world in its becoming – and yet they never leave us; they are sedimented into our becoming, they become us. And yet even in our becoming there is no 'I' separate from the intra-active becoming of the world. Causality is an entangled affair: it is a matter of cutting things together and apart (within and as part of phenomena). (394)

In other words, there are no inherently separate bodies that have direct causal effects on one another, nor are enacted bodies objectively available for any kind of further

interaction. An enacted body does not persist in some pre-given location through pre-given time to be causally interacted with over and over again, but bodies are iteratively reconfiguring (along with spacetime) through causal intra-actions, where each intra-action sets up a new causal structure between newly differentiating-entangling bodies. Thus, bodies are directly related by a causal structure only as part of their co-constitution within phenomena, where the enacted causal structure is both a "cutting together" and a "cutting apart", or a cutting together-apart (one move) (Barad 2014a): cause and effect are cut apart, or differentiated through agential separability, while also being cut together, or entangled by the particular relationality that has been enacted. Finally, the enactment of marks on bodies as part of intra-action has causal effects on further intra-actions because it partially determines what is and is not possible for further intra-actions, or in other words, it enables and constrains further intra-actions through a shifting of the associated possibilities.

While with marks on bodies, we can talk about how a causal intra-action shifts the possibilities for further intra-action, with apparatuses, which are themselves iteratively shifting phenomena, we can talk about sets of material-discursive practices (which, essentially, are complex shifting patterns of marks on bodies) that have stabilized to the extent that they causally condition the specificities of intra-action according to recognizable patternings. For example, a particular measurement conducted in a particular laboratory with a particular instrument results in marks on bodies that shift the possibilities for further intra-actions, while the fact that scientific experiments are often based on measurement is a material-discursive apparatus that

conditions how science is enacted in the modernist onto-world. As we learned in Chapter 2, with agential realism, the notion of an apparatus is generalized from a physical-conceptual observing instrument in the laboratory, to a material-discursive practice that conditions specific agential cuts, thereby resulting in specific material reconfigurings of the world. Just as a laboratory instrument designed to measure momentum constrains the resulting cut to one that is a (contingently) determinate measurement of momentum, thereby excluding the possibility of determinately measuring position, the material specificity of apparatuses enables and constrains what cuts are possible. And just as it is not possible to subtract out the effect of this laboratory instrument on the measurement (Barad 2007, 113), which means that the determinate values obtained exist only in relation to that particular experimental setup, the material-discursive apparatuses involved in an agential cut must be accounted for in reference to any enacted subjects or objects, whether these apparatuses are explicitly given or occluded. Thus, multiple intra-acting apparatuses, or material-discursive boundary-drawing practices, are causal factors in conditioning what is defined and how things are patterned in intra-action.

In the agential realist onto-world, in/determinate phenomena are associated with shifting sets of possibilities, which affect how intra-action can occur, and which are themselves affected by intra-action. We can also consider how these possibilities, or more generally the indeterminacy that is part of the dynamism of in/determinate phenomena, play a causal role in shaping intra-action. As we discussed in Chapter 1, intra-activity is the ongoing dynamism of in/determinacy, and determinacies-within-

phenomena are constituted not by any single possibility that becomes determinate while the other possibilities disappear, but by the entire pattern of possibilities involved in the intra-action; this means that even as particular determinacies are enacted, other possibilities remain indeterminate. That is, all the possibilities co-exist and mutually inform the overall intra-action (Barad 2017, 66). Thus, we can say that spacetimematterings are partially constituted within phenomena by the associated pattern of possibilities, or that the entire pattern of possibilities plays a causal role (in conjunction with other conditions and constraints) in shaping intra-action. In this sense, an intra-action is not simply between the determinacies that co-constitute one another, but it is also inclusive of virtual intra-actions, in which all the relevant possibilities are virtually explored. Thus, although virtual intra-actions are not spacetimemattering – possibilities do not themselves spacetimematter – virtual intra-actions participate in spacetimemattering. The dynamism of in/determinacy is such that patterns of possibilities play a causal role in shaping intra-action, and in turn, the resulting marks on bodies play a causal role in shaping further intra-actions by shifting the associated sets of possibilities.

In summary, we have considered agential realist causality in terms of (i) the causal structure that is enacted within phenomena as part of the agential cut, which includes the "marks on bodies" that shift possibilities for further intra-action, (ii) apparatuses that condition the material-discursive specificities of intra-action, and (iii) the causal role of indeterminacy in shaping intra-action. As we will see below, these types of agential realist causality do not explicitly account for, but neither do they

explicitly exclude, the types of causality that occur in conjunction with Findhorn's devas and nature spirits.

6.2 Making sense of etheric nature spirits in an agential realist onto-world

As discussed above, the modernist onto-world is structured in terms of a pre-existing physical spacetime and the deterministic causality of mechanism and field effects. In contrast, with agential realism, it is not any particular determinate spacetime configuration or causal structuring but the very fact of spacetimemattering that is primary. Not only are space and time enacted along with matter in an agential realist onto-world, but *the space and time that are enacted are not bound to any particular configuration*. Thus, if we take into account the available possibilities and any existing constraints, it should theoretically be possible to agentially intra-act spacetimematterings according to an infinity of different configurations (though not everything is possible). This enables us to consider the possibility of transphysical spacetimematterings, or spacetimematterings that are enacted according to configurations other than the physical (metrical), where these transphysical spacetimematterings would be no less real than physical spacetimematterings, although they would enact different sets of characteristics, as constrained and enabled by different sets of possibilities.

With Findhorn's onto-world, we have been working with a multi-realm cosmology of collaborative beings, including the etheric nature spirits. As discussed in Chapter 4, it is not possible to account for nature spirits and the etheric realm in a

modernist onto-world without explaining away their distinguishing features by reducing them to the physical. In an agential realist onto-world, there are no pre-determined, independently existing realms populated by different types of beings, nor are realms iteratively created in such a way that they become stable entities that are causally closed with respect to other realms. Instead, we can talk about different sets of material-discursive practices that tend toward particular patterns of spacetimemattering, all of which are thoroughly entangled, and none of which result in anything separate or fixed. In this section, we will propose that different patterns of spacetimemattering can account for what Findhorn understands as the differences between physical and etheric spacetime materializations. As part of this analysis, we will also be working to overcome the pervasiveness of physicocentrism that makes it difficult to envision transphysical beings such as nature spirits.

We will begin with a broader scope in §6.2.1, attempting to become comfortable with the idea of transphysicality, or more generally, with the idea of multiple different yet still ontologically real patterns of spacetimematterings that are thoroughly entangling and informing one another. Then, in §6.2.2, we will discuss the nature of etheric spacetimematterings, including how we might recognize etheric spacetimematterings as distinct from (but thoroughly entangled with) physical spacetimematterings. This will include the hypothesis that etheric spacetimematterings are distinguishable from and not reducible to physical spacetimematterings because they enact different spatiotemporal relations and causal connectivities. Finally, in §6.2.3, we will discuss the entangled relationality of

physical and etheric spacetimematterings, including the hypothesis that etheric apparatuses (e.g. Findhorn's etheric counterparts built by the nature spirits to supply the physical plants with life force) condition physical spacetimematterings (e.g. Findhorn's physical plants) to enact life-specific processes.

6.2.1 Coming to terms with transphysicality

In the modernist onto-world with its determinate physical individuals, matter is equated with the physical. That is, in a modernist onto-world, there is ample scientific evidence suggesting that matter behaves according to certain regularities – the so-called "laws" of classical Newtonian physics – that operate physically, or in terms of a metrically defined space, linear time, and strict deterministic causality. In fact, measurement is a key process in determining what is real in a modernist onto-world, and measurement requires a metrical geometry in which the distance between any two points is defined. As pointed out by the philosopher Eric Weiss (2012), it was a "major discovery" to recognize that "… the time-space relation conditioning causal relations in the *physical* world is … metrically geometrical, so that it permits measurement. But this does not mean that all actuality is … metrical in the same way" (226). In other words, in order for an entity to be considered scientifically real in a modernist onto-world, it must be physical, or measurable within a spacetime characterized by metrical geometry; this is a "discovery" that has resulted in the ability to predict and control the changing relationships among physical entities,

leading to the scientific and technological advances of the modernist onto-world, while however also creating the limiting perception that only the physical is real.

But the success of this modernist framework need not prevent us from considering the possibility that non-physical, non-measurable entities – such as nature spirits – could also be real. Moreover, the classical notions of metrical space, linear time, and strict deterministic causality are disrupted by quantum physics, providing an opening for alternative interpretations. As we have discussed, agential realism is an ethico-onto-epistemology that, among other features, provides a coherent interpretation of puzzling quantum physics outcomes, challenging the fundamental modernist conceptions of matter, space, time, and causality. In an agential realist onto-world, space and time are enacted along with matter, and causality is part of the enacted structure of intra-action. In contrast to the modernist onto-world with its determinate physical individuals that are understood and worked with metrically, the in/determinate phenomena of the agential realist onto-world can spacetimematter in a variety of patterns, including but not limited to metrical patterns. This means that materiality in an agential realist onto-world is not equated with the physical, or with that which can be measured. Thus, in addition to being able to make sense of the results of classical physics with its metrical constraints, agential realism provides the opportunity to include explanations that would not be considered possible in a modernist onto-world. That is, measurement still functions in the agential realist onto-world (because spacetime can be metrically enacted), but only as part of and in relation to in/determinate phenomena, which include alternate possibilities for how

the measured entities, including their enacted spacetime configuration and causal relations, could have been, or could be, enacted. The important point here is that in an agential realist onto-world, because reality is not limited to physical (metrical) spacetimematterings, reality is not limited to that which can be measured. Thus, we can also consider working scientifically with entities such as etheric nature spirits, which are non-measurable but still real.

To begin engaging more deeply with transphysicality, it is helpful to consider Weiss' (2003, 2012) cosmology of the "subtle worlds", or the "transphysical worlds",[122] which was developed with the intention of referring to transphysicality in ways that could be mathematically approachable.[123] The way in which I am using the term "transphysical" in this project is based on Weiss' use of the term, and it is also based on Weiss' work that I formulated the idea of differentiating between Findhorn's physical and etheric realms in terms of different patterns of spacetimematterings, or more specifically, in terms of differently enacted spacetime configurations and causal connectivities. Regarding transphysicality, Weiss (2012) says, "I now propose that each of these [transphysical] worlds is differentiated from the others because [the bodies that are enacted in these worlds are related to one another][124] in ways that

[122] Weiss (2003, 2012) uses the language of "worlds" or "realms", but these terms are not to be taken in the modernist sense of being separate, pre-existing, or causally-closed, because Weiss' work is based on the relational process philosophy of Whitehead, which recognizes the relational coming-into-being of matter, space, and time (through Whitehead's "actual occasions" or "actual entities").
[123] There is another precedent for this type of approach, in which projective geometry is shown to characterize the relations in the etheric realm; we will address this approach below when specifically discussing etheric spacetimematterings.
[124] In the original text, this phrase is, "occasions of different grades interact". The term "occasions" refers to Whitehead's "actual occasions" or "actual entities", which are similar to intra-acting agencies. The phrase "different grades" refers (in Weiss' use of the term) to bodies that are enacted along with different spacetimes, such as physical versus etheric bodies. I have translated this phrase to fit with the

define different geometries or different time-spaces. In other words, it now becomes plausible to begin the process of forming a mathematical analysis of the time-space of the transphysical worlds" (218). Specifically, as proposed by Weiss (2012), the metrical geometry of the physical world is the most rigid and constrained, while the transphysical worlds enact increasingly less constrained geometries (219). For example, non-metrical geometry is less constrained than metrical geometry, because non-metrical geometry is not constrained to any parallel postulate (this will be further discussed below). Also, in the context of agential realism, we have discussed the topological enfolding of phenomena, where topology is not subject to geometrical constraints at all.

Philosophically, we have shown that in an agential realist onto-world, spacetimematterings need not be limited to physical configurations. But because of the pervasive physicocentrism of the modernist onto-world, in which the modernist is educated to assume that anything ontologically real must have a physical basis, it is difficult to envision how iteratively enacted entities such as nature spirits could be real while not being physical enacted. In order to overcome this bias and engage constructively with transphysicality, it is worth considering how we might already be familiar with transphysicality in our own experience – for example, through our dreams. In our waking experience, we seem to interact with determinate physical individuals that are locatable in physical spacetime and that obey the causal rules

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language of the agential realist onto-world, in order to make the point that we can differentiate between, as well as define and mathematically approach, transphysical realms in terms of the spacetime relations with which particular bodies are enacted (within phenomena).

associated with physicality. But what happens when we go to sleep, and when we dream?

The philosophical literature on dreams and dreaming, according to the Stanford Encyclopedia of Philosophy, does not present a unified theory but includes conflicting theories, for example that dreams are imaginative experiences, or hallucinations, or illusions (Windt 2017). In contrast to these physicocentric theories that attempt to explain dreams as a phenomenal aspect of the physical world, let us consider dreams as transphysically enacted, where transphysical spacetimematterings are just as real as physical spacetimematterings, and where these different patterns of spacetimematterings are thoroughly causally connected and intra-actively informing one another. During sleep, our sleeping physical body continues to be enacted along with physical spacetime (iterations of physical spacetimematterings), such that this body is measurable and visible from within the context of other physical intra-actions. But consider that this physically-enacted sleeping body is entangled with its transphysically-enacted dream body that, through iterations of transphysical spacetimematterings, is experiencing its (co-constituting) dream world.[125] We can learn something about the transphysicality associated with dreams either by exploring our own dream experiences, or, as follows, by investigating what has been experienced and documented by others. After reviewing this information, which utilizes language and concepts that make our physical and dream bodies seem like

[125] By referring to a "dream world", I do not intend to suggest the existence of separate worlds or realms, but I am merely referring to the particular dream experience that is being transphysically enacted while still being intra-actively connected with the relevant physical spacetimematterings. Similarly, we could say that the world in which we grew up in is different from the world in which we now live, but this would not imply that these are separate worlds.

separate bodies that experience separate worlds, requiring a theory of how they could interact with one another, we will clarify this issue using agential realism.

In the literature on the "out-of-body" experiences that occur when one "leaves" the physical body during sleep, the dream world is referred to as the "astral realm", and one is said to have an "astral projection" when the astral body is actively engaged in dreaming (while the physical body is asleep). According to Robert Bruce (1999), who explores the astral dynamics of out-of-body experiences, all people project out of their physical bodies (and into their astral bodies) while sleeping,[126] but only some people can remember and share their experiences (xx).[127] Through his experiences, Bruce (1999) has developed detailed theories about astral projection, but what is relevant to our discussion are some of his observations regarding how transphysicality is different from physicality:[128] "The nonphysical laws governing the astral dimension are fluid and variable" (6), and "The normal laws of physics do not apply, although there are habits to deal with, like gravity" (7). Moreover, through the ways in which he documents memories as being transferred from the astral body back to the physical body, it is clear that Bruce (1999) finds the physical and astral realms to be thoroughly causally connected.

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[126] By "projecting", Bruce (1999) means that one's main point of awareness, or "center of consciousness", is transferred from the physical to the astral body (12, 16); this is based on the understanding that the "mind" and "memories" are spread between these multiple interconnected bodies (4-5).

[127] Bruce (1999) suggests exercises designed to cultivate the ability to become aware of one's astral projections. I have practiced some of these exercises in order to investigate transphysicality in more than a theoretical manner, resulting in an experience in which I felt that I was hovering "outside" my sleeping physical body and was no longer capable of controlling my physical body until I "returned", waking up "inside" my physical body again.

[128] Bruce (1999) describes multiple different types of dream bodies, but I am lumping them together into transphysicality more generally, in order to make the point that transphysicality is different from physicality.

Weiss (2012) also analyzes dream experience, summarizing that the physical world and the dream world are similar in that both contain distinct places and individual objects; "However, the [dream] world is different from the physical world because it lacks many of the restraints on what is possible that we encounter in our waking world. It is also more responsive to our moods and thoughts, and it differs significantly in how cause and effect relate to measurable distances" (187). For example, in travelling from one setting to another in the dream world, it is not necessary to traverse a continuous trajectory from the one location to the other, and in fact, a location can be achieved simply through the intention of being there (Weiss 2012, 189). With these examples, we can understand the dream world as operating according to different geometrical and causal constraints than those according to which the physical world operates, though these worlds are thoroughly causally connected because we (along with our memories) transfer back and forth between them when falling asleep and waking up, not to mention the fact that dreaming has measurable physiological effects on the physical body.

In this discussion on dreaming, we have been limited by the language and concepts of the modernist onto-world, resulting in analyses in which dream bodies have been portrayed as separate bodies that inhabit a separate realm – the dream world – and that must therefore somehow connect back to and interact with their corresponding physical bodies. However, in the agential realist onto-world, we have available the notion of intra-action, along with the flexibility resulting from there being no inherent pattern according to which spacetimemattering is enacted. Thus,

not only can both physically and transphysically patterned spacetimematterings be enacted, but these spacetimematterings intra-actively inform one another. In other words, there are no separate realms between which it is necessary to interact, because physical and transphysical spacetimematterings – though they can be differentiated from one another because they operate according to different geometrical and causal constraints – are mutually co-constituting one another. In the agential realist onto-world, then, the so-called "dream world" and "physical world" that "we" participate in are causally connected, iteratively shifting sets of transphysical and physical spacetimematterings, as part of which "we" are enacted along with "our" various worlds.

In summary, because the dream world is transphysical, it is not measurable or perceptible with the physical senses, but as we have been discussing, this does not mean that it is not real. Moreover, with agential realism, we know that material arrangements need not be limited to physical arrangements such as physically enacted bodies, but that there could also be transphysically enacted bodies, such as these astral projections or dream bodies that we have been considering. The important point here is to recognize that transphysical spacetimematterings enacting transphysical geometries and causal connectivities might be more than theoretical constructs and might better support the facts of our experience than physical spacetimematterings alone. For someone who has experienced dreams, especially vivid and compelling dreams that seem just as real as waking experience, this example provides the opportunity to experience how transphysicality is thoroughly

causally connected with physicality while also being distinguishable from physicality by the different patterns – the different spatiotemporal configurations and causal connectivities – according to which they are spacetimemattering.

6.2.2 Etheric spacetimematterings

In the previous subsection, we considered astral spacetimematterings as an example of transphysicality, giving us a feeling for how it could be that physical spacetimematterings are not the only enacted configurations involved in our experience. But for the purpose of this project, we need to focus on the details of etheric spacetimematterings. As discussed in Chapter 3, Findhorn's nature spirits are etheric beings that work in the etheric realm to causally affect the materialization of entities in the physical realm. The significance of the etheric realm is that it provides the life force for the physical realm; specifically, the nature spirits build the etheric counterparts to the physical plants, where these etheric counterparts affect the growth and development of the physical plants by providing them with life force. In contrast to the physical realm, the etheric realm is "intangible" or "immaterial" (where I argued in Chapter 3 that "immaterial" actually means transphysical), and although (some of) the Findhorn gardeners were able to communicate with the nature spirits, they acknowledged that these etheric beings are not perceptible through the physical senses. In Chapter 4, we determined that Findhorn's etheric realm cannot be understood as part of the modernist physical realm without eliding the important differences between them. Thus, in this subsection, we are developing the hypothesis

that, in an agential realist onto-world, etheric spacetimematterings are distinguishable from and not reducible to physical spacetimematterings, because they enact different spatiotemporal relations and causal connectivities.

As we discuss etheric spacetimematterings in an agential realist onto-world, it is important to remember that they do not constitute an independently existing etheric realm, just as there is no independently existing physical realm, but that we are referring to particular patternings according to which the topologically enfolded spacetimematter manifold is iteratively restricted, where we are labeling these patterned spacetimematterings as either physical or etheric based on their enacted spatiotemporality and causal structure. Just as with any agential intra-action, an etheric intra-action also effects agential separability and sets up a causal structure within the phenomenon, though these are etherically instead of physically patterned. That being said, I will be using the language of "realms" in what follows, as I present evidence to support my hypothesis.

In the previous subsection, we discussed Weiss' theory of transphysical realms as differentiated by different spatiotemporalities and causal connectivities. Specifically considering the etheric realm, we have recourse to the work of Rudolf Steiner, an esoteric philosopher of the New Age onto-world whose contributions during the late 1800s and early 1900s span fields such as agriculture, education, social reform, medicine, and architecture.[129] According to Whicher (1989), who

[129] Steiner's work with the etheric realm is likely to be compatible with Findhorn's characterizations of the etheric realm: Sir George Trevelyan, who participated in the writing of the Findhorn Garden book (Findhorn Community 1975), was a student of Steiner's and understood the importance of including

worked with Steiner's approaches mathematically, Steiner believed that an important first step to learning the "laws" of the etheric realm is to understand etheric space through the study of projective geometry (37). Projective geometry is based on the existence of points and lines, as well as (relative) sizes and shapes, but it is a non-metrical geometry because it does not rely on a concept of measurable distance. With non-metrical geometries such as projective geometry, measurement is not possible; in contrast, metrical geometries permit measurement because the distance between any two points is defined. Steiner, through his clairvoyant abilities,[130] had described his experiences of the etheric realm, and George Adams, a mathematician who had studied Steiner's work, was able to match the qualitative nature of projective geometry to Steiner's description of the etheric realm, thereby describing the etheric realm geometrically (Whicher 1971, 245, 251).[131]

In the modernist onto-world, the (physical) world is generally described and worked with according to metrical geometries, where one familiar example of a metrical geometry is Euclidean geometry, although it is acknowledged that this particular formalism is not the only possible framework that is consistent with our experience.[132] In fact, classical physics and mechanics presupposed a notion of

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the etheric realm in agricultural practices (Hawken 1975, 165); Dorothy MacLean (1981) refers to Steiner several times in her book about devas, including the confirmation that the Findhorn gardeners used some of Steiner's (biodynamic) farming practices in their garden, although they did not rely exclusively on his methods (51).

[130] We will discuss in Chapter 7 what could be meant by Steiner's clairvoyant abilities, or more generally, what it could mean to utilize apparatuses other than the physical sense organs in producing knowledge about the world.

[131] An interesting historical note is that it was Whitehead, along with Bertrand Russell, who introduced George Adams to projective geometry (Whicher 1989, 13).

[132] According to Reichenbach, as explained in Sklar (1974), we must choose the particular geometry that corresponds to the physical world by *convention*, because there are multiple consistent metrical

metrical spacetime, according to which it is possible to quantitatively describe the motion of physical objects resulting from the application of physical forces. That is, metrical geometry is assumed to have some relevance to the physical world. In contrast, non-metrical geometries such as projective geometry are utilized in abstract mathematical ways but are not generally assumed to have any ontological existence, or any kind of associated mechanics, because ontologically there is only "room" for one spacetime to exist – the physical. However, if the spacetime described by projective geometry matches Steiner's descriptions of the etheric realm (which are consistent with Findhorn's understanding), and if, with agential realism, we can say that the etheric spacetimematterings are as ontologically real as physical spacetimematterings, then there is reason to further investigate the possibility that etheric spacetimematterings are patterned according to the spatiotemporality and causal connectivity associated with projective geometry. This means that the mathematics of projective geometry could possibly be used as a tool to further understand and characterize etheric spacetimematterings.

Thus, while it may be the case that measurement is possible only as part of physically patterned intra-actions, etherically patterned intra-actions could potentially be spatiotemporally described and mathematically analyzed according to projective geometry. In fact, projective geometry has been linked to the etheric component of plant growth (Adams and Whicher 1980), which as we have discussed in terms of Findhorn, supplies the life force for the physical plant through the work of the nature

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geometries – e.g. Euclidean, spherical, hyperbolic – that are compatible with the different possible ways of interpreting our experience (89-94).

spirits. According to Adams and Whicher (1980), following in the lineage of Steiner (discussed above), projective geometry can be utilized not only in abstract mathematical applications but also practically, for example by linking the forces described by projective geometry – which they call "etheric forces" or "formative forces" – to the growth and development of living forms such as plants (12):

> Because of the one-sidedly mechanistic and materialistic direction of applied mathematics, which has served science well in the direction of atomism, it appears that no one, apart from the researchers following Rudolf Steiner's indications, has deemed it worth while to work out the formulation of polar Euclidean [projective] spaces, let alone to develop concepts concerning the forces which might apply in such a space. Yet this is precisely what is needed to give to the concept of etheric formative forces – processes at work in the building up of living tissues and forms – a clear mathematical basis. (Adams and Whicher 1980, 41)

This example considers the living plant as a whole (Adams and Whicher 1980, 12) that includes both the physical patternings corresponding to its iteratively enacted inorganic (physical) matter, as well as the etheric patternings corresponding to its life force, or its iteratively enacted processes of growth and development – this will be further discussed in the following subsection in the context of the relationality between physical and etheric spacetimematterings. Note that this type of example need not be limited to projective geometry: Whitehead (1933) points to "Non-metrical Projective Geometry" as only one example of "the science of cross-classification", suggesting that many different "non-numerical quasi-geometrical sciences" could be developed (137-138).

In summary, we have provided support for the hypothesis that etheric spacetimematterings are distinguishable from and not reducible to physical

spacetimematterings because they enact different spatiotemporal relations and causal connectivities. Specifically, we have suggested that etheric spacetimematterings could potentially be modeled by projective geometry, which describes a different spatiality and different types of forces than the metrical geometry associated with physical spacetimematterings. The intention here is not to claim any final truth regarding the patterning of etheric spacetimematterings, but simply to suggest that it is possible to move beyond the physicocentric belief that our scientifically describable world is limited to physical spacetimematterings. Finally, this hypothesis helps us not only to describe one possible way in which to make sense of Findhorn's etheric realm in an agential realist onto-world, but it is also a step toward becoming aware of the way in which we are partially responsible for enacting the boundaries (and their associated exclusions) that define our reality.

We have examined etheric spacetimematterings in terms of their enacted patternings, but we can also consider the life force that is, for Findhorn, associated with the etheric realm. In order to make etheric reality intelligible, and again, helping us to become more comfortable with transphysicality, we will examine how life force could show up in our experience. We – as subjects-in-the-process-of-becoming – do experience our own physicality, as iteratively differentiated from the physicality of the rest of the universe, but we also experience our own aliveness, or life force, as well as the aliveness of other subjects-in-the-process-of-becoming. By considering how we differentially experience life force, we can gain some feeling for what life force is, or for what etheric spacetimematterings could be. Consider holding in your

hand, or in your arms, a pencil, a crystal, a flower, a lizard, a puppy, or a human infant.[133] If possible, take a few moments to imagine, sequentially, that you are holding each of these items, noticing the different feelings that accompany each one. It is likely that you will experience different feelings of aliveness while engaging with at least some of these different entities. If we assume that these different feelings are a result of the different etheric (life force) bodies that are enacted as part of these various entities, we could say that the lizard, for example, has a stronger life force than the pencil. Or, we could say that the life force of the puppy is different than the life force of the flower, though both are perceptible. With this feeling for how etheric life force manifests in our experience, we could also imagine what it might feel like to encounter a nature spirit, or an etheric being whose life force we could possibly engage with, even as we cannot physically touch or perceive them. In the following section, we will consider the role that etheric spacetimematterings, characterized by life force, play in the enaction of physical spacetimematterings.

6.2.3 The relationality of physical and etheric spacetimematterings

According to the Findhorn gardeners, as discussed in Chapter 3, the etheric nature spirits build the etheric counterparts that supply the life force for the physical plants, where the etheric counterparts are crucial to the growth and development of the physical plants. These etheric counterparts can be modified by the nature spirits as part of collaborating with humans, or in response to other physical conditions.

[133] I am indebted to Eric Weiss for suggesting this experiment to engage with the etheric life force.

Based on our exploration of etheric spacetimematterings in the previous subsection, we can say that in an agential realist onto-world, plants are physically spacetimemattering along with their etherically spacetimemattering counterparts, which are built and managed by the etherically spacetimemattering nature spirits, as part of ongoing mutual intra-actions. In this subsection, we will discuss the causal effects that these physical and etheric spacetimematterings could have on one another. Again, we must emphasize that physical and etheric spacetimematterings do not each form causally closed realms or any kind of boundaried spaces of their own, but that they are relationally co-constituted and causally connected.

In §6.1.2, we discussed the causality of the agential realist onto-world. To briefly review, agential realism includes a re-working of the classical notion of causality: while classical causality occurs between determinate individuals, the in/determinate phenomena of agential realism entail intra-activity, which enacts a causal structure within phenomena. That is, causal structures are intra-actively enacted within phenomena, which means that causality occurs between entities as they co-constitute one another within and through intra-action. This agential realist understanding of causality provides the connection between causality and the process of coming-into-being that is needed in order to explain how the nature spirits act as casual factors in the spacetime materialization of Findhorn's plants. We will discuss the causality of the nature spirits both in terms of the marks on bodies that shift possibilities for further intra-action, as well as in terms of the apparatuses that condition the material-discursive specificities of intra-action.

The important point to explore is how causality could function between etheric and physical spacetimematterings, while recognizing that neither "physical" nor "etheric" pre-exist the intra-actions that define them. As discussed above, the modernist onto-world includes some form of causal closure with regard to the physical realm, such that physical events can be sufficiently explained only in terms of physical causes. But in an agential realist onto-world, phenomena are thoroughly entangled and topologically enfolded through one another, which means that physical and etheric spacetimematterings are enfolded through one another and have the potential to affect one another. Moreover, we are not limited by the notion of causally-closed realms, so if we can move beyond physicocentrism, we can consider the possibility that transphysical causes (that are not reducible to physical causes) are also participating in the enaction of physicality, and conversely, that physical causes are participating in the enaction of transphysicality.

It will be helpful to discuss the relationality between physical and etheric spacetimematterings by using the agential cut – and the resulting marks on bodies – as our unit of analysis.[134] With agential realism, marks on bodies shift the possibilities for further intra-actions. To say that physically enacted marks on bodies shift the possibilities only for further physical intra-actions, and that physical intra-actions are conditioned only by physically enacted marks on bodies, would be to claim that physical spacetimematterings form some sort of a closed realm. But if spacetimematterings can be enacted according to etheric as well as physical

[134] See Chapter 5 for an explanation of why this is an appropriate unit of analysis.

configurations, then it must also be possible for etheric marks on bodies to result from intra-action (or, in other words, for etheric bodies to be enacted with marks). Therefore, if marks on bodies shift the possibilities for all further intra-actions, physically enacted marks on bodies must also shift the possibilities for further etheric intra-actions, and etherically enacted marks on bodies must also shift the possibilities for further physical intra-actions. In this way, physical and etheric spacetimematterings could causally affect one another by constraining and enabling their associated possibilities for further intra-action. This analysis can be summed up with two important points: neither the "physical" nor the "etheric" pre-exist the intra-actions that define them, and because they are both intra-actively enacted, they both have the potential to causally affect one another during the process in which they are mutually enacted (each according to their particular patternings).

Having established the relationality between physical and etheric spacetimematterings with respect to marks on bodies, we can extend this analysis to apparatuses. The material specificities of apparatuses, which constrain and enable how the agential cut is enacted, are complex (iteratively reconfiguring) systems of marks on bodies. Thus, as was argued above for marks on bodies, the material specificities of these apparatuses need not be physical, but could also be etheric. That is, we could also talk about etheric apparatuses as conditioning the material-discursive specificities of intra-action. Because, according to Findhorn, the etheric counterpart plays a significant role in the growth and development of physical plants, it seems reasonable to suggest that it is acting as an etheric apparatus conditioning

how the physical plant is enacted. Thus, in order to account for the fact that Findhorn's physical plants grow and develop in conjunction with their etheric counterpart, I am hypothesizing that particular physical intra-actions (such as those involved in plant growth and development) are causally conditioned by an etheric apparatus, where the etheric apparatus is itself also iteratively reconfiguring, in conjunction with both physical and etheric conditioning.

This explanation is sufficient for our purpose of showing how physical and etheric spacetimematterings can causally affect one another, but it does not address why the enaction of the physical plant requires anything other than physical apparatuses. For Findhorn, this has to do with life force, or with the necessity of the etheric realm as the supplier of life force for the physical realm, where this life force enables the growth and development of the physical plant. In the remainder of this subsection, we will analyze this claim from within the context of our three onto-worlds – modernist, New Age, and agential realist – in order to create the hypothesis that in an agential realist onto-world, the (etherically enacted) material specificities of etheric apparatuses give meaning to life-specific concepts, thereby constraining and enabling physical intra-actions to enact life-specific processes. For the purpose of this discussion, we will talk about life force in terms of the life-specific processes involved in the growth and development of plants, e.g. spontaneity, flexibility in adaptation, regeneration, and of course the fact of life itself.

In the modernist onto-world, where only the physical is considered to be real, Findhorn's claim that the etheric realm is necessary for supplying life force to the

physical realm would be dismissed, and an explanation for life-specific processes would be sought in terms of the physical alone. Yet in the modernist onto-world, it is debatable whether or not life-specific processes, including the fact of life itself, can be explained by a reduction to physical elements. Although we have included reductionism as a characteristic feature of the modernist onto-world, complex systems theory is a part of the modernist onto-world that stretches toward non-reductionistic methodologies. For example, as an alternative to reductionism, proponents of complex systems theory claim that life-specific processes are the kinds of behaviors that *emerge* from complex physical systems, where emergence, in this context, means that even though the individual parts of a physical system are nonliving, the specific interactions between these parts enable the system as a whole to exhibit the property of life (Jantsch 1980). It is important to note this binary between living and nonliving that is characteristic of the modernist onto-world,[135] which is here being expressed in terms of nonliving parts and a living emergent whole.

However, the biological anthropologist Terrence Deacon (2012) explains that this concept of emergence in complex systems theory is philosophically untenable in terms of what he refers to as "substance metaphysics", which is compatible with what we are referring to as a metaphysics of individualism that does not take into account the results of quantum physics.[136] In response, Deacon (2012) argues that properties such as life can still be explained in entirely physical terms by re-working the concept

[135] As we will see below, this modernist binary between living and nonliving is retained in the New Age onto-world but not in the agential realist onto-world.
[136] Specifically, Deacon (2012) critiques the philosophical concepts of mereology and supervenience to show that the concept of emergence is philosophically untenable in the context of a substance metaphysics (164-168).

of emergence such that it is based on dynamical processes of change, or the transformations that occur between physical states, as opposed to the composition of any given physical state (175). While Deacon's (2012) dynamical process approach to emergence challenges both the reductionism and the metaphysics of individualism associated with the modernist onto-world, his framing of the issue remains modernist, in that he strives to explain reality (the fact of life, in this case) only in terms of the physical. Moreover, his dynamical process approach retains the modernist conception of change as occurring against the backdrop of a pre-given spacetime. In contrast, we have seen how with agential realism, matter, space, and time are co-constituted through the topological dynamics of intra-action, such that change is "the iterative differentiatings of spacetimemattering" (Barad 2007, 179). In summary, the modernist onto-world seeks to explain life-specific processes only in terms of the physical (with debatable success),[137] and approaches such as complex systems theory, especially Deacon's (2012) dynamical process formulation, recognize the importance of moving beyond modernist limitations as part of the endeavor to explain life-specific processes.

In contrast to the modernist onto-world in which only the physical is considered to be real, Findhorn's New Age onto-world is not limited to the physical realm, so it makes sense to talk about the etheric realm as the supplier of life force for the physical realm. Specifically, we could understand this claim in terms of the

[137] Recall that quantum physics is not being included as part of the modernist onto-world, in the sense that it might potentially be able to explain life-specific processes. Moreover, with agential realism, quantum physics results in the need to rethink the binary between living and non-living, changing what it means to analyze life-specific processes.

etheric realm acting as an organizing factor in enabling life-specific processes that physical matter alone does not enact – e.g. spontaneity, flexibility in adaptation, regeneration, and of course the fact of life itself. This hypothesis is supported by the work of the projective geometry community following in Steiner's lineage, which was discussed above. For example, Whicher (1971) recognizes that it is time for biologists "to realize and admit that *a living body is alive precisely when it is not functioning solely according to the known laws of physics and chemistry*, but is under the influence of [etheric] laws which save it from the fate it would undergo if it were [merely physical]", where etheric laws are seen as counteracting "the disintegrating processes of the lifeless [physical] realm" (243). In other words, they are arguing that it is a mistake to continue attempting to explain life based solely on the physical, because life-specific processes require both physical and etheric aspects.

In the context of this project, we are seeking to include etheric aspects as real and important factors in our discussion. But this consideration of etheric aspects from within the New Age onto-world is limited by several related difficulties, as stemming from modernist tendencies that are retained in the New Age onto-world. First, Findhorn's claim that the etheric realm supplies the life force for the physical realm suggests that the physical realm is considered to be lifeless without the participation of the etheric realm, which reveals that the New Age onto-world retains the modernist binary between living and nonliving. Moreover, as we discussed in Chapter 4, the New Age onto-world retains the modernist notion of a realm as a fixed structure populated by entities, where in this particular case, the binary between living and

nonliving is demarcated by this existence of separate realms. In order to overcome these difficulties and approach the inclusion of etheric aspects in a manner that connects to scientific theories, we must consider how this discussion changes when we diffract the notion of etheric life force through the agential realist onto-world.

As we have discussed, there are no separate realms or pre-defined patterns in an agential realist onto-world, but physical and etheric spacetimematterings are intra-actively defined and causally connected as part of their intra-activity. We have also discussed how boundaries in an agential realist onto-world are not pre-existing but are enacted, not once and for all but iteratively, contingently, and along with their associated exclusions; the boundary between living and nonliving falls into this category as well (Barad 2007, 201). This means that the existence of life-specific processes is not pre-given, but that these processes are contingently enacted in some cases and not in others, as dependent upon the available possibilities and subject to the existing constraints. We are attempting to make sense of Findhorn's etheric realm acting as an organizing factor in enabling life-specific processes that physical matter alone does not enact. This suggests the hypothesis that, in an agential realist onto-world, life-specific processes – which are enacted in some cases and not in others – cannot be enacted only in terms of physical spacetimematterings, but also require the participation of etheric spacetimematterings.

We can further analyze this in terms of apparatuses, where the material specificity of an apparatus gives meaning to certain concepts at the exclusion of others (Barad 2007, 267-268), thereby enabling particular cuts while excluding

others. Above, we explained that we can also think in terms of etheric apparatuses, and I am suggesting that the (etherically enacted) material specificities of particular etheric apparatuses give meaning to life-specific concepts, thereby constraining and enabling physical intra-actions to enact life-specific processes. Just as a momentum measurement could not be enacted in the absence of an apparatus designed to measure momentum, life-specific processes could not be enacted in the absence of an etheric apparatus whose material specificities give meaning to these processes. Thus, we could hypothesize that in an agential realist onto-world, life-specific processes can be enacted only with the participation of an etheric apparatus, where these enactions of life-specific processes are also subject to the particular conditions and constraints involved in the associated physical intra-actions, and where the etheric apparatuses are themselves reconfiguring according to physical conditions and constrains. That is, etheric apparatuses, like any apparatus, are not fixed, but are themselves iteratively reconstituted. Recalling our experiment in the previous subsection, in which we imagined the different life forces associated with various entities, it makes sense that etheric apparatuses (i.e. etheric bodies) are themselves differentially constituted, enacting different strengths and types of life force in intra-action with different kinds of physical spacetimematterings.

To summarize, in the modernist onto-world, life-specific processes are hypothesized to be emergent properties of physical systems,[138] while in the New Age

[138] Even in an agential realist onto-world, it is possible to remain physicocentric, in the sense that we could attempt to understand life-specific processes in terms of spacetimematterings that are enacted according only to physical configurations. This would not mean that life-specific processes "emerge"

onto-world, the etheric realm is seen as necessary (along with the physical realm) for life-specific processes. But it is not clear how to work scientifically with the etheric realm in the New Age onto-world, whereas in the agential realist onto-world, we can work with etheric spacetimematterings mathematically, according to the different spatiotemporalities and causal connectivities that they intra-actively enact. In this regard, Adams (1977) has worked out a preliminary mechanics that utilizes not only physical forces, but also etheric forces – the types of forces associated with projective geometry – as based on "the dynamical interplay of space [physical space] and counterspace [the space associated with projective geometry]" (2). It is beyond the scope of this project to examine the complex details of Adams' mechanics, but the relevance for this project is that there is a precedent for showing how etheric forces could be mathematically linked with physical forces, lending further support to our hypothesis that in an agential realist onto-world, life-specific processes are enabled and constrained by an etheric apparatuses conditioning the material-discursive specificities of physical intra-actions.

These above hypotheses are speculative and are provided only in order to give examples of how some of the specific features of Findhorn's nature spirits and the etheric realm could be made sense of in an agential realist onto-world. The thesis of this project is not dependent upon these hypotheses but is supported by the fact that agential realism overcomes the modernist limitations that preclude the possibility of

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from nonliving physical configurations – which does not make sense in an agential realist onto-world – but it would mean that some physical configurations enact life-specific processes while others do not, as dependent upon the existing possibilities and subject to any constraints (where these possibilities and constraints would also have to be made sense of in only physical terms).

making sense of etheric nature spirits (without reducing them to the physical). In summary, in an agential realist onto-world, the differences between Findhorn's physical and etheric spacetime materializations (including nature spirits) can be made sense of in terms of different patterns of spacetimemattering, where physical and etheric spacetimematterings are thoroughly causally connected, such that etheric apparatuses can condition the material-discursive specificities for further physical intra-actions, and vice versa. We have additionally hypothesized, based on what we know from Findhorn about the life force of the etheric realm, that etheric spacetimematterings enact a non-metrical spacetime configuration characterized by projective geometry, and that etheric apparatuses participate in, and indeed are required for, the physical enaction of life-processes.

6.3 Making sense of devas and the God within in an agential realist onto-world

With Findhorn's onto-world, we have been working with a multi-realm cosmology of collaborative beings, including devas, nature spirits, and the God within. The nature spirits, which we discussed in the previous section, collaborated with the Findhorn gardeners regarding details about specific plants in the garden, while the devas tended to share information about the garden more generally, as well as educating the Findhorn gardeners about their co-creative roles in creating a thriving ecosystem. Similarly, the God within was an important factor in helping the Findhorn gardeners act in accordance with the good of the whole. In this section, we are addressing both the devas and the God within, because as we will see, they are

ontologically similar. In §6.3.1, we will discuss the oneness of an agential realist onto-world, including a brief discussion regarding the God within. Then, in §6.3.2, we will discuss the devas in terms of the indeterminacy of matter, and in §6.3.3, we will discuss the causal role of the devas in terms of how patterns of possibilities are constitutive of spacetimematterings within phenomena. While accounting for the features of Findhorn's devas and the God within in an agential realist onto-world will require some additional hypothesis, the important point to make in this section, providing support for the thesis of this project, is that agential realism overcomes the modernist limitations that preclude the possibility of making sense of devas and the God within.

6.3.1 Oneness and the God within in an agential realist onto-world

From Findhorn, we learned in Chapter 3 that oneness is a togetherness and interdependence of all existence, in which greater wholes encompass what we think of as separate parts, and there are no distinct boundaries separating "inner" and "outer". We also discussed Findhorn's God within as the divinity that unites Findhorn's onto-world in its ultimate oneness, where the Findhorn gardeners were able to tune in to the good of the whole by connecting to their inner divinity, or the God within, helping them to make choices in alignment with the best interest of the whole, where the whole could be a garden, a country, or the entire universe. In Chapter 4, we analyzed Findhorn's concept of oneness, determining that multiple entities that appear to be separate and are able to interact with one another ultimately

have a togetherness in which they are not separate but are “one”, without any distinct boundaries or inner/outer delineation. Furthermore, we showed how for Findhorn, wholes are composed of parts that are not dualistically separated, where these wholes include not only entities that have materialized in spacetime, both etherically and physically, but also possibilities, such as the potential devic forms that are “outside” of spacetime.

Oneness and the God within are vital aspects of Findhorn’s onto-world, but in Chapter 4 we determined that these aspects cannot be made sense of within a modernist onto-world that is reductionistic and based on determinate individuals that have no necessary connection to one another, because it does not include the kinds of wholes that are implicated in oneness. In contrast, the concept of oneness can be expressed and clarified in an agential realist onto-world. Importantly, the entangled intra-active relationality of agential realism goes beyond mere interconnectedness or interdependence between individuals, because there are no pre-given or fixed individuals, boundaries, or inside/outside delineations. That is, there are no fully-formed, individual subjects that can be interconnected with one another, and “there is no ‘I’ separate from the intra-active becoming of the world” (Barad 2007, 394), but individuals iteratively co-constitute one another, along with their world, in an inherent mode of dependence and connection. As Barad (2007) explains regarding the causality involved in interconnectedness,

> The point is not merely that there is a web of causal relations that we are implicated in and that there are consequences to our actions. We are a much more intimate part of the universe than any such statement implies. If what is implied by "consequences" is a chain of events that follow one upon the next,

> the effects of our actions rippling outward from their point of origin well after a given action is completed, then to say that there are consequences to our actions is to miss the full extent of the interconnectedness of being. (394)

Thus, with its dynamic intra-active relationality, the interconnectedness of an agential realist onto-world goes beyond a mere web of causal relations, because every relationally enacted being is partially constituted by and to at least some extent causally implicated in (even by virtue of its exclusion) the differentiating-entangling of every other relationally enacted being, within and as part of the dynamically reconfiguring universe.

With this dynamic oneness of the agential realist onto-world, any enacted beings are inherently intra-connected and exist only in relation to the phenomenon – the whole – of which they are ontologically inseparable "parts". As we discussed in Chapter 5 regarding parts and wholes, agential realist phenomena are entangled in/determinate wholes that do not have pre-determined parts, but that are dynamically reconstituted according to how the "parts" are iteratively enacted, where these "parts" include both determinacy and indeterminacy (in a dynamic intra-play). This enables us to make sense of Findhorn's wholes that, in addition to both physical and etheric spacetime materializations, include the devas with their potential patterns informing how structures have been and could be enacted within the whole. In an agential realist onto-world, we can say that whole in/determinate phenomena include indeterminacy (related to devas), and can include both physical and transphysical spacetimematterings (such as etheric nature spirits), all of which are ultimately inseparable from one another in their iterative dynamic intra-activity. Because

phenomena are the fundamental existents in an agential realist onto-world, the wholeness of phenomena and the oneness of any potentially intra-acted "parts" are fundamental and irreducible. In summary, we can say that in an agential realist onto-world, oneness is the togetherness of an in/determinate whole – a phenomenon – where the "parts" of this whole, or any potential entities that can be relationally differentiated from this whole, are intra-connected and intra-dependent by virtue of their ultimate inseparability within and as part of the whole.

Within the scope of this project, it is not necessary to go into any depth regarding the God within as a special or distinct sort of being in Findhorn's onto-world, not only because we are concentrating mostly on the devas and nature spirits in terms of plant-human collaboration, but also because there is a way in which the God within seems to be ontologically similar to the devas. As discussed in Chapter 3, we can think of devas individually, for example as pertaining to particular types of plants, but the devas are both many and one, and according to the Findhorn gardeners, being in connection with them is ultimately being in connection with the whole universe; similarly, for the Findhorn gardeners, connecting with the God within also means connecting with the whole universe. Also, the Findhorn gardeners explained that being in contact with the devas was ultimately the same as being in contact with "our true selves"; similarly, they felt that the God within is "the core of what I am and what everything is". Moreover, regarding the good of the whole that can be aligned with through the God within, we learned that the devas and nature spirits create according to the good of the whole because they are still attuned to the "Cosmic

oneness" (in contrast to humans). But while nature spirits are etherically spacetimemattering in relation with particular physically spacetimemattering plants, the devas with their potential forms operate "outside" of spacetime, and both the devas and the God within seem to work with the Findhorn gardeners in terms of presenting possibilities and dealing with a larger scope. Thus, because the devas act as one voice representing the oneness of the whole universe, and because being in contact with the devas is ultimately about being connected with the core of our own selves and the good of the whole – which aligns closely with how the God within is described – we will focus on the devas and will not go into further detail regarding the God within.

6.3.2 Devas and indeterminacy

According to the Findhorn gardeners, as was discussed in Chapter 3, the devas hold potential (non-materialized) patterns or forms, and they causally influence the spacetime materialization of these forms while themselves being "outside" of spacetime. Although the Findhorn gardeners communicated with individual devas such as the Pea Deva, the devas are both one and many, such that, even when the devas seem to speak as individuals, they simultaneously speak as one. Moreover, the devas with their potential patterns exist only in conjunction with the plants expressing their patterns, and conversely, the materialization of a plant in spacetime occurs only in conjunction with its associated devas. We showed in Chapter 4 that it is not possible to account for devas in a modernist onto-world, which does not include

objective possibility as integral to its ultimate existents. But in an agential realist onto-world, with possibility as a dynamically inseparable part of in/determinate matter, we are not precluded from making sense of devas.

The dynamic in/determinacy of matter in an agential realist onto-world was thoroughly discussed in §5.1 of the previous chapter. To briefly review, matter in an agential realist onto-world is not pre-existing but is in/determinate, where indeterminacy is part of what makes it possible for matter to relationally differentiate in particular patterns and not others, and where this indeterminacy is never resolved once and for all. Moreover, in/determinacy troubles the very notion of singular or multiple, and neither fully determinate nor fully indeterminate entities exist in themselves. With the dynamism of in/determinacy, the agential cut is a differentiating-entangling (one move), in which contingent determinations within phenomena create new entanglements, constraining and enabling what is possible for further intra-actions. Moreover, agential realist phenomena are constitutively entangled with the void, or with the virtual particles that embody different possibilities for mattering. Thus, although the agential cut results in particular determinations at the exclusion of others, virtuality is constitutively included because every possibility is explored through virtual intra-actions, such that the resulting determinations are a result of the entire diffraction pattern of possibilities.

In an agential realist onto-world, with its dynamic reconfiguring of fundamentally in/determinate matter, we can begin to make sense of devas in terms of particular patterns of indeterminacy that are inseparable from, and dynamically

reconfiguring with respect to, their associated spacetimematterings. As we learned in Chapter 3, Findhorn's devas are an inseparable part not only of plants, but of entire gardens, and also of land formations, weather, minerals, insects, humans, and even machines. Thus, we can understand the devas with their potential patterns that are an inseparable part of all spacetime materializations in terms of the fact that matter in an agential realist onto-world is not pre-existing but is fundamentally in/determinate – all spacetimematterings (such as plants) are partially constituted by their associated patterns of possibilities (devas), where these patterns of possibilities exist only in conjunction with phenomena as a whole. Thus, in an agential realist onto-world, we are not precluded from making sense of devas in terms of the patterns of possibilities that are dynamically intra-related with spacetimematterings through the in/determinacy of phenomena.

However, if we attempt to make sense of some of the specific features of Findhorn's devas, we must go further. For Findhorn, devas are beings that collaborate with humans, so it would be limiting and incorrect to simply claim that devas *are* the indeterminacy, or the patterns of possibility, within matter. That is, it is not clear what it could mean to collaborate directly with indeterminacy, and moreover, an agential realist onto-world would not include purely indeterminate beings, as nothing is purely indeterminate or purely determinate. Instead, we can begin by considering that devas are somehow enacted as beings that hold and work with the patterns of possibility associated with particular sets of intra-actions, where we need to create hypotheses regarding how we could make sense of "holding" and

"working with" patterns of possibility in the context of agential realism. As part of this, we also need to address how Findhorn's devas exist "outside" of spacetime and are both one and many, or in other words how devas can be enacted as beings that cannot be enumerated and that are not spacetimemattering.

In order to make sense of these aspects of devas, it will be helpful to bring in Barad's (2012) work on quantum field theory, which was introduced in Chapter 5. We learned, in short, that matter is constitutively entangled with the void – which is not empty but is full of virtual particles (that are real but do not exist in spacetime) – such that we can think of the in/determinacy of matter in terms of enacted individuals being partially constituted by the infinite number of virtual intra-actions through which all the relevant possibilities are explored as part of intra-action. Barad (2012) furthermore describes virtuality as "*the indeterminacy of being/non-being, a ghostly non/existence*", such that virtual particles "teeter on the edge of the infinitely thin blade between being and non-being" (12). Findhorn's devas are beings in the sense that they can be identified and communicated with, but they are not beings in the sense that beings are usually considered to be individually separable and locatable in spacetime – or with agential realism, agentially separable along with enacted spacetime. Thus, like virtual particles, devas seem to fit into the category of being/non-being, in that there is no determinate fact as to whether they are beings or non-beings. Moreover, like virtual particles, devas do not exist in spacetime, devas hold all the relevant possibilities through which entities are partially constituted when they are materialized in spacetime, and devas are ultimately inseparable from these

materializations. In an agential realist onto-world, in/determinate matter constitutively includes indeterminacy, so devas can still be referred to as material, but as beings/non-beings, they are better referred to as im/material. We will use the term "virtual beings" to refer to devas in an agential realist onto-world, keeping in mind the fact that being/non-being is implicated in this term.

Considering devas as virtual beings brings up some interesting considerations. Anything that is spacetimemattering – for example, physical plants and their etheric counterparts – is iteratively reconfiguring through sets of related agential cuts, producing bodies that are ingrained with the historiality of their own becoming, including the sets of possibilities that inform their ongoing enaction. These spacetimematterings are partially constituted by virtuality, but they are also produced by an agential cut, which effects the agential separability that results in the determinacies-within-phenomena that can be enumerated by virtue of their co-constituting in particular spatiotemporal and causal configurations with respect to one another. For example, "we" can point to specific physical plants and their etheric counterparts, along with their enacted spatiotemporalities and causal connectivities (as "we" are all co-constituting within phenomena), but "we" cannot do this with devas. In other words, devas are not spacetimemattering in the sense that an agential cut produces particular spatiotemporal patternings that enable the enumeration of particular enacted individuals. Devas are not enacted individuals – they are virtual beings – yet they are intimately involved with spacetimematterings, and they both influence and are influenced by intra-action. These considerations will help us to

make sense of what it could mean that devas hold and work with patterns of possibility.

The causality of the devas, or the way in which they work with their patterns of possibility to shape intra-action, will be addressed in the following subsection. As for the notion of holding a pattern of possibility, the Findhorn gardeners refer to devas both in the sense that "devas hold patterns" and in the sense that "devas are patterns". With devas as virtual beings, we could hypothesize that devas are constituted by shifting patterns of possibility while not being subject to agential cuts that ever resolve them into spatiotemporally enacted determinacy and enumerability, and that they participate in the process of relational differentiating-entangling through virtual intra-action. We must note that virtual intra-actions, not being metrically spatiotemporal, cannot be measured. Furthermore, virtual intra-actions are not spatiotemporal at all, and can thus not be perceived in ways that transphysical spacetimemetterings (such as nature spirits) could possibly be perceived (though not with the physical sense organs). Yet as discussed above, virtuality has material effects (because we can see the effects of vacuum fluctuations), so it makes sense to say that devas are not themselves spacetimemattering while still being causally efficacious in spacetimemetterings, the details of which will be addressed in the following subsection.

6.3.3 Devas as causal factors in an agential realist onto-world

According to the Findhorn gardeners, as discussed in Chapter 3, the devas direct their "energy" toward the spacetime materialization of their potential pattern, thereby playing a causal role in the process of materialization. In Chapter 1, we explained how with agential realism, where intra-activity is the ongoing dynamism of in/determinacy, the determinacies-within-phenomena are constituted not by any single possibility that becomes determinate while the other possibilities disappear, but by the entire pattern of possibilities involved in the intra-action, such that the indeterminacy does not resolve once and for all, but is further entangled. With devas being both one and many, we recognized that it does not make sense to refer to any "one" deva as a causal factor, but that devas are entangled patterns of possibilities that, by virtue of their joint action, play a causal role in spacetimemattering. Yet we must say something more about the role that devas play, and how intra-actions become this and not that, when all the devas are involved. In this subsection, we will discuss how we can make sense of devas as causal factors in an agential realist onto-world, or how devas work with their patterns of possibility.

In §6.1.2, we discussed that in an agential realist onto-world, causality does not occur between fully-formed entities, but occurs as part of the coming-into-being of entities within phenomena; this provides the connection between causality and the process of coming-into-being that is needed in order to explain how Findhorn's devas act as casual factors in the spacetime materialization of plants (and other entities). We furthermore discussed how indeterminacy acts as a causal factor in shaping intra-

action, because spacetimematterings are partially constituted within phenomena by the associated patterns of possibilities, or by their virtual intra-actions. Based on how we characterized devas as virtual beings in the previous subsection, we can say that in an agential realist onto-world, plants are partially constituted by their virtual intra-actions with devas, and in turn, the agential cut shifts the possibilities for further intra-actions, which means that the patterning of the devas is affected in terms of what is and what is not possible for further intra-actions. Thus, with the dynamic in/determinism of matter in an agential realist onto-world, we can begin to make sense of Findhorn's devas in terms of the indeterminacy that plays a role in causally shaping intra-action. We can additionally speculate about how to make sense of some of the specific features of devas, as we will do next, but in terms of supporting the thesis of this project, what is important is that we have shown that agential realism overcomes the modernist limitations that preclude the possibility of making sense of devas at all.

In the previous subsection, we said that devas hold and work with their patterns of possibilities, where we construed "holding" in terms of the devas as virtual beings that are constituted by these patterns. In this section, we will hypothesize that the causality of the devas, or the way in which they "work with" their patterns of possibility to shape intra-action, is by ordering these sets of possibilities so as to lure the intra-action toward spacetimemattering in particular ways and not others. We need to discuss both what is meant by "ordering" and by "luring". First, this hypothesis is inspired by Whitehead's (1978) process relational ontology, in which

sets of possibilities are associated in an ordered way with particular subjects-in-the-process-of-becoming, and these subjects-in-the-process-of-becoming are differentially *lured* (Whitehead's term) by these possibilities to enact particular patternings. Similarly, Findhorn's devas do not passively sit by and watch how their patterns are spacetime materialized, but they actively direct their "energy" to this end. This active role of possibilities is not directly suggested as part of agential realism, but Barad's (2012) description of virtuality does include a sense of liveliness: "The void is a lively tension, a desiring orientation toward being/becoming", and virtual particles are actively "yearning" toward and "imagining" some kind of non-virtual existence, where these yearning and imaginings have "material effects" (13). Minimally, we can say that in an agential realist onto-world, in which indeterminacy is the condition for the continued dynamism of intra-action, in/determinate matter is not a passive affair. Perhaps we could even construe particular intra-actions as being lured toward enacting particular agential cuts, at the exclusion of others, as a response to the differential yearning of the virtual particles involved in those intra-actions.

Regarding this differential yearning, we must clarify that not all possibilities are equally weighted for any given intra-action, but that there is an ordering to these possibilities. That is, as we have discussed, all possible things are happening to some degree, such that the entire patterning of possibilities is causally implicated, yet it is also the case that this patterning is constituted based on the differential weighting of the associated possibilities (personal communication from Karen Barad to the author on Nov. 2, 2018). Similarly, for Whitehead (1978), the possibilities are ordered with

respect to their relevance for a particular subject-in-the-process-of-becoming; moreover, these possibilities act as lures, such that the subject-in-the-process-of-becoming will be differentially lured according to the ordering, or the differential weighting, of these possibilities. Regarding the hypothesis we are presenting – that the devas work with their patterns of possibility to shape intra-action by ordering these sets of possibilities so as to lure the intra-action toward spacetimemattering in particular ways and not others – we could say that a deva works with its particular pattern of possibilities by virtually intra-acting with some particular weight, in contrast to the other devas. In other words, the differential weight represents the differential yearning, which acts as a lure, in the sense that some virtual intra-actions are more relevant to a subject-in-the-process-of-becoming than others. Yet the devas are ultimately one, and as one, we can say that they form an ordered pattern through differentially weighted sets of virtual intra-actions, such that they jointly condition the enaction of the agential cut.

Let us take the example of a kale plant, which is iteratively constituted through its intra-actions, including its virtual intra-actions, or the infinite possible configurings of what could be or could have been. This kale plant is partially constituted not only by the Kale Deva but also by the Broccoli Deva, and ultimately by the entire patterning of devic possibilities. So why is it a kale plant and not a broccoli plant? Because although the devas are integrated as one field of indeterminacy – the devas that speak with one voice – there is an ordering to this indeterminacy, or a differential weighting (yearning) that makes particular devas

more relevant for, or acting as stronger lures for, particular spacetimematterings. Although all devas are involved, the Kale Deva is weighted most heavily for the spacetimematterings of kale plants. In summary, all relevant possibilities are virtually intra-acted, and the causality is due to the whole pattern of possibilities, but the material-discursive specificities of any given spacetimemattering are lured into enaction according to a differential weighting of these possibilities.

As far as virtuality is concerned, one might prefer to write it off as a mathematical necessity that does not warrant ontological investigation.[139] However, we have connected the virtuality of the agential realist onto-world with virtual beings such as Findhorn's devas, and in Findhorn's onto-world, the devas are important collaborative entities, not to mention the fact that nothing would exist at all without the devas and their potential patterns. Agential realism revolutionizes matter by calling on its fundamental in/determinacy, and the Findhorn gardeners, by collaborating with the devas in their garden, seem to have found a way in which to work with some aspect of the indeterminacy of matter. For Findhorn, engaging with the devas, or with virtual beings, means becoming aware of new possibilities, actively

[139] An example of someone who does take virtuality seriously is Rupert Sheldrake (2009), with his "hypothesis of formative causation". According to Sheldrake (2009), a range of possible forms is available for any given physical situation, but physical laws and causality cannot necessarily dictate which form will be taken up, so he posits "morphogenetic fields" as additional causal factors in the determination of form (82). Morphogenetic fields are *virtual* fields (Sheldrake 2009, 65), which are not spatiotemporal fields but are probability structures (Sheldrake 2009, 72) that both microscopically and macroscopically order physical processes that would otherwise be indeterminate (Sheldrake 2009, 78). Morphogenetic fields affect physical form by imposing "patterned restrictions on the energetically possible outcomes of physical processes", and these fields "resonate" with particular physical systems because similar physical systems have taken up similar forms in the past (Sheldrake 2009, 3). With this hypothesis, the cells of a developing organism differentiate according to the pattern of the morphogenetic field with which they are associated, forming new structures based on previous similar structures.

exploring possibilities, and getting a sense of how different possibilities might relate to the whole. This practice of responding to new possibilities – specifically those that might lead to mutual flourishing – is moreover how we have construed collaboration in an agential realist onto-world. Thus, instead of simply engaging with indeterminacy as an abstract concept that is necessary in order for the mathematics to function properly, our analysis suggests that it might be possible to work with virtual beings by investigating what kinds of cuts produce devas, and then collaborating with these devas.

6.4 Devas and nature spirits as collaborators in an agential realist onto-world

In the preceding sections, we suggested that in an agential realist onto-world, it is possible to make sense of devas and the God within as virtual beings, and of nature spirits as etheric beings – or, more generally, as transphysical beings.[140] It is important to reiterate that the terms "virtual beings" and "transphysical beings" do not refer to determinate individual beings. On the contrary, virtual beings (beings/non-beings) are differentially constituted by shifting patterns of possibilities as part of virtual intra-actions, and transphysical beings are differentially constituted as part of iteratively enacted transphysically-configured spacetimematterings. Neither virtual nor transphysical beings are *physically* spacetimemattering, which means that they cannot be measured or otherwise engaged with physically, yet we are not precluded

[140] In order to show that communication and collaboration are theoretically inclusive of any transphysical being, not just etheric beings, I will refer in this section to transphysical beings, except when making a particular example related to etheric beings.

from making sense of these beings in an agential realist onto-world, in which the ultimate entities are dynamically reconfiguring in/determinate phenomena. That is, virtual beings are a dynamic part of materiality, though better referred to as im/material, and transphysical beings are materializing along with spacetime just as physical beings are, but according to different patternings.

In this section, we will investigate how virtual and transphysical beings could be said to engage in collaboration. In Chapter 5, we discussed how the notion of collaboration shifts in an agential realist onto-world, where there are no determinate individuals between whom collaborative interactions occur, and where we have suggested that collaboration is enacted by mutually intra-acting agencies as they jointly take responsibility for, or enable new responses toward, the iterative enaction of their common world. In this section, we will show that transphysical beings meet the criteria that we set out in Chapter 5 as necessary for collaboration, while virtual beings are not directly subject to these criteria and thus play a different role in collaborative practices, namely as the very condition for the possibility of these practices. After some initial considerations in §6.4.1, we will discuss communication and collaboration with transphysical beings in §6.4.2, and with virtual beings in §6.4.3.

6.4.1 Initial considerations

In Chapter 5, we showed that humans are not the only collaborators in an agential realist onto-world. We started with the criteria that collaboration in a

modernist onto-world requires agency, knowledge, intelligence, and the ability to communicate, where communication includes subjectivity, intentionality, and the ability to physically exchange meaningful information. Then, we showed that in an agential realist onto-world, agency, knowledge, intelligence (intelligibility), subjectivity, and intentionality can be reworked as dynamic features of intra-action that do not require human participation. Regarding the physical exchange of meaningful information, we found that any potential subjects[141] are inherently connected by virtue of entanglement, where their mutual intra-action – which replaces interactions such as exchanges of information – does not require human participants, brains, mental states, physical sensory organs, or physicality at all. Moreover, we found that meaning is an inherent part of material-discursive intra-action, and that what is required for meaningful communication is the ability to develop patterns of meaning-making through the particular type of iterativity associated with sets of intra-actions that share the same historiality, which again, is not limited to humans.

While we have discussed virtual and transphysical beings at length in the preceding sections of this chapter, we have not specifically stated what kind of being a human is. Because we will ultimately be discussing collaborations that include humans, we must briefly address what it could mean to be enacted as a human. We can say that a human is partially constituted by physical spacetimematterings, given that humans are iteratively enacted along with physical bodies (in contrast to virtual

[141] In Chapter 5, we used the term "potential subjects" to designate all subjects-in-the-process-of-becoming and subjects-that-have-or-could-become that could possibly be differentiated from the in/determinate whole.

and transphysical beings, which are not enacted along with physical bodies). In a modernist onto-world, it might moreover be recognized that humans have some sort of mind or mentality that is somehow additional to yet still associated with their physicality, as was discussed in Chapter 4. But in an agential realist onto-world, we are not limited to physical spacetimematterings, so we could consider the human to be differentially constituted as a complex relational enaction of multiple enfolded patterns of spacetimematterings, not limited to physical spacetimematterings but also including transphysical spacetimematterings. For example, we have highlighted etheric spacetimematterings as crucial for the enaction of life-specific processes, which suggests that humans are partially constituted by etheric spacetimematterings. Certainly in the New Age onto-world, humans are composed of multiple bodies including but not limited to physical and etheric bodies. In an agential realist onto-world, there are of course no pre-given humans, no separate bodies, and no separate realms, but different patterns of spacetimematterings are thoroughly causally connected and dynamically enfolded through one another. Since it does not seem appropriate to refer to humans as constituted only by physical spacetimematterings, given the importance of etheric spacetimematterings regarding life force, we can propose that humans are (at least) constituted by both physicality and transphysicality, or that they are trans/physical beings.[142] In the context of this project, however, we will bracket any further discussion regarding the specifics of

[142] Since virtuality is constitutive of all spacetimematterings, humans are moreover partially constituted by virtuality, but the point I am making here is about moving beyond the assumption that humans are only physically constituted.

human trans/physicality. Instead, we will focus on how transphysical beings (e.g. nature spirits) and virtual beings (e.g. devas) – which are both beings that are not constituted by physical spacetimematterings at all – could engage in communication and collaboration.

6.4.2 Communication and collaboration with transphysical beings

Transphysical beings such as Findhorn's etheric nature spirits are enacted by particular sets of agential cuts, just as humans are, although the resulting patterns of spacetimematterings are transphysically, instead of physically, configured. But we showed, in Chapter 5, that physicality is not required for intra-active communication, including meaning-making; therefore, transphysical beings need not be excluded from participating in communication. In other words, the potential subjects that are all entangled with one another as part of the whole can include both physical and transphysical beings. Moreover, since the dynamic features of intra-activity can be shown to include agency, knowledge, intelligibility, subjectivity, and intentionality, these should be available to transphysical as well as physical beings (or more accurately, to spacetimematterings that are enacting transphysical as well as physical configurations). While the manner in which the world is made intelligible for and as part of a transphysical spacetimemattering is certainly different from the way in which the world is made intelligible for and as part of a physical spacetimemattering, the important point is that no spacetimemattering is excluded from participating in intelligibility, simply because they are enacted along with different

spatiotemporalities and causal connectivities. Therefore, no spacetimemattering is excluded from engaging in these practices that we have deemed necessary for collaboration.

The further criterion for engaging in sustained meaningful communication is the ability to develop patterns of meaning-making through the iterativity associated with historic sets of intra-actions, which, as we discussed in Chapter 5, is not limited to humans, and includes even electrons (where humans and electrons are not determinate individual beings but are iteratively enacted as part of phenomena). There are multiple reasons supporting the claim that transphysical beings are also constituted by historic sets of intra-actions. First, physical configurings of spacetimemattering should not be necessary in order for historiality to be ingrained in the iterative becoming of a body; that is, it seems reasonable to assume that etheric bodies can be enacted with the traces of their enfolded becoming within them, just as physical bodies are. We additionally have empirical evidence from Findhorn, because the nature spirits are examples of transphysical beings that are able to engage in sustained relationships with the Findhorn gardeners, which requires some sort of memory or historiality, and from which we can surmise that they must therefore be constituted by historic sets of intra-actions. Therefore, we can suggest that transphysical beings are constituted by historic sets of intra-actions, such that they can participate in sustained meaning-making practices as part of their iterative enaction.

In summary, once we overcome physicocentrism, there is no reason to deny transphysical beings the criteria that we established for collaboration, although of course the particular modes of collaboration may differ depending on the types of beings that are enacted. But in addition to these criteria, we must address the fact that the notion of collaboration shifts in an agential realist onto-world. We have stated that collaboration is enacted as part of mutually intra-acting agencies jointly taking responsibility for, or enabling new responses toward, the iterative enaction of their common world; thus, we must ensure that transphysical beings are not excluded from taking responsibility as part of their iterative enaction. First, because agential intra-action entails responsibility, and transphysical beings are enacted as part of agential intra-action, we can say that transphysical beings are not excluded from actively participating in responsibility. Moreover, from Findhorn, as we discussed in Chapter 3, we have empirical evidence suggesting that the etheric nature spirits (transphysical beings) took active responsibility in their collaborations. According to the Findhorn gardeners, the nature spirits (and devas) co-create in alignment with the good of the whole because they are still attuned to the "Cosmic oneness", whereas humans tend to act in selfish ways because they have lost sight of this oneness. Also, according to the Findhorn gardeners, the nature spirits (and devas) recognize the importance of their entanglement with humans, because part of their reason for wanting to collaborate with humans is to remind humans of their ultimate oneness, so that humans can stop acting in selfish, destructive ways (that are not in alignment with the good of the whole). Based on Findhorn, then, the nature spirits certainly collaborate

in ways that express their active responsibility to the mutual flourishing of the whole. If we take this evidence seriously, then in an agential realist onto-world, we can posit that collaborations can be enacted as part of the mutual intra-action of humans and nature spirits through a joint taking of responsibility for the regeneration of a livable common world.

Before concluding this subsection, we will briefly consider different modes of communication, or meaning-making, including knowing and intelligibility. Regarding communication, while human communication tends to occur with the participation of the physical sense organs, it is not possible to communicate with transphysical beings by seeing them with the physical eyes or by hearing them with the physical ears. That is, as we learned in Chapter 3, Roc was able to "see" and "hear" the nature spirits (transphysical beings), though not with his physical sense organs. According to Roc, this communication occurred through some form of "mental" or "telepathic" activity, or through some sort of "thought transference".[143] Another example is provided by David Spangler, who joined the Findhorn gardeners to help with Findhorn's development as a spiritual center, and who has researched and written extensively on his explorations of the "subtle" realms, which include both transphysical and virtual beings (see for example Spangler 2010). As Spangler (2010) says, "I became the communication rather than just receiving it from outside

[143] It is interesting to note that, in a modernist onto-world, telepathic communication tends to be disregarded because it cannot be physically explained. But if we consider humans as trans/physical beings, and if we have empirical evidence from Findhorn that communications with transphysical beings might occur in some sort of telepathic manner, then it becomes interesting to reconsider telepathy in terms of the transphysically enacted aspects of humans.

myself like we hear someone speaking to us" (43), and "I pay attention, in other words, to what is evoked in me in a full-bodied way" (42).

Based on these types of experiences from Findhorn, we can propose that when humans communicate with transphysical (and virtual) beings, humans are constituted with some kind of bodily, or materially enacted knowing, such as images, symbols, thoughts, words, feelings, etc. Similarly, when transphysical beings communicate with humans or with other transphysical beings (or with virtual beings), they also are constituted with a bodily, or materially enacted knowing, but according to different patternings than for humans. That is, as trans/physical beings, humans are constituted by both physical and transphysical patterns of enfolded spacetimematterings, while transphysical beings do not include physical patternings. Thus, the ways in which knowing and intelligibility are materially enacted for transphysical beings will likely be different from how images, symbols, thoughts, words, feelings, etc. are materially enacted for and as part of humans. Finally, it is important to clarify that in an agential realist onto-world, these human, transphysical, and virtual beings are not separate individuals between whom communication is occurring (as an interaction between pre-given individuals), but that communication is being enacted in diverse ways as part of complex intra-actions through which these various beings are mutually co-constituting.

6.4.3 Communication and collaboration with virtual beings

In the previous subsection, we gave examples from Findhorn illustrating how, when humans communicate with either transphysical or virtual beings, humans are constituted with some kind of bodily, or materially enacted knowing, such as images, symbols, thoughts, words, feelings, etc. Another example from Chapter 3, in specific reference to the devas (virtual beings), is how for Dorothy, communications from the devas came to her as "thoughts of inspiration". While communicating with both transphysical and virtual beings resulted in similar experiences for the Findhorn gardeners – because humans are enacted along with meaning-making practices that are specific to their ongoing constitution as trans/physical beings – the way in which virtual beings (such as Findhorn's devas and the God within) participate in communication must be markedly different than from how spacetimemattering beings (such as both humans and nature spirits) participate in communication, because virtual beings engage only in virtual intra-actions and do not themselves spacetimematter.

Whereas transphysical beings – once physicocentrism is overcome – are simply another pattern of spacetimemattering that can be distinguished from physical beings, virtual beings require a different sort of analysis. Because their participation in intra-action is through virtual intra-action, which is not itself spacetimemattering, we must question whether they can be said to enact agency, knowledge, intelligibility, subjectivity, and intentionality, as well as whether they participate in sustained shared meaning-making – or in short, whether they can participate in collaborative meaning-

making practices. In this subsection, we will suggest that virtual beings cannot be said to engage directly in agency, knowledge, intelligibility, subjectivity, intentionality, or sustained shared meaning-making, but that they can still be said to participate in collaborative meaning-making practices in the sense that they are the very condition for the possibility of such practices, where we will hypothesize that their method of communicating and collaborating with humans (and transphysical beings) is by luring them toward particular possibilities and not others. The details follow.

First, it is important to affirm that virtual beings fully participate in the process of intra-action, considering that they – where "they" means both one and many – are constitutive parts of intra-action, partially influencing how the agential cut will be made. But regarding the criteria that we have been considering for collaboration, we will see that these criteria do not directly apply to virtual beings. For example, virtual beings cannot be considered as potential subjects – where potential subjects are inherently connected through entanglement – because virtual beings are not subjects-in-the-process-of-becoming or subjects-that-have-or-could-become. Yet they are still inherently connected to potential subjects because possibilities are partially constitutive of potential subjects. Although only particular patterns of possibilities are associated with any given phenomena, we cannot help ourselves to an enumeration of indeterminacy, and so we can conclude that (all) possibilities are inherently connected with all potential subjects. Thus, virtual beings

are inherently connected to any potential subjects and are moreover constitutive of these potential subjects.

Regarding how sustained shared meaning-making could occur, the first question is how to apply the concept of meaning to virtual beings. It is through the agential cut that potential subjects are materially-discursively enacted, where meaning is an inherent part of spacetimemattering, and where meaning-making can be sustained through historic sets of intra-action. But how is meaning enacted for virtual beings, which are constituted by all possible patterns of possibilities for anything that ever has been or could be spacetimemattering? Whereas physical and transphysical spacetimematterings are limited by having access only to the meaning that is enacted as part of their particular material configuration, we could propose that virtual beings – which are themselves constituted by patterns of possibilities – have limitless access to infinite virtual meaning, where "virtual meaning" refers to any meaning-making that has been or could be materially enacted. But regarding sustained shared meaning-making, our criterion of requiring historic sets of intra-actions does not apply to virtual beings, because virtual beings do not spacetimematter and do not engage in historiality. That is, although patterns of possibility are dynamically shifting as part of intra-action, virtuality cannot be enumerated or otherwise arranged according to some enacted spatiotemporality, so it does not make sense to talk about historiality in regards to virtual beings. Thus, virtual beings cannot be said to engage in sustained shared meaning-making practices. However, instead of concluding that virtual beings cannot participate in communication and collaboration, we can

recognize that these practices take on slightly different meanings for virtual beings, as follows.

First, it does not make sense to talk about communication or collaboration between virtual beings, because they are ultimately all one, inclusive of all possible virtual meaning. Regarding communication between virtual and non-virtual beings – for example, the Findhorn gardeners communicating with the devas – we cannot claim that virtual beings engage in sustained shared meaning-making, but we can propose that *they are one of the conditions for the possibility of this meaning-making*. That is, while spacetimemattering communicators are iteratively enacted along with particular meaning-making practices, where meaning can be sustained as part of historic sets of intra-actions, virtual beings, as part of virtual intra-action, hold and work with the very possibilities for these various meaning-making practices. Similarly, virtual beings cannot be said to actively participate in agency, knowledge, intelligibility, subjectivity, and intentionality as part of intra-action, because these features of intra-action are part of what it means to be spacetimemattering. Yet, the agency, knowledge, intelligibility, subjectivity, and intentionality that are enacted as part of intra-action would not be possible without the virtual beings that hold and work with the patterns of possibility that partially determine how these features can be enacted. Thus, while virtual beings do not actively participate in the features that we have deemed necessary for collaboration, meaning that they are not themselves spacetimemattering along with particular patterns of sustained shared meaning-making, we can propose that they are the (partial) condition for the possibility of this

meaning-making, and can therefore still be said to play a role in collaborative meaning-making practices.

Based on our discussion in §6.3.3 regarding how virtual beings differentially lure (non-virtual) intra-actions toward particular agential cuts (and not others), we could furthermore hypothesize that virtual beings communicate with spacetimemattering communicators by differentially luring them toward particular outcomes and not others. It is important to note that this is not a one-way communication, because the virtual beings are also affected through a reconfiguring of their patterns – in determinate and meaningful ways – in response to how marks on bodies are enacted as part of the spacetimemattering communicators. Thus, in a communication between virtual and non-virtual beings, we can suggest that (i) the virtual beings lure the non-virtual beings toward particular outcomes through virtual intra-actions, (ii) the non-virtual beings are enacted – through historic sets of intra-actions – with particular meaning-making practices partially constituted by their meaningful exploration of the relevant differentially weighted possibilities, and (iii) the particular way in which the non-virtual beings spacetimematter – which is influenced but not completely determined by the luring of the virtual beings – reconfigures the patterning of the virtual beings in their association with further intra-actions. As we discussed in Chapter 5, not every intra-action counts as a communication, so although virtual beings are always engaging in luring and reconfiguring, the non-virtual communicator must still be constituted by historic sets of intra-actions (see (ii) above) in order to engage in sustained meaning-making

practices. Finally, it is important to reiterate that in an agential realist onto-world, these virtual and non-virtual beings are not separate individuals between whom communication is occurring (as an interaction between pre-given individuals), but that communication is being enacted in diverse ways as part of complex intra-actions through which virtual and non-virtual beings are mutually co-constituting.

We have suggested (see (ii) above) that non-virtual beings, such as humans, would experience their communications with virtual beings, such as the devas or the God within, as some kind of meaningful exploration of the relevant possibilities toward which they are being differentially lured. And we know from Findhorn that humans experience communications with these beings in a variety of ways, for example as thoughts of inspiration that they translate into particular words or actions, or by feeling connected to the good of the whole, or even by feeling as if they are connected to the core of themselves or to the core of the universe. It is important to recognize that this does not mean that the virtual beings are communicating these specific feelings or thoughts to the humans (as part of intra-action), but that the way in which the humans are enacted in response to the luring of these virtual beings is by, for example, feeling these thoughts of inspiration. In other words, while the virtual beings communicate both through luring and through a subsequent reconfiguring of their patterns, the spacetimemattering human enacts this communication in the particular manner that is relevant to their ongoing constitution as trans/physical beings, namely as some kind of bodily, or materially enacted knowing, such as images, symbols, thoughts, words, feelings, etc.

Finally, regarding the notion of taking responsibility as part of collaborating in an agential realist onto-world, we can say that because virtual beings are not spacetimemattering, they are not materially-discursively constituted along with the responsibility that is an inherent part of intra-action. However, if one of the methods for taking responsibility is to become aware of new possibilities, responding to those possibilities that lead to a mutual flourishing of our entangled selves (Barad 2007, 296), we can propose that virtual beings are part of the condition for the possibility of taking responsibility, because they actively present these possibilities through virtual intra-action, differentially luring the intra-action toward particular outcomes (and not others). Though we cannot claim that virtual beings necessarily lure intra-actions toward possibilities that result in mutual flourishing, we have empirical evidence from Findhorn, as reviewed in the previous subsection, that the devas (and nature spirits) co-create in alignment with the good of the whole. Thus, although devas are not mutually intra-acting agencies, because they are not mutually spacetimemattering along with their collaborators, there is still a sense in which they could be said to take responsibility, namely as virtually intra-acting agencies that differentially lure intra-actions toward particular outcomes and not others.

In summary, in this subsection, we have shown how it could be possible for transphysical beings such as nature spirits to meet the conditions that we have specified for collaboration, and we have proposed that virtual beings are not directly subject to these conditions but could still be said to participate in collaborative meaning-making practices in the sense that they are the very condition for the

possibility of such practices. Moreover, with collaboration in an agential realist onto-world occurring when mutually intra-acting agencies jointly take responsibility for the iterative enaction of their common world, we have shown how it could be possible for transphysical beings such as nature spirits to jointly take responsibility along with humans in their mutual intra-actions, and we have proposed that virtual beings could also be said to take responsibility as virtually intra-acting agencies that differentially lure intra-actions toward particular outcomes and not others.

6.5 Final Reflections

In this chapter, we have provided support for the thesis of this project by presenting a possible way of making sense of Findhorn's devas and nature spirits as ontologically real beings that are enacted along with humans as part of the iterative relational differentiating-entangling of the universe. As part of overcoming the physicocentrism of the modernist onto-world, we have worked out in detail how it could be possible for an agential realist onto-world to be productive not only of physical beings but also of transphysical beings (e.g. nature spirits) and virtual beings (e.g. devas). While agential realism provides the ethico-onto-epistemological framework that makes this possible, it does not itself build up a specific cosmology detailing the various types of beings that could be enacted. That is, while we are not precluded from making sense of these beings – because in contrast to the determinate physical individuals of the modernist onto-world, the dynamically reconfiguring in/determinate phenomena of the agential realist onto-world include possibility and

can include the transphysical – we have had to present hypotheses that are not direct consequences of agential realism in order to present a possible way in which to make sense of some of the specific details of Findhorn's devas and nature spirits.

In the context of the thesis of the project, we have simply provided an explanation for how we could understand the observations and experiences of the Findhorn gardeners in their collaborations with the devas and nature spirits. But in a larger context, this is a rather bold proposal, the significance of which should not be overlooked. With physicocentrism, modernists tend to believe that the physical world is the only reality, and the question would likely not arise as to whether there are any non-physical apparatuses that play a role in (physical) intra-action. But one of the key functions that is available in an agential realist onto-world is the practice of making otherwise hidden apparatuses visible, understanding why they matter, and taking responsibility for them. In the present case, the hidden apparatuses are transphysicality and virtuality, which are not only not accounted for, but are explicitly excluded by the modernist onto-world. But as we learned in Chapter 3 from the Findhorn gardeners, if humans continue to ignore or otherwise disrespect the devas and nature spirits, this could result in the withdrawal of life force from the physical realm, with devastating results, not only for humans. Thus, in Chapter 7, we will explore what might be required in order to engage scientifically with these otherwise hidden apparatuses, both by making transphysicality and virtuality the objects of scientific study, and by including collaborations with the devas and nature spirits in our work with plants.

7. Engaging Scientifically with Plant-Human Collaboration

> We are responsible for the world of which we are a part, not because it is an arbitrary construction of our choosing but because reality is sedimented out of particular practices that we have a role in shaping and through which we are shaped....
>
> What we need is an understanding of the material-discursive practices by which these connections are formed and reformed, not in space and time but in the very configuring and reconfiguring of spacetimematter. In particular, the responsible practice of science requires a full genealogical accounting of the entangled apparatuses or practices that produce particular phenomena. (Barad 2007, 390)

> It is very true that only a limited number of people have as yet developed faculties enabling them to see and communicate with the devas and nature spirits. This need not discourage us if our rational understanding can accept it. Indeed we are not being asked to 'believe', so much as to allow room for a new idea to come in and see where this leads us. (Findhorn Community 1975, ix)

Having shown how it is possible to make sense of Findhorn's plant-human collaboration in an agential realist onto-world, we can now explore how our scientific practices might be affected if we take seriously the possibility of enacting collaborations with devas and nature spirits as part of our scientific practices with plants. In Chapter 5, we showed that collaborators in an agential realist onto-world need not be limited to humans, where collaboration is enacted as part of mutually intra-acting agencies jointly taking responsibility for, or enabling new responses toward, the iterative enaction of their common world. While Findhorn's plant-human collaborations were aligned with the good of the whole, we reworked this notion in an agential realist onto-world in terms of being attentive to the possibilities that might lead to mutual flourishing, or to the regeneration of livable common worlds. In Chapter 6, we showed how it is possible to make sense of devas as virtual beings, and

of nature spirits as transphysical beings, and we showed how it could make sense for these beings to participate in collaborations as well. It is important to remember that the terms "virtual beings" and "transphysical beings" do not refer to determinate individual beings, but that, like human beings, they are differentially constituted as part of complex intra-actions.

As part of this analysis in the preceding chapters, we emphasized the fact that physicocentrism is an important apparatus guiding the modernist onto-world in terms of what is considered to be real, while virtuality and transphysicality are apparatuses that are not only not accounted for, but are explicitly excluded in the modernist onto-world. Yet for Findhorn, the devas and nature spirits are crucial aspects informing how the physical world comes to be. These have been excluded from mattering in a modernist onto-world, but in an agential realist onto-world, we can examine some of the further implications in which their inclusion could result. In this chapter, we will be focusing particularly on the implications for scientific practices, although I will sketch out how ethical and political considerations could be more thoroughly examined as part of a proper agential realist analysis.

We will begin in §7.1 by considering the nature of scientific practices in an agential realist onto-world in terms of objectivity, ethics, and responsibility, all of which are closely related to one another, as we will see. Then we will bring this discussion to bear on the topic of plant-human collaboration, considering both how we intra-act with plants in current scientific practices, and what it could mean to include collaborations with devas and nature spirits in our scientific practices. In

§7.2, we will examine a technoscientific practice with spinach plants, questioning for whom and according to whose enacted values this practice is constructed, which will illustrate the difference between treating plants as simple objects for human purposes and considering how to engage with plants as complex phenomena, and which will suggest the need to reconsider our working relationships with plants. Then, in §7.3, we will bring devas (virtual beings) and nature spirits (transphysical beings) into the discussion. First, we will consider how it could be possible to engage scientifically with virtuality and transphysicality through their physical traces in experimental laboratory practices, and finally, we will examine what it might mean – as part of our scientific practices – to enact livable common worlds that are inclusive of virtual and transphysical beings, where an intra-active engagement with these beings requires apparatuses other than the physical sense organs.

7.1 Scientific practices in an agential realist onto-world

As we discussed in Chapter 2, some of the features of the modernist onto-world include a metaphysics of individualism, representationalism, and human exceptionalism. With this combination of features, humans are thought to be separate from and outside of nature, such that scientific practices are understood as practices in which (human) language and measurement represent a pre-existing nature. This separation between a pre-given reality and the human descriptions of this reality provides the metaphysical underpinning for both realism and social constructivism, resulting in debates about whether human descriptions mirror nature (realism) or

culture (social constructivism) (Barad 2007, 133-135). Performativity is an account that circumvents the representationalist issues resulting from the separation between reality and the descriptions of this reality, because with performativity, human practices such as thinking and measuring are no longer understood as reflections on a pre-existing reality, but are instead practices in which we engage with the world of which we are a part (Barad 2007, 133). With agential realism, Barad (2007) goes beyond existing performative accounts[144] by including matter as an active performative participant and by pointing out the material nature of discursive practices (Barad 2007, 135-136), as we have discussed at length in previous chapters. Furthermore, with posthumanism, Barad (2007) stays true to Bohr's commitment to humans being a part of nature, and to scientific practices being natural practices (instead of being something that is done *on* nature), while reworking his implicitly humanistic account by recognizing that humans are not exceptional ontological beings but are differentially co-constituted along with the world of which they are a part (136, 332).[145] Thus, with agential realism's posthumanism and performativity,

[144] According to Barad (2007), Foucault recognizes that discursive practices are productive of knowledge practices as opposed to merely describing them, but he does not have a clear understanding of the material nature of discursive practices (147), and he moreover talks about the production of human bodies but takes non-human bodies for granted (169). Also according to Barad (2007), Butler understands matter as a process of materialization, but misses the fact that matter participates in this process of materialization as opposed to passively materializing as a result of discursive practices only in the sense that matter is the "passive product of discursive practices rather than as an active agent participating in the very process of materialization", and only in terms of human discursive practices and human bodies (151).

[145] In fact, agential realism can be thought of as a kind of naturalism, according to the conception of naturalism as reworked by Rouse (2004); as Barad (2007) states, "Furthermore, my account of scientific practices is not naturalistic in the sense of giving science unquestioned authority to speak for the world, on the contrary; Rouse argues that a suitably revised conception of naturalism takes seriously what our best scientific theories tell us while simultaneously holding science accountable for its practices, for its own sake as it were, in order to safeguard its stated naturalist commitments.

nature and culture are no longer separate, and scientific practices, like any practices, are material-discursive practices as part of which the scientist is co-constituted.

In a modernist onto-world, as we have discussed in various contexts, scientists focus on the fully-formed, physical aspects of matter, which means that they engage with what I am referring to as "simple objects", or as determinate individual objects located in physical spacetime.[146] Scientific practices, then, reveal the (pre-existing) characteristics of these simple objects, which are the ultimate entities of the modernist onto-world. But as we have discussed, the ultimate entities of an agential realist onto-world are in/determinate phenomena, and there are no pre-existing individual entities with pre-existing characteristics that can be analyzed. As Barad (2007) says, "In my agential realist account, scientific practices do not reveal what is already there; rather, what is 'disclosed' is the effect of the intra-active engagements of our participation with/in and as part of the world's differential becoming" (361). That is, there are no simple objects, and everything must be worked with as complex material-discursive phenomena. Moreover, scientific practices entail intra-active participation through the co-constitution of the scientist and the part of the world that they are studying. Through this intra-active engagement, boundaries are iteratively reconfigured, producing knowledge as part of the enacted materiality that includes more than just

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Indeed, the unquestioned authority of science does not get a free pass here; on the contrary, the point is that a strong commitment to naturalism in Rouse's sense makes it possible to call its presumed authority into question on its own terms" (407 n19).

[146] Whitehead (1925) refers to this as the fallacy of "simple location", in which "nature" is thought to be made of matter that is "*here* in space and *here* in time" without requiring any other reference to any other portion of space and time (49). For Whitehead (1925), no element can be said to posses the property of simple location in space and time, and it is a fallacy to simply state the location occupied by matter (in some given conception of spacetime, which could be either absolute or relative) without saying anything about its relationality (58).

the human mind: "Boundary-making practices do not merely pick out the epistemic object, backgrounding the rest. And scientific practices are not merely practices of knowing, and the knowledge produced is not ours alone" (Barad 2007, 378). The scientist is responsible not only for their own iteratively shifting boundaries, but also for taking account of what knowledges are produced and for whom, as well as what knowledges and knowers are excluded as part of their scientific practices.

One of the critical factors in working with scientific practices in an agential realist onto-world is to correctly identify the objective referent, which is not a simple object, but is the whole phenomenon as part of which the scientist themself is co-constituted. As we discussed in Chapter 2, the agential cut enacts agential separability within phenomena, providing the conditions for objectivity through a contingent resolution of the ontological indeterminacy (Barad 2007, 348). Thus, objectivity becomes a matter of the scientist being responsible for their role in co-creating these phenomena, or being accountable for how the world emerges through their participation (Barad 2007, 361), which requires a careful accounting of the multiple apparatuses involved in the production of the phenomena under investigation (Barad 2007, 390). This moreover includes taking responsibility for the fact that "the very nature of who 'we' are beings to shift" (Barad 2007, 363) in conjunction with scientific practices: "The entanglements we are a part of reconfigure our beings, our psyches, our imaginations, our institutions, our societies; 'we' are an inextricable part of what gets reworked in our R&D projects" (Barad 2007, 383). It is helpful to take careful account of who/what is meant when using the term "we", remembering that

there are no pre-given individuals that exist separately from and interact with a pre-given environment, but that "we" are iteratively co-constituting along with our environments, according to particular historialities and with particular exclusions. That is, "we" are an entangled part of our scientific practices, in which our beings, our psyches, our imaginations, our institutions, our societies, are dynamically and mutually reconfiguring through complex intra-actions that matter in terms of how boundaries are drawn and what exclusions are made.

Part of correctly identifying the objective referent for any given scientific practice includes an awareness of the ethical concerns (Barad 2007, 37), because in an agential realist onto-world, the ontological, epistemological, and ethical dimensions of scientific practices cannot be separated (Barad 2007, 25-26), making ethics integral to scientific practices. This is not limited to scientific practices, but as we discussed in Chapter 2, ethics is given as part of the structure of intra-action. I do not pre-exist as an individual with an ethical obligation, but I-in-the-process-of-becoming, or "I", am relationally co-constituted with and as part of everything that is "other" to "me", and therefore "I" have an intrinsic ethical responsibility toward all "others": "Ethics is therefore not about right response to a radically exterior/ized other, but about responsibility and accountability for the lively relationalities of becoming of which we are a part" (Barad 2007, 393). With regards to scientific practices, scientific experiments cannot be performed in isolation from their ethical implications, because with every action, we are always already engaged in materializing the world in certain ways and not others: "Ethics is about mattering,

about taking account of the entangled materializations of which we are a part, including new configurations, new subjectivities, new possibilities – even the smallest cuts matter" (Barad 2007, 384). Thus, we are inherently responsible for the ethical implications of our scientific practices, not after the fact but as part of the framing of these practices, and where ethical issues are necessarily political issues (see Chapter 2). As a core part of these ethical considerations, Barad (2007) says that, "*values are integral to the nature of knowing and being*" (37), which does not mean that pre-existing individuals make choices that are characterized by pre-given values, but that particular values (and not others) are enacted as part of the particular manner in which the world (not just humans) is intra-acted in its specificities. It will be important in our ongoing discussion to take note of how values can be differentially intra-acted as part of scientific practices.

How, then, can we learn to intra-act responsibility within and as part of our world, especially in conjunction with scientific practices, when "Responsibility entails an ongoing responsiveness to the entanglements of self and other, here and there, now and then" (Barad 2007, 394)? In Chapter 5, we discussed the fact that agential intra-action entails responsibility, where some methods for actively taking responsibility include recognizing that humans are not the only agential and responsible parts of intra-action, paying attention to the making of boundaries, or to what matters and to what is excluded from mattering, taking account of entanglements, and responding to those possibilities that lead to a mutual flourishing of our entangled selves. Specifically with regard to scientific practices, Barad (2000)

notes that we must be able to analyze the intra-actions of the relevant apparatuses that are involved in the production of our scientific object(s) (237). Some of the skills that are required for this include identifying and analyzing the material-discursive nature of the relevant apparatuses, examining how these intra-acting apparatuses are productive of "objects" and "subjects" (including humans) through the enactment of particular boundaries, and understanding how these apparatuses and their enacted boundaries could be reconfigured (Barad 2000, 237-238). We will utilize some of these skills when we consider an example of a technoscientific practice with spinach plants in the following section.

In summary, in an agential realist onto-world, responsible scientific practice requires an examination of the relevant apparatuses, which includes taking account of the shifting constitution of the scientist, as well as ethical and political issues.[147] As has been discussed in several contexts, a proper agential realist analysis requires thinking through entangled philosophical, scientific, ethical, and political issues together, because this results in an ongoing intra-active engagement that cannot be replicated by the juxtaposition of separate analyses. Although I am focusing mostly on scientific issues in this chapter – which means that what I am presenting should not be uncritically utilized in the absence of a more thorough analysis of the relevant

[147] A practical example of considering questions of ethics (and justice) as inseparable from scientific practices was put into action in 2006 at the University of California at Santa Cruz by the Science & Justice Working Group, in which agential realism's Karen Barad is actively involved (Reardon 2018). This working group is now part of the Science & Justice Research Center, which provides a framework for bringing together the natural sciences, engineering, humanities, and the social sciences in collaborative conversations over controversial issues, and which also includes a training program for graduate students in ethics and justice as part of scientific practices (Reardon 2018). This group has moreover produced several collaborative publications (Science & Justice Research Center (Collaborations Group) 2013; Reardon et al. 2015).

set of entangled apparatuses – I will in the following section sketch out how ethical and political issues could be more thoroughly engaged with as part of our analysis of the nanobionic spinach plant.

7.2 Plants in scientific practices: the nanobionic spinach plant

In an agential realist onto-world, as we discussed in the previous section, we are responsible for the ethical and political implications that are inextricable from our scientific study of (and technological work with) plants, not after the fact but as part of the framing of our scientific endeavors. But in a modernist onto-world, plants are not generally considered to be sentient beings in the way that humans and some animals are,[148] so the ethics of working with plants is less likely to be considered (although this is not meant to imply that sentience is a requirement for ethical treatment). However, from the overview of scientific and philosophical research on plant sentience presented in Appendix A – where I am using the term "plant sentience" to refer to what is variously called "plant cognition", "plant intelligence", "plant consciousness", "plant neurobiology", or more generally, the study of plants as something more than inanimate objects – we know that the topic of plant sentience is being given serious consideration, although it is still on the fringe of mainstream science. Politically, this goes along with the already occurring shift toward treating "nature" as something beyond a mere backdrop to human activities. For example, the movement to grant legal standing and "rights" to "nature" continues to gain

[148] This statement is not meant to exclude the fact that humans and other animals can also be treated as objects and disregarded ethically.

momentum, including a 2010 Bolivian law[149] granting rights to "Mother Earth", where the earth is recognized as consisting of "complex and dynamic communities of plants, micro-organisms and other beings and their environments, in which human communities and the rest of nature interact as a functional unit…" (as quoted in Pelizzon and Gagliano 2015, 7). This growing consideration of plants and other parts of "nature" as sentient beings worthy of being granted legal standing suggests that it is not unreasonable to question the ethicality of our technoscientific practices with plants (and with "nature" more generally). But whether or not plants are considered to be sentient beings, in an agential realist onto-world, we have a responsibility to consider the ethicality of our scientific (and technoscientific) practices with plants. In this section, we will consider an example of a technoscientific practice with spinach plants, which will allow us to illustrate the difference between treating plants as simple objects for human purposes and considering how to engage with plants as complex phenomena.

As described in Appendix A, plants take in a multitude of information about their environment, such as detecting and distinguishing between different types of light, perceiving chemicals in the atmosphere and in the soil, detecting and responding to touch, and perceiving temperature, electricity, and sound (Karban 2017, 4-10). Technologically, scientists can develop techniques to access some of this information, thereby utilizing the natural capacities of plants in the service of human

[149] The Bolivian law referred to is the *Law of the Rights of Mother Earth (Ley de Derechos de la Madre Tierra*, Law 071 of the Plurinational State of Bolivia), passed by Bolivia's Plurinational Legislative Assembly in 2010 (Pelizzon and Gagliano 2015, 7).

projects. But scientists have also gone farther in engineering plants to assume non-native functions that allow them to detect specific things valued by humans. In one application, by implanting carbon nanotubes into the leaves of spinach plants, scientists and engineers have created "nanobionic" spinach plants that can detect the presence in the groundwater of chemicals typically utilized in explosives (Wong et al. 2017). When these chemicals are taken up into the leaves of the plant where the nanotubes are embedded, the fluorescence of the nanotube is altered, and this signal can be detected with instrumentation including lasers, cameras, and computers. According to Professor Michael Strano, the leader of the research team that developed the nanobionic spinach plants, "This is a novel demonstration of how we have overcome the plant/human communication barrier" (Trafton 2016). And in the words of Min Hao Wong, the lead author of the corresponding scientific publication (Wong et al. 2017), "These sensors give real-time information from the plant. It is almost like having the plant talk to us about the environment they are in" (Trafton 2016). Plant nanobionics has also been utilized to detect chemicals other than those utilized in explosives, and Strano believes that nanobionic plants could be harnessed for the detection of a wide variety of environmental conditions, based on the "wealth of information" that plants continually extract from their environment (Trafton 2016).

Examining the nanobionic spinach plant with the tools we mentioned in the previous section for analyzing scientific practices in an agential realist onto-world, we can say that we must engage with nanobionic spinach plants not as simple objects (there are no simple objects in agential realism) but as complex material-discursive

phenomena that are iteratively reconfigured through the complex intra-action of multiple apparatuses. The following analysis is not intended to be a thorough analysis of nanobionic spinach plants, but is serving to illuminate the difference between treating plants as simple objects for human purposes, and considering how to include ethical considerations in engaging with plants as complex phenomena. As Barad (2007) says, "Technoscientific practices are about making different worldly entanglements, and ethics is about accounting for our part of the entangled webs we weave" (384); the scientists and engineers working with the nanobionic spinach plants have made a new kind of worldly entanglement with these plants, and it is crucial to think ethically and politically about their participation in weaving these new entanglements.

As a partial analysis, some of the relevant apparatuses producing the nanobionic spinach plant include: the scientists and engineers involved in the research, the other types of research in which they engage, the universities where the research was conducted, the funding agencies, the political stakeholders, the technological equipment, the new company Plantea that Wong has formed to continue developing this technology (Trafton 2016), who will have access to this technology, how the public will respond to this technology, possible religious or ecological objections to this technology, other extractivist technologies, industrialism, other work being done with carbon nanotubes, histories of scientific experimentation with spinach plants, possible effects on spinach plants that are not being implanted with nanobionics, the particular environments in which the nanobionic spinach plants

might be deployed, the economic and political factors involved in determining which environments warrant investigation, accountability for the material effects of staging nanobionic plants in particular environments, what counts as toxic and for whom, histories of explosives, other methods of detecting explosives, the "explosive origins of the Nobel prizes" (Arreseigor 2017), the (human) fear regarding explosives, militarism, the human exceptionalism that makes it okay for humans to dominate and control "nature", what constitutes relations of consent, colonialism, Indigenous perspectives on maintaining balance in the environment, and the general bias in the (modernist) scientific community against viewing plants as sentient beings. As part of analyzing (some of) these apparatuses, we will focus on questions about for whom and according to whose values this new technology is beneficial.

It may seem easy, in a modernist sense, to justify the engineering of nanobionic spinach plants as a collaboration that is beneficial for both humans and plants, because by detecting the presence of explosives and preventing an explosion from occurring, both the humans and the plants inhabiting that area could be spared. Similarly, with other applications such as using nanobionic spinach plants to detect toxins in the environment, it could be argued that a toxic environment will negatively affect plants as well as humans. However, while these are not unworthy justifications, they are still human-focused, even if they include "nature" in their concerns. That is, such justifications are based on values that are enacted along with humans – e.g. preserving life and creating safe environments – which are not necessarily the values that are enacted as part of spinach plants. In the context of

biological science, humans might claim that survival and reproduction are the values that are enacted as part of plant growth and development, but this is still a human-imposed assumption. Moreover, as we will explore below, this line of reasoning is complicated by a closer look at the political implications of toxicity, explosives, and the industrial practice of extraction.

One of the modernist assumptions underlying the framing of the nanobionic plant technology is that plants, humans, and the environment are all assumed to be separate and characterized by certain properties that can be analyzed in isolation from one another. For example, when plants and humans are located in an environment that might be toxic or contain explosives, it is assumed that the "environment" contains the toxicity, while humans (and plants) are detecting and otherwise dealing with this toxicity. In contrast, Astrid Schrader (2010) has argued, in the context of analyzing almost twenty years of inconclusive scientific research on whether the dinoflagellates *Pfiesteria piscicida* are responsible for large-scale fish die-off in U.S. estuaries in the mid-Atlantic, that toxicity cannot be considered as belonging to these organisms in a pre-given way, but that these so-called toxic organisms come into being only in relation to the fish for whom they are toxic, as well as in relation to specific environmental factors that also play into this toxicity (285). Using Barad's agential realism, Schrader (2010) explains that there is no determinate fact regarding the identity of these dinoflagellates as either toxic or not toxic, and that in order to make a claim one way or another, it is necessary to take responsibility for the specific relations that are enacted in making this claim (279).

Furthermore, how we understand the notion of toxicity is intertwined with political issues: "…the toxicity of our environments is intertwined with power relations understood as toxic: racism, settler-colonial violence, corporate greed, militarism, and toxic masculinities" (Cielemęcka and Åsberg 2019, 102). Important questions include who or what counts as toxic, and how "we" are implicitly involved in these constructions of toxicity. Moreover, as Cielemęcka and Åsberg (2019) mention, instead of believing that toxicity must be countered in order to return to some state of purity, we could engage in the collective healing of both humans and more-than-humans (105). This kind of analysis leads to new possibilities – for example, instead of including plants in our human attempts to counter so-called toxicity, we could learn how to work with plants to heal the social and political issues inherent in our very constructions of toxicity. In the specific case of explosives as a toxin to be purged, the issue is complexified because of its entanglement with militarism, leading to questions such as why militaristic projects are more likely to be funded and what kinds of militaristic agendas are being furthered. These are only a few examples of the entangled apparatuses involved in the production of a technology aimed at detecting explosives or other toxins.

According to modernist assumptions, plants and humans are furthermore seen as separate individuals that detect and transfer information through physical methods, in that plants continually extract "information" from the environment by drawing water through their roots up into their leaves, and humans can extract this information from plants through techniques such as nanobionics. This brings up several issues.

First, treating plants as resources from which to extract information is part of an extractivist technology in which natural resources are removed from the land and sold for profit, where these profits are generally not intended to benefit the land from which these resources were removed. As discussed in Willow (2016), extractivism is not only an environmental issue but is wound up with social and economic injustices: "Under extractivism, natural resources become vehicles for increasing personal wealth without regard for potential costs to others. Simply stated, extractivism transforms 'nature' into a tool for the promotion of social injustice…. Extractivism is thus a political as well as an environmental project, both a social and an ecological problem" (2). Extractivism can moreover be understood as a contemporary manifestation of colonialism, for example in the effects of the mining of resources from Canada's boreal forest on the many First Nations people who depend on this forest for their sustenance and who are politically disempowered and subject to social injustices by these practices (Willow 2016, 2-3). Andía and Ødegaard (2019) call for a broader interpretation of extractivism in which practices of value extraction other than raw materials are commodified, highlighting "different dimensions of how capitalist projects extract value from a range of different forms and areas of life not previously part of capitalist commodification and accumulation, revealing how extractivist dynamics may embrace and affect all aspects of life" (16). This includes not only how human communities are affected but also how the spirits of the land and their relationships with the humans are disrupted (18). In this sense, the information being extracted from the nanobionic spinach plants, which has the potential of being

utilized for political projects and/or personal profit, must be considered in light of its entangled repercussions on the humans living in the impacted areas, on the plants themselves, and on the relationships between the humans and the plant spirits. Interestingly, despite being treated as a resource to be mined for information, the nanobionic spinach plants are referred to with language that attributes them with some kind of agency, in the sense that, for example, Wong feels almost as if the plants are talking to him about their environment, and Strano refers to plants as "knowing" that a drought is coming, or as being "very good analytical chemists" (Trafton 2016). But whether plants are treated as resources or attributed with agency (or both), in a modernist onto-world, it is the humans who ultimately exercise the agency to extract information from plants and to use this information in service of controlling "nature" – including the spinach plants – in alignment with human values.

Second, regarding the method of communication by which humans can access the information garnered by the plants, the assertion by the nanobionic spinach plant engineers that "we have overcome the plant/human communication barrier" is a strong claim, not only because it is somewhat out of place in a modernist onto-world in which plants are not generally considered to be sentient, but also because it assumes that a fluorescent signal marking the presence of a particular chemical counts as "communication". Moreover, the claim that this one-way "communication" is "almost like having the plant talk to us about the environment they are in", takes account only of humans extracting information from plants in service of human-centered projects, while it completely excludes the possibility that these plants might

already be communicating with other beings, that they might have other information to communicate to us, or that they might also like to receive communications from us. In contrast, in an agential realist onto-world, plants, humans, and environment – as part of their entangled being – are iteratively co-constituting one another, enacting agency, values, knowledge, and toxicity, including the potential for enacting meaningful two-way communication.

We can touch upon several additional ethical issues regarding the nanobionic spinach plants. For one, we must consider whether the implanting of these nanotubes in the plants, forcing the plants to assume non-native functions in service of (enacted) human values, is in any way deleterious to these plants. For example, this engineering process might stunt the growth and development of the plants, limit their reproductive abilities, or interfere with their ability to communicate with other plants or insects. Another question turns on how pain and suffering are defined, in the sense that pain and suffering are possibly being inflicted upon these plants as part of the engineering or detection processes. Additionally, there is an assumption being made about plants as a general category, in the sense that the particular spinach plants that are implanted with the nanobionics would automatically be assumed to work in service of all plants, taken as a general category, when in fact this may not be the case. That is, not all plants have the same needs, and what is beneficial for one plant may be harmful for another, where this issue is complexified by all sorts of interdependencies between various plant and animal species (including humans). This is further complexified by whether the "needs" of plants are understood in

purely biological terms or not; that is, perhaps these particular spinach plants might not "want" to work with explosives, let alone with humans. This, again, brings up the question of whether the values that are enacted along with plants might be different from the human-enacted values driving the framing of this technology.

In summary, whether we are causing them pain, inhibiting their normal life functions, going against their needs or values, using them as mere tools from which to extract information, forcing them to work in service of the "environment" taken as a whole, or imposing upon them human agendas having to do with explosives, we are openly and intentionally treating these plants as objects, as living materials (biomaterials) that we can engineer for our purposes: "Once you start to think of living organisms like plants as biomaterials that can be combined with electronic materials, this [having plants do things that they do not natively do] is all possible" (Trafton 2016), says one professor commenting on this approach. The modernist assumption that agency belongs to individuals – and specifically, to human individuals – makes plants into the passive objects of human practices, foreclosing the possibility of plants as active participants in mutual collaborations, as well as the possibility that the values enacted as part of plant practices might be different from those enacted as part of human practices. When we consider plants as complex material-discursive phenomena that are iteratively reconfiguring through the complex intra-action of multiple apparatuses – a few of which we have briefly touched upon – it is interesting to note the contradiction between the excitement that is portrayed at

the "communicative" abilities of plants and the fact that the plants are not treated as possible collaborative partners.

The fact that a nanobionic spinach plant is an exciting technological achievement masks the underlying ethical and political issues that require us to reconsider our working relationship with plants. Scientists have discovered a way to engineer these plants to communicate to us the presence of explosives, but they have not found a way for the plants to communicate whether it is okay for them to be utilized in this manner, or furthermore, whether there might be a better method to address the particular need. If we diffract these technoscientific practices with nanobionic plants through the plant sentience studies in the scientific and philosophical community, we need to take these questions seriously and think about how to work with plants as sentient beings. But an obvious difficulty in working with plants as sentient beings is the communication barrier between plants and humans. Even if this barrier could potentially be overcome through nanobionic engineering, or through other manipulations designed to extract information from a plant and transmit it in a manner that humans can decode, these manipulations would necessarily be designed according to human values. That is, if our communication with plants is limited to methods that we must engineer by modifying plants *before* we can even communicate with them, we are stuck with treating plants as objects, at least until we can engineer them to communicate with us.

This is where the ability to communicate with plant devas and nature spirits becomes attractive. In Chapter 3 we learned that, according to Findhorn, the plant

devas and nature spirits are willing to work with humans to modify their own patterns instead of having humans force changes upon them. In the context of the nanobionic spinach plant, this suggests that the Findhorn gardeners might have been able to work with the Spinach Deva to devise a method of receiving communications regarding the level of explosives in the soil without having to implant nanotubes in the spinach plants.[150] We will consider how such collaborations could be included in scientific practices after first examining how virtuality and transphysicality could be engaged with in scientific practices.

7.3 Devas and nature spirits in scientific practices

The research on plant sentience that is presented in Appendix A is being conducted with modernist scientific approaches and rigor, yet it remains on the fringe and tends to be dismissed or even ridiculed by mainstream modernists. If we include in this discussion the possibility of plant devas and nature spirits as experienced by the Findhorn gardeners, who were not even working with academic methodology, this would clearly constitute a further violation of modernist adherences. As we have noted, entities such as devas and nature spirits have been excluded from mattering in a modernist onto-world, but why? In Chapter 2, we traced the rise of modernism in conjunction with the nature-culture divide that was expressed philosophically, scientifically, and in the political and economic systems as they were developing

[150] For Findhorn, this kind of a collaborative working relationship with the plant devas would not function based only on human values, because the devas and nature spirits collaborate only if the project is in service of the good of the whole – we will discuss this interesting point further in the following section.

primarily in seventeenth century Europe. As we discussed, the banishing of spirits that occurred along with the view of nature as agency-less and de-spirited was a crucial part of both the new market economy and the new certainty that accompanied a science based on a mathematical-mechanical view of the universe, to be analyzed through reduction and quantification. This particular historical entanglement involved in the exclusion of devas and nature spirits from modernism – between the certainty provided by modern science, and the non-human world as an agency-less object to be controlled and dominated – helps to explain why bringing devas and nature spirits into a modernist scientific discussion is likely to provoke outrage, when one of the significant achievements of modernist science is to have excluded such entities from mattering. Through modernist scientific measurement – which requires metrical spacetime – things are considered to be real only if they can be (or can be reduced to something that can be) precisely located in physical (metrical) spacetime and measured. This means that in a modernist onto-world, scientists focus on the fully-formed, physical aspects of matter, which means that they engage with plants as simple objects, or as determinate individual objects located in physical spacetime, as was discussed above. Devas and nature spirits do not fit into this physical modernist analysis.

This modernist achievement need be neither minimized nor rejected, but we must acknowledge that it is only one way in which to experience and interface with, or intra-act, the world. With agential realism, we can recognize that what seem to be the simple objects of scientific investigation are complex material-discursive

phenomena produced by a multitude of relevant apparatuses, not limited to those which can be physically studied (measured). With Findhorn, we can furthermore recognize that plants as complex material-discursive phenomena include their devic and etheric aspects, which are not physical, but with agential realism can still be considered to be real (material). This opens up several new possibilities. In §7.3.1, we will make these devic and etheric aspects the focus of a scientific inquiry, in the sense of studying them as objects about which to gain knowledge. As we discussed in Chapter 6, in an agential realist onto-world, devas can be made sense of in terms of virtuality, and nature spirits (working in the etheric realm) can be made sense of in terms of transphysicality, where both virtuality and transphysicality are consequences of in/determinacy. Thus, the fundamental in/determinacy of matter in an agential realist onto-world provides the opportunity to scientifically consider the virtual and the transphysical in addition to the physical (measurable), where such a study could possibly help us to learn more about devas and nature spirits. Then, in §7.3.2, in order to avoid treating the devic and etheric aspects of plants merely as objects about which to seek knowledge, we will consider including collaborations with the devas and nature spirits in our scientific practices, thereby radically shifting our working relationships with plants.

7.3.1 Engaging with the physical traces of virtuality and transphysicality

In this subsection, we will begin with a brief discussion regarding a qualitative scientific engagement with transphysicality, making the point that anything non-

physical cannot be measured, imaged, or otherwise detected with the physical senses. But, acknowledging the importance of measurement and imaging in scientific practices, we will suggest the possibility of engaging with the physical traces of virtuality and transphysicality. We will discuss several examples of this, examining in depth whether it is in fact possible to connect virtuality and transphysicality with physical traces in laboratory experiments, and what kinds of theoretical considerations are required in order to do so in a robust manner.

As we discussed in Chapter 3, Findhorn's nature spirits are etheric (transphysical) beings that work in the etheric realm to causally affect the materialization of entities in the physical realm. In Chapter 6, we made sense of nature spirits as spacetimemattering etherically, where we hypothesized that etheric spacetimematterings are distinguishable from and not reducible to physical spacetimematterings because they enact different spatiotemporal relations and causal connectivities. (We also clarified that these different patterns of spacetimematterings do not form separate realms but are thoroughly causally connected and dynamically enfolded through one another.) Specifically, we suggested that etheric spacetimematterings could potentially be modeled by projective geometry, which is non-metrical and describes a different spatiality and different types of forces than the metrical geometry associated with physical spacetimematterings. We furthermore mentioned that this connection between etheric spacetimematterings and projective geometry came about through Steiner's clairvoyant experience of the etheric realm, where this means that he did not see or otherwise engage with the etheric realm

through his physical senses, but that he was able to "see" the etheric through some other means (similarly to how Roc was able to "see" the nature spirits at Findhorn, though not with his physical eyes, as discussed in Chapter 3).

If we consider a scientific engagement with etheric spacetimematterings, we must acknowledge that they are not detectable with the physical senses, nor can they be imaged as part of a laboratory experiment, because such an image – either a static image on a piece of graph paper printed out from an imaging instrument, or an image on a computer screen that is dynamically shifting over time – is depicted in terms of metrical spacetime (or in terms of metrical space at some given instant of time).[151] While it may be the case that measurement and (physical) imaging are possible only as part of physically patterned intra-actions, this need not prevent us from working scientifically with entities such as etheric nature spirits. Although etheric entities are non-measurable and non-visible (but still real), we can, for example, utilize the mathematics of projective geometry as a tool to spatiotemporally describe and mathematically analyze etherically patterned intra-actions. We gave examples in Chapter 6 of how projective geometry has been utilized by Adams and Whicher (1980) in a practical application, in which they linked the "etheric forces" described by projective geometry to the growth and development of living forms such as plants, as well as how Adams (1977) has worked out a preliminary mechanics that shows how etheric forces could be mathematically linked with physical forces.

[151] This type of physical image that I am describing as part of laboratory experiments is distinct from the type of images that one could experience "in the mind's eye", or clairvoyantly, or through the use of non-physical organs of perception (this will be further discussed in the following subsection).

As we have noted, etheric spacetimematterings, not being physically configured, can be neither imaged nor measured, and the examples provided above are of a *qualitative* mathematical engagement with etheric spacetimematterings.[152] That is, quantification is necessarily physical, because it requires a metrical configuration, as we discussed at length in Chapter 6. With physicocentrism, there is a strong bias toward being able to physically image and quantify anything that is considered to be real, but this is not possible for either transphysicality (e.g. the etheric) or virtuality. However, because we have made sense of virtuality and transphysicality as real in an agential realist onto-world, it is tempting to try and find ways in which to engage with them through some sort of quantification. Thus, it is worth investigating whether it is possible to image or measure the physical traces, or the *effects,* of virtuality and transphysicality. This is not precluded in an agential realist onto-world, because physical and etheric spacetimematterings are thoroughly enfolded and causally connected, and virtuality is a constitutive part of all spacetimematterings. In other words, virtuality and transphysicality are constitutively

[152] Regarding what could be meant by a qualitative mathematical engagement, we can look to scholars who have engaged with Goethe's qualitative method of science. Goodwin (1999) contrasts a reductionistic scientific engagement, in which component parts are analyzed through quantification, with a holistic scientific engagement, in which the qualities of wholes are experienced. In terms of the growth of plants, Adams and Whicher (1980) explain how the study of projective geometry – not just the analytical study but also the experience of its different spatialities and forces – in conjunction with close observation of the growth and development of plants, leads to qualitative experiences in which it becomes clear how the spatiality and forces of projective geometry are linked with the spatiality and forces at play in the growth and development of plants. In a bit more detail, Whicher (1989) explains that while metrical (measureable) properties are not invariant in projective geometry, morphological qualities are (26), such that certain qualities can be transposed into their polar opposites in a "law-like" manner that expresses regular relationships between them (29), and this relationality can then be experienced in our perception of space, color, tone, etc. (39). Finally, while quantitative science connects qualities (such as color) with underlying physical elements that can be quantified (such as wavelength) but that have no necessary connection to the quality they are associated with, Goethe's qualitative science uncovers the necessary relationships between the qualities themselves (Amrine et al. 1987, 205).

and causally connected with physical spacetimematterings, which can be both imaged and measured.

In fact, the physical effects of virtuality have been measured. In one such example, Barad (2007) explains that the hydrogen spectrum, which indicates the differences corresponding to the possible energy levels of hydrogen's electron, includes a measurable shift – called the Lamb shift – corresponding to the vacuum fluctuations of the quantum vacuum (92). As we discussed in Chapter 5, vacuum fluctuations can be understood in terms of virtual particles, or virtuality, so the Lamb shift is a physical measurement of a change that occurs due to the play of virtual particles. Another type of measurement that tends to be associated with either virtuality or transphysicality is the measurement of bioelectric (or bioelectromagnetic) fields.[153] In the remainder of this subsection, we will discuss several examples in which virtuality and transphysicality are engaged with through such fields. While the Lamb shift is considered to be an accurate confirmation of the theory of quantum electrodynamics (Barad 2007, 92), thereby linking virtuality to a measurable value, the scientific study of bioelectricity has a controversial history (Barad 2015, 403), and we will need to proceed carefully.

First, we need to make some clarifications. The distinction that I am making in this project between virtuality, transphysicality, and physicality, is not easy to grasp. We must keep in mind that only physicality is measurable, and that only

[153] Part of the discussion that follows will be framed in terms of electricity, while another part will be framed in terms of electromagnetism, but these terms are interchangeable because of the unification of electricity and magnetism (see, for example, Barad 2015, 418 n21).

physicality can be detected or imaged through the physical senses and their technological extensions. That being said, in an agential realist onto-world, there are no pre-existing physical things, no determinate physical individuals with pre-existing properties that can be measured. Instead, we can make sense of measurement in terms of intra-activity, in the sense that marks on bodies are produced in a way that is at least theoretically reproducible. As we have discussed at length, measurement requires metrically enacted spacetime, which we have associated with physicality. Therefore, any measurements or images that are produced in an experiment are physically spacetimemattering, although one might claim that they are indicative of virtuality or transphysicality.[154] Because of the complex and dynamic nature of intra-action, it makes sense that particular measurements and images will correlate with or otherwise be indicative of virtuality or transphysicality. But it is also important to recognize that there could be virtuality or transphysicality that is not intra-acting with physicality in such a way that it is implicated in any kind of measurement or image, although these could potentially still be engaged with scientifically, as was discussed above in the case of a qualitative mathematical engagement with the etheric (transphysicality). Finally, while anyone could claim that a measurement or an image is indicative of virtuality or transphysicality, with agential realism we have a theoretical framework (based on a coherent interpretation of quantum physics) that

[154] With agential realism, virtuality is a constitutive part of every intra-action, so every physical spacetimemattering that we image or measure is partially constituted by virtuality, but some of these images – such as the electric frog face, as will be discussed next – are more directly suggestive of virtuality. In contrast, intra-actions can be both physically and transphysically configured, but not every physical spacetimemattering that we image or measure will necessarily be indicative of transphysicality.

causally connects physical and transphysical spacetimematterings, along with the virtuality that is partially constitutive of all spacetimematterings.

An example of how it is possible to engage with virtuality through laboratory experiments using imaging techniques is given by Barad's (2015) analysis of a recent bioelectric approach to biological regeneration. Biological organisms and even ecosystems have varying degrees of the capacity to regenerate various parts of themselves; the study in question focuses on *Xenopus laevis*, an African clawed frog (Barad 2015, 402). In short, the researchers[155] have shown that these frogs – which are able to naturally regenerate their tails while they are tadpoles – can be made to regenerate their tails even after this natural capacity has been lost, through the application of an electric field in the region of their missing tail (Barad 2015, 403). What this means is that bioelectric signals are partially responsible, in addition to biochemical and genetic factors, for the process of development, because they communicate patterning information between cells (Barad 2015, 404). According to Barad (2015), the study of bioelectricity is, historically speaking, "littered with charges of charlatanism and quackery" (403). However, this particular example of scientifically engaging with bioelectricity is taken seriously by the mainstream scientific community because the bioelectricity is being engaged with at the molecular level; specifically, the bioelectric fields are controlled through the manipulation of key proteins (Barad 2015, 403).

[155] The researchers are Michael Levin and Dany Adams of Tufts University (Barad 2015, 402).

As part of these bioelectrical studies on regeneration, an unusual image was produced of *Xenopus* tadpoles during their early stages of development: in a time-lapse video, *before* these embryos had developed a face, the researchers captured the image of a face – a pattern of electric potential – on the surface of the embryo (Barad 2015, 404-405). Remarkably, the electrical pattern of the face appears and disappears prior to the activation of the genes and the subsequent cell differentiation that results in the development of the flesh-and-bones face; according to the researchers, the bioelectricity activates the genes that are necessary for the development of the face (the face develops abnormally when the biochemical process that generates the electric potential is disrupted) (Barad 2015, 405). It is as if the developing embryo is "trying out" various configurations electrically before committing to its differentiation; in the context of agential realism, this is suggestive of virtuality. Indeed, Barad (2015) conjectures that the electrical pattern of the frog face is a quantum feature of this biophysical process of development, which goes beyond the inclusion of quantum mechanical effects to engage with the virtuality associated with quantum field theory (409-410):

> The stunning nature of this example is that what it shows is not merely (nonrelativistic single particle) *quantum mechanical* effects (e.g., quantum entanglement) that scientists now believe account for photosynthesis, bird navigation, and olfactory function, but *quantum field theoretical* effects, like virtual explorations of what might yet materialize (or what might yet have been) as an integral part of ongoing processes of materialization in the dynamical play of indeterminacies in being and time. (Barad 2015, 410)

This example shows how it is possible to engage with the physical traces of virtuality, or specifically with the bioelectric patterns of frog faces that have not yet developed –

and that might not develop if the electric potential is disrupted – through their biochemical processes.

As we discussed in Chapter 5, as part of the in/determinacy of matter in an agential realist onto-world, spacetimematterings are partially constituted by their virtual intra-actions, or by their virtual explorations of all the possible histories that could be or could have been. According to Barad (2015), what the researchers captured in the as-yet-undeveloped frog face is the material trace of these virtual explorations that are integral to the flesh-and-bones development of the frog face: "What we witness are traces of differentiating materializations-to-come, virtual explorations of making face" (409). However, it is important to recognize that this image is not, strictly speaking, an image of a virtual face (virtuality cannot be captured in an image), but it is an image of the physical effects of virtuality, according to the various experimental protocols and associated theories. The important point to make here is that anyone could suggest a correspondence between a physical image and something non-physical (as is often the case in New Age practices, as was discussed in Chapter 4, specifically in the context of using quantum physics analogically), but scientifically engaging with such a correspondence minimally requires a coherent set of theories that include some kind of causal linkages between the non-physical and the physical. With agential realism, in which virtuality is partially constitutive of materiality (and indeed of the ongoing process of materialization), we can scientifically engage with the physically imaged bioelectric frog face as the physical trace of the play of virtuality.

For our next example, we leave behind the scientifically accepted territory of molecular biology in order to investigate the "biofield", which is actively being researched in the field of complementary and alternative medicine (CAM) in the context of "energy medicine", where energy medicine refers to healing modalities such as acupuncture, homeopathy, Reiki, and therapeutic touch, which involve "subtle field interactions" (Rubik 2002, 703).[156] The term "biofield" was proposed in 1992 at a conference in CAM as "a massless field, not necessarily electromagnetic, that surrounds and permeates living bodies and affects the body" (Rubik et al. 2015, 9). In 2002, Dr. Beverly Rubik, a researcher in the field of biophysics who is involved with CAM, began the process of providing a scientific (biophysical) foundation for the biofield as a "complex, extremely weak electromagnetic field of the organism hypothesized to involve electromagnetic bioinformation for regulating homeodynamics" (Rubik 2002, 703).[157] Intended only as a first step toward scientifically characterizing the biofield, Rubik's (2002) definition of the biofield is based on bioelectromagnetics and biological systems theory, but Rubik acknowledges that the biofield might also involve other aspects that "go beyond space-time, matter-energy, and require multidimensional geometry or other novel concepts" (709), so this definition is not meant to limit the biofield to electromagnetism. In fact, in an article providing "current physics perspectives" on the biofield theory, Kafatos et al.

[156] An entire recent issue of the journal "Global Advances in Health and Medicine" was devoted to an exploration of the biofield. Both Kafatos et al. 2015 and Rubik et al. 2015, cited in this discussion, are part of this issue.

[157] Whereas homeostatis – the fact that a body resists change in order to maintain a stable internal system – is based on classical physics, homeodynamics is based on dynamic behavior (Rubik 2002, 707).

(2015) claim that Rubik's original definition of the biofield is limited because it is based on fields as defined in classical physics and does not include quantum effects (38); instead, they claim that, "The properties of such a field [the biofield] could be based on electromagnetic fields, coherent states, biophotons,[158] quantum and quantum-like processes,[159] and ultimately the quantum vacuum" (25).[160] In any case, with Rubik's (2002) definition of the biofield, we can say that at various levels of organization, "All the body constituents and their interactions give rise to the biofield, and the biofield in turn directs the functions of all the body constituents" (710). This is similar to our above discussion about the virtual frog face, in which key proteins give rise to the bioelectric field, and this bioelectric field then informs cell development; in fact, Rubik (2002) cites various animal studies – such as frogs growing back their limbs in the presence of electrical currents – as evidence for the biofield (710-711).

This discussion about CAM's biofield is relevant to our investigation of transphysicality – and specifically, to Findhorn's etheric realm that supplies life force for the physical realm – because as Rubik (2002) acknowledges, "the concept of the biofield, or any organizing field in biology, evokes shades of vitalism…" (708);

[158] Biophotons are "the extremely low-level visible light emission from organisms" (Rubik 2009, 558).
[159] By "quantum-like processes", Kafatos et al. (2015) means that quantum principles such as entanglement and coherence are being applied at the macroscopic level (26).
[160] Kafatos et al. (2015) make conjectures about the nature of the quantum vacuum and how it relates to the activity of the biofield, but because they are looking at how the consciousness of the (pre-given) observer is implicated in biofield activity (26), it is clear that their interpretation of quantum physics is not consistent with agential realism's interpretation (and it is not clear whether they are themselves working with a coherent interpretation of quantum physics). The point of mentioning their work is to show that the biofield is being engaged with in terms of quantum physics, and specifically in terms of the quantum vacuum, and that it could perhaps benefit from an agential realist analysis.

vitalism has to do with a vital force underlying life. According to Rubik (2002), vitalism in science was replaced by biologic field theories, including the concept of bioelectricity,[161] which however fell out of favor with the advent of molecular biology (708), as was also mentioned above in the context of the electric frog face. But in the context of CAM, vitalism is historically important to the practice of energy medicine – for example in terms of the *qi*, or vital energy, of Chinese medicine – as is the concept of subtle energy bodies (708). Rubik's goal is not to debate over the existence of subtle energy bodies, but to introduce this concept of the biofield that is both consistent with contemporary biophysics and has the potential to provide a scientific foundation for the diverse healing modalities of CAM, with their associated vitalistic principles (Rubik 2002, 708). In terms of engaging scientifically with the biofield, Rubik (2002) says that, "We cannot observe the biofield directly, isolate it, or analyze it comprehensively…. Nonetheless, certain aspects of the biofield may be ascertained from careful measurements, and its properties elucidated through the existence of certain phenomena" (Rubik 2002, 715). We will briefly examine how the biofield can be measured, and how this can be said to correspond to vital forces or subtle energies.

As we have described, the human biofield arises from all the interactions of the body's constituents. An example of a conventional measurement of the biofield is the electroencephalogram (EEG), which is a measurement of the brain's electrical activity, where this electrical activity contributes to the overall human biofield (Rubik

[161] With early vitalism, life force was considered to be immeasurable, but this was challenged by the concept of bioelectricity (Rubik et al. 2015, 9).

2009, 557).[162] But in order to access the components of the biofield that are relevant to energy medicine, non-conventional approaches are utilized to measure other frequency bands of the body's electromagnetic spectrum. One such approach is the measurement of "biophotons", which are "the extremely low-level visible light emission from organisms",[163] and another is the measurement of induced light emission from high-voltage electrophotography (also known as the Kirlian effect)[164] (Rubik 2009, 558).[165] As Rubik (2009) acknowledges, such measurements do not in themselves determine whether these energies have anything to do with vital life force, and in fact, they are often considered to be waste energy or noise in the system (558). But because these images can be produced in conjunction with CAM research on energetic healing modalities – specifically, with "biofield therapies" such as Reiki or therapeutic touch, in which the practitioner's biofield is said to play a role in the healing process – changes in the images of both the practitioner's and the patient's biofields can be correlated with the efficacy of the healing practice (Rubik 2009, 558). Because the biofield is seen as a regulator of homeodynamics in terms of coordinating life functions (Rubik 2002, 707), and because energetic healing

[162] Other examples of conventional measurements of the biofield are the electrocardiogram (ECG), the magnetocardiogram (MCG), the magnetoencephalogram (MEG), galvanic skin response (GSR), and thermography (Rubik 2009, 557).
[163] The mainstream scientific community holds that these measurable biophoton emissions from the body cannot be utilized for life-specific processes because they are not coherent (in phase), and that they can be explained "solely in terms of known principles of chemiluminescence from free radicals as a byproduct of cellular chemistry and that such light emitted is from random processes and thus carries no signal" (Rubik 2009, 568).
[164] The Kirlian effect was repudiated by skeptics who explained the effect as due to residual moisture in the samples, but according to Kafatos et al. (2015), the most recent, high-definition data shows that this explanation is incorrect (32).
[165] For further details regarding the particular devices and techniques used to measure these non-conventional aspects of the biofield, see Rubik (2009) pp. 559-568.

modalities are said to operate in conjunction with subtle energy and vital life forces, Rubik maintains that the hypothesis of the biofield links these vitalistic concepts to solid biophysics principles, as can be tested through the imaging of the biofield during CAM healing practices.

However, CAM's biofield research does not seem to include a rigorous theory connecting vital life force or subtle energy bodies to the physical body. In order to engage with Findhorn's nature spirits and the etheric counterparts that provide the physical plants with life force, we need a framework such as agential realism, which can provide these connections. As we discussed in Chapter 4, the New Age onto-world tends to be inclusive of multiple realms of existence in addition to the physical; for example, in some conceptions, the physical body is surrounded by additional "subtle" or "non-physical" bodies made of different kinds of matter that are distinguished from one another by their differing "densities" or "vibrations". In an agential realist onto-world, in contrast, we would speak of entangled spacetimematterings enacted according to various different configurations – some physical (measurable) and some transphysical (non-measurable) – with no separate bodies or realms. In the research presented above, the engagement with subtle (transphysical) bodies or energies is scientifically framed in terms of "fields" that surround or permeate physical bodies. Specifically, as we discussed, the biofield refers (at least in part) to the electromagnetic fields that can be measured around living bodies, connecting the concept of subtle energy bodies to something that can be

imaged and measured in a laboratory. But how exactly this connection is framed matters, and there are several crucial points to make here, as follow.

First, it is necessary to clarify what is meant by a field. Regarding fields in classical physics, Barad (2015) says that, "A field in physics is something that has a physical quantity associated with every point in space-time. Or you can think of it as a pattern of energy distributed across space and time" (394), and Rubik et al. (2015) say that, "The concept of a field from physics refers to a spatially distributed nonmaterial element that is able to impart a force upon an object within it. Therefore, a field cannot be detected directly but only through its action upon a suitable probe – for example, a charge in an electric field" (9-10). Whether a field is considered to be "nonmaterial" or "a pattern of energy", we can minimally say that it has physical effects. But any confusion that might exist as to the materiality of fields is clarified with quantum field theory (QFT): "Fields are patterns of energy. When fields are quantized, the energy is quantized. But energy and matter are equivalent. And so an essential feature of QFT is that there is a correspondence between fields (energy) and particles (matter)" (Barad 2015, 395). In other words, every field is associated with a particle, making it seem as if fields are decidedly material (as opposed to non-material). However, this statement must be qualified, because with QFT, matter is partially constituted by virtuality, so if we refer to fields as material, we must recognize that these material fields are inclusive of virtuality.

As we have discussed in detail, the nature of matter is radically changed with agential realism, in which in/determinate matter constitutively includes virtuality and

is not limited to being enacted according to physical configurations. Thus, material fields – which, with agential realism, are not separately existing determinate entities but are intra-acted as part of phenomena – constitutively include virtuality and are not limited to being enacted according to physical configurations. This inclusion of virtuality as part of the enaction of fields is why Barad (2015) is able to describe the electrical pattern of the as-yet-undeveloped frog face – where the electric potential that is measured is indicative of the bioelectric field – in terms of the play of virtuality. Similarly, CAM's biofield must also be indicative of the play of virtuality, although this does not show up in Rubik's (2002, 2009) analysis.

Regarding the fact that (material) fields are not limited to physical configurings furthermore suggests that transphysical fields could also be enacted, but how can it be determined whether a field is physically or transphysically patterned (or both)? This question becomes relevant when connecting the physical measurements of CAM's biofield to transphysicality, or to some sort of subtle body or life force. Let us take the example of a bar magnet, with which one can physically engage, and which is surrounded by a magnetic field that is invisible to the physical eyes. When iron filings line up according to the magnetic field of a bar magnet, the image made by these iron filings is a physical trace of this magnetic field. With classical physics, we would say that each point of spacetime imparts a force according to which the iron filings align. In an agential realist onto-world, spacetime does not pre-exist but is enacted along with the magnetic field, so we can say that because the iron filings are enacting a physical pattern, the spatiotemporality enacted along with the magnetic

field must also be physically configured. We are not claiming that the magnetic field *is* physical, but that it is enacted according to physical configurations, as evidenced by the observable behavior of the iron filings. We cannot rule out the possibility that the magnetic field (or any field) is also enacted according to transphysical configurations, along with some sort of transphysical effects that we cannot image or measure, though we could potentially still engage with them scientifically through their particular enacted spatiotemporality (e.g. through projective geometry for etherically patterned fields).

This question of how to engage with transphysicality does not arise unless there is a reason to suspect that something non-physical is involved: with Findhorn, the etheric (transphysical) counterparts are vital parts of the growth and development of the physical plants; with CAM, subtle (transphysical) bodies are involved in these healing modalities. In the context of the imaging of electromagnetic fields as part of CAM's biofield research, we could say – as based on the experimental methodology and the associated theories – that the resulting image is a physical trace of the electromagnetic field, where the electromagnetic field is produced through complex intra-actions that are physically patterned and might also be transphysically patterned. When correlated with particular activities such as energy medicine, it might be possible to suggest that these physical traces additionally indicate the intra-play of transphysicality, but we would need to develop specific theories that link the physical traces of these fields to the purported transphysicality (e.g. subtle energy bodies, etheric bodies, etc.). In an agential realist onto-world, we are not precluded from

doing so, because physical and transphysical spacetimematterings are causally connected. For example, we could propose that the enacted electromagnetic field mediates intra-actions between physical spacetimematterings enacting flesh-and-bones bodies and transphysical spacetimematterings enacting "subtle" bodies, where what is meant by "mediation" could be further studied. Or, specifically in terms of etheric bodies, we could propose that the measurements of the biofield are physical traces that change according to changes in the mutually intra-acting etheric spacetimematterings that iteratively reconstitute the biofield, where these etheric spacetimematterings can be engaged with mathematically and connected to physical theories (as described above). In this way, we could begin to develop a language and procedures for engaging with the biofield – or with other forms of transphysicality – through its physical traces.

In summary, we have described several examples of scientific research that engage with the physical traces of virtuality and transphysicality, and we have emphasized that the images and measurements produced in the laboratory are physical traces that must be linked to virtuality and transphysicality through coherent scientific theories. In the first example, of the electric frog face, Barad (2015) makes the theoretical link between the electric images and virtuality through quantum field theoretical effects, such that we can say that these bioelectric images are indicative of the virtuality that is constitutive of all spacetimematterings. In the second example, CAM's biofield is experimentally linked to transphysicality through the imaging of bodies engaging in energetic healing modalities, but without a theoretical link

connecting transphysicality and physicality. Because we have shown that with agential realism, spacetimematterings can be configured both physically and transphysically, where these are enacted according to different spatiotemporalities yet are still thoroughly enfolded and causally connected (see Chapter 6), it should be possible to propose specific theoretical connections relevant to the particular issue.

While it can be exciting to develop methods of seeing and measuring the physical effects of both virtuality and transphysicality, we must continue to take responsibility for not reducing virtuality and transphysicality to simple objects of study disengaged from social and political issues, but to intra-act with them as complex material-discursive phenomena, which also includes recognizing how "we" shift as part of these practices. As Barad (2007) says with regard to the changing conception of atoms, "Not only has our image of the atom changed, but our practices of imaging and imagining and intra-acting with them have changed, and so have we" (354). These changes in "us" – which includes our selves, our institutions, our societies, etc. – are not only philosophical and scientific, but are also social, economic, political, etc. Before concluding this subsection, we will briefly touch upon how these interrelated issues show up in terms of Barad's (2015) engagement with regenerative bioelectricity, and the field of CAM in relation to the New Age.

Barad's (2015) exploration of the virtuality involved in the regenerative capacity of bioelectricity is part of a larger work that explicitly includes "a political investment in creating new political imaginaries" (388). With quantum field theory, as we have discussed, an electron is not a determinate individual particle but is

partially constituted by virtuality, or by "all possible intra-actions with 'itself' through all possible virtual others, including those (and itself) that are noncontemporaneous with itself" (Barad 2015, 401). For Barad (2015), this marks not only an undoing of the binary between being and becoming, but also an undoing of "kinds" and "natural essences" and even of identity itself – the electron in its intimate dance with indeterminacy is "forever transitioning and transforming itself", and matter is "always already radically open" (401). This is an undoing of the notion of "normal", which is a politically charged topic when it comes to the regenerative possibilities of bioelectricity. That is, as the researchers who captured the bioelectric frog face suggested, "If it holds that these bioelectrical signals are controlling gene expression, or the patterns of where genes are expressed, we have a whole new approach to correcting birth defects, or preventing them or spotting them before they happen" (as quoted in Barad 2015, 406).

This scientific practice is here being framed in terms of what counts as normal and what counts as defective, where the defective must be corrected in alignment with the normal.[166] But for Barad (2015), when these regenerative possibilities are understood as quantum phenomena, meaning that virtuality is integral to what matter is, matter becomes full of new possibilities, of new imaginaries (411), resulting in an "undoing of universality" (413) and in an ongoing questioning of what counts as "normal" or "natural" (412). Barad's (2015) work with the virtual frog face is

[166] As Barad (2015) mentions, the scientific practice of regeneration using bioelectricity is moreover entangled with military-industrial, capitalist, and colonialist projects (412), and QFT itself has an entangled history with these political forces (413).

philosophically and scientifically interesting, and it is also an ethical invitation for us to investigate our own natures, or that which we might unconsciously be assuming to be either natural or unnatural: "…examine your own nature, stretch your own body out on the examining table, do the work that needs to be done on yourself (with all this charge's intended multiple meanings), and discover the seams and sutures that make up the matter of your own body. Materiality in its entangled psychic and physical manifestations is always already a patchwork, a suturing of disparate parts" (392-393). Barad (2015) focuses on various transmaterialities such as transgender, transsexual, and other "subversive gender identities" (419 n32), and I would include "transphysical" here too: "materiality in its entangled psychic, physical, *and transphysical* manifestations is always already a patchwork". I am pointing out that transphysicality is another excluded aspect of materiality that should not be dismissed, feared, or seen as unnatural simply because it spacetimematters according to different spatiotemporalities and causal connectivities.

In contrast to this example, in which political reimaginings are treated as an integral part of exploring the possibilities of regenerative bioelectricity, our next example explores the field of CAM in relation to the New Age, illustrating the marked lack of engagement with political issues (at least in the particular example we are considering). Baer (2003) has critiqued the holistic health/New Age movement (of which CAM is a part) by examining two "gurus" or "spokespersons" of this

movement – Deepak Chopra[167] and Andrew Weil – who "have been propelled into fame as holistic biomedical physicians as a result of their success at manipulating the organs of mass communication" (233). For Baer (2003), one of the crucial ways in which the holistic health movement overlaps with the New Age is because both emphasize the individual as being responsible for their life by seeking out methods of self-improvement (235). CAM is referred to as "a style of medicine that, while recognizing the benefits of alternative therapies and mind-body-spirit connections, downplays the role of political-economic, environmental, and social structural forces in contributing to disease" (Baer 2003, 245). That is, while the holistic health movement emerged as a progressive movement in the 1970s, it has been co-opted by capitalist institutions and has become entrepreneurialized, such that it no longer represents a struggle for social change and empowerment around healthcare but participates in the individualism of the free-market society (Baer 2003, 241-242). Moreover, holistic healthcare generally caters to the wealthy and ignores the rest of the public, and as Baer (2003) says, Chopra and Weil in particular "either ignore or downplay community service, social reform, and other collective goals" (242), not taking into account issues such as race, gender, and class (240). As one example of the contradictions that result from the holistic health movement (and the New Age more generally), Baer (2003) remarks that Chopra lectures against the dangers of capitalism while charging $25,000 per lecture, living in a $2.5 million house, and bring in $15 million per year through his various enterprises (241).

[167] Chopra is listed as a co-author on the article by Kafatos et al. (2015) that was referenced above in relation to how the biofield is being engaged with in terms of quantum physics.

While Baer (2003) does affirm the potential of the holistic health movement to transform society by challenging the hegemony of biomedicine, his analysis of Chopra and Weil shows that this has not (yet) occurred, and that they have instead created "an alternative form of medical hegemony by reinforcing individualizing patterns in U.S. society specifically and in the capitalist world-system more generally", while also serving as "modem exemplars of the U.S. success story-a myth that continues to legitimize patterns of social inequality" (246). This example of the contradictory manner in which CAM, as part of the holistic health movement, has been expressed, not only serves as a continuation of our critique of the New Age from Chapter 4, but importantly, shows why our engagement with the practices of CAM and with the New Age more generally cannot be limited to philosophical analyses, but also requires a full ethical and political consideration of what is entailed in the particular framing of these issues, as well as in the possible consequences of these practices.[168]

As part of our analysis in this chapter of how virtuality and transphysicality could be scientifically engaged with, we not only need to consider the ethical and political issues that are entangled with a scientific examination of the *physical traces* of virtuality and transphysicality, but we also need to consider the implications involved in working with virtual and transphysical *beings* as part of our scientific practices. The novelty of including relationships with beings such as devas and

[168] I have not provided a thorough ethical and political analysis of CAM, and clearly, not everyone involved in CAM fits the above analysis of Chopra and Weil; the purpose of including this particular perspective on the holistic healthcare movement is to provide an initial step toward taking responsibility for our engagement with these practices as part of this project.

nature spirits in our scientific practices is that these practices could then become collaborative endeavors focusing on the intra-active coordination of livable common worlds among and for a multitude of enacted beings, as we will address in the following subsection.

7.3.2 Collaboration as part of scientific practices

As discussed above, in a modernist onto-world, scientists focus on the fully-formed, physical aspects of matter, which means that they engage with plants as simple objects, or as determinate individual objects located in physical spacetime. In contrast, the Findhorn gardeners, as discussed in Chapter 3, engaged with plants as complex beings spacetimemattering both physically and etherically in conjunction with their devas and nature spirits. Although the Findhorn gardeners did not conduct laboratory experiments to search for proof of the existence of devas and nature spirits, they had direct evidence of these virtual and transphysical beings through their engagements with them, where these engagements taught the Findhorn gardeners how to begin overcoming their limited sense of self in order to co-create for the good of the whole. Moreover, once the Findhorn gardeners recognized the ways in which the devas and nature spirits were collaborating with them, physical proof of their efficaciousness became evident in terms of the growth and development of the physical plants in their gardens. That is, because they were able to communicate with these beings, they could correlate the actions of the devas and nature spirits to the subsequent growth and development of the plants.

In a modernist onto-world, as we showed in Chapter 4, Findhorn's plant-human collaboration is not possible. But with agential realism, as we discussed in Chapters 5 and 6, we are not precluded from making sense of collaborations with devas and nature spirits – or with virtual and transphysical beings – and therefore, we have a responsibility to include these otherwise hidden apparatuses, working with them as complex material-discursive phenomena. In the previous subsection, we worked with virtuality and transphysicality in terms of their physical traces in the laboratory, and in this subsection, we will explore what might be involved in working with virtual and transphysical beings as collaborative partners in our scientific practices. We will discuss the fact that an intra-active engagement with virtual and transphysical beings requires apparatuses other than the physical sense organs, and then we will examine what it might mean to enact livable common worlds that are inclusive of virtual and transphysical beings.

As quoted in the epigraph to this chapter, "It is very true that only a limited number of people have as yet developed faculties enabling them to see and communicate with the devas and nature spirits" (Findhorn Community 1975, ix). The Findhorn gardeners, as we discussed in Chapter 3, did not intentionally create methods of communicating with the devas and nature spirits, but they were already working in their gardens with love and respect, as well as engaging in spiritual practices requiring them to "go within" and listen to their "inner voice", when these beings unexpectedly established contact with them. In Chapter 6, we discussed the fact that human communication tends to occur with the participation of the physical

sense organs, but that it is not possible to communicate with virtual or transphysical beings in this way. Instead, the Findhorn gardeners explained that their communications occurred through some form of "mental" or "telepathic" activity, manifesting, for example, as "thoughts of inspiration". Based on these types of experiences, we said, with agential realism, that when humans communicate with virtual and transphysical beings, humans are constituted with some kind of bodily, or materially enacted knowing, such as images, symbols, thoughts, words, feelings, etc. This sort of intra-active engagement with virtual and transphysical beings requires apparatuses other than the physical sense organs, so if we want to work with these beings beyond a mere examination of their physical traces in laboratory experiments, we must develop other apparatuses in order to engage with them, and we must accept the types of knowledge that are produced as part of these new ways of engaging. In order to become more comfortable with this idea, we will discuss several examples of scientific practices in which it could be said that apparatuses other than the physical sense organs have been used to gain knowledge about the world.

One key example is given by Johann Wolfgang von Goethe (1749-1832), who is well known for his literary works, but himself considered his scientific works to be of greater importance (Seamon and Zajonc 1998, 1). Goethe discovered that it is necessary to develop the mind as an "organ of perception" that goes beyond analytical thinking and (physical) sense perception in order to perceive the

"wholeness" of phenomena;[169] this new organ of perception can be developed through a process he called "exact sensorial imagination", in which one visualizes the phenomenon in a sensory way by going deeply into the phenomenon (as opposed to examining it from a distance), until one experiences the unity of the phenomenon (Bortoft 1996, 21-22).[170] Interestingly, Goethe claimed not only that it is necessary to develop these new organs of perception in order to properly "see" phenomena, but that it is the responsibility of the scientist to do so; that is, in addition to extending the physical senses technologically, the scientist must practice their exact sensorial imagination in order to themselves become an instrument to be utilized as part of their scientific practices (Bortoft 1996, 245). According to Bortoft (1996), Goethe's method is one of "*ontological participation*" from within the phenomenon (242), and Bortoft suggests that this sort of participatory science could be performed alongside the quantification of modern science (327-328). As another similar example, we mentioned in the previous subsection that although etheric spacetimematterings are not detectable with the physical senses, Steiner was able to engage with the etheric realm clairvoyantly. Steiner was deeply influenced by Goethe and was in fact responsible in the late nineteenth century for compiling and editing Goethe's

[169] This is Goethe's use of the word "phenomenon" (translated from German), not Barad's. But similarly to Barad, Goethe's phenomena refer to wholeness, and his point of engaging with the wholeness of phenomena was to perceive the intrinsic relations (instead of imposing external relations between pre-existing parts), through which the meaning of the phenomenon would be revealed (Bortoft 1996, 294). Moreover, Goethe believed that it was a mistake to separate cause and effect, and that instead one should concentrate on the wholeness of the phenomenon (Seamon and Zajonc 1998, 26).

[170] Goethe's approach is based on the "thinking" human mind as the locus of participation with "nature", although the meaning of "thinking" is extended to include participatory techniques such as exact sensorial imagination. Goethe practiced these techniques as part of his science, but he did not develop a robust epistemology or ontology to go along with them (although Steiner (2008) developed an epistemology based on Goethe's worldview), so it is not clear whether he purposely excluded non-humans from these practices or whether he was simply focusing on human practices.

scientific writings (Steiner 2008, xix); based on the way in which Steiner describes his clairvoyant engagement with the etheric realm (Steiner 2015, 658-661), the techniques for practicing such an engagement seem similar to Goethe's exact sensorial imagination. Steiner (2015) furthermore developed an "occult science" around the inclusion of knowledge gained through such clairvoyant abilities.[171]

As a final, more contemporary, example, Barbara McClintock was an American scientist known for her discovery of "transposons" as part of her research on the cytology[172] of corn during the 1940s and 1950s. In fact, McClintock was awarded a Nobel Prize for this discovery in 1983, once the scientific community had verified transposition on a molecular level. McClintock's discovery was not accepted on its own terms because her approach to engaging with her objects of inquiry was considered speculative and unscientific (Keller 1983, 192-193). It is this approach that is of relevance to our discussion. As part of her approach, McClintock was able to achieve a particular state of mind in which she could suddenly understand the answer to a problem in such a way that she had no doubt that it was correct; such insights occurred before she could even put them into words, and she was unable to provide rational explanations for them (Keller 1983, 103). Part of achieving this state of mind, for McClintock, was to make a change in herself that allowed her to integrate the problem and see it in a new way. In one case, she described this in terms

[171] From Steiner's (2015) "An Outline of Occult Science" (framed in terms of separate worlds), "The first point in occult science is by no means the advancing of assertions or opinions which are to be proven, but the communication, in a purely narrative form, of experiences which are to be met with in a world other than the one that is to be seen with physical eyes and touched with physical hands. And further, it is an important point that through this science the methods are described by which man may verify for himself the truth of such communications" (40).

[172] Cytology is the study of the structure and function of plant and animal cells.

of being in a state of joy that enabled her to make the right connections and do the right experiments (Keller 1983, 125). As another example, during a particular study of the chromosomes in a mold called *Neurospora*, McClintock had to overcome her state of fear and discouragement – which she did, in part, by sitting under a Eucalyptus tree and crying for a while (Keller 1983, 115). McClintock describes how she was then able to see the chromosomes clearly:

> I found that the more I worked with them the bigger and bigger [they] got, and when I was really working with them I wasn't outside, I was down there. I was part of the system. I was right down there with them, and everything got big. I even was able to see the internal parts of the chromosomes – actually everything was there. It surprised me because I actually felt as if I were right down there and these were my friends. (as quoted in Keller 1983, 117)

Instead of acting as a detached observer distancing herself from these objects of study, McClintock transformed herself from feeling fear into feeling joy, she went beyond her individual self-conscious "I" (Keller 1983, 118), and she gained access to a direct "knowing" by engaging personally with her objects of study. There is no mention of McClintock communicating with virtual or transphysical beings as part of this process, but McClintock does say that, as long as she was in the proper state of joy, her object of study would tell her what to do next: "You let the material tell you where to go, and it tells you at every step what the next has to be because you're integrating with an overall brand new pattern in mind" (as quoted in Keller 1983, 125). In having these participatory experiences with her objects of study, in relying on information that comes as a direct "knowing" instead of through the accepted physical techniques of modern science, and in working with "an awareness of the

oneness of things" (Keller 1983, 205), McClintock is clearly using apparatuses other than her physical sense organs.

Although these examples do not deal specifically with virtual and transphysical beings, they show that there are diverse ways in which scientists can develop apparatuses beyond the physical sense organs in order to engage in alternative ways of knowing. Importantly, these examples are also indicative of a tension between individualism and some form of wholeness: Goethe speaks about having to develop himself as an (individual) instrument, but this development then enables him to engage in ontological participation from within the wholeness of the phenomenon; McClintock speaks about the need to change her (individual) state of mind, but this then results in her ability to go beyond her individual self-conscious "I". This is not dissimilar to some of the tensions that are evident with the Findhorn gardeners, who speak in individualistic terms about going within themselves and developing their inner voice, and about the devas and God as being the core of their (individual) selves, while also maintaining that there is no dualistic separation between themselves and the devas/God, and that they are all "inside" of one another (e.g. God is within them and they are within God). All three of these cases are examples of reaching toward some form of wholeness that cannot be properly expressed or readily understood as part of the modernist onto-world. In fact, Goethe's scientific work was at odds with the concurrently developing Newtonian (modernist) worldview, McClintock's methods of scientific engagement were shunned by the modernist scientific community, and Findhorn's methods of engaging

with the devas and nature spirits – which are the focus of this project – are not acceptable by modernist standards. Thus, we have turned to agential realism in order to have a chance at working effectively with plant-human collaboration, for example by overcoming this tension between individualism and wholeness (oneness), as we discussed in Chapter 6.

In an agential realist onto-world, as quoted in the epigraph to this chapter, "…the responsible practice of science requires a full genealogical accounting of the entangled apparatuses or practices that produce particular phenomena" (Barad 2007, 390). If we take seriously the responsibility of our participatory relationality, we should no longer engage in any form of modernist science without including practices that illuminate and take responsibility for its larger context, or the referent phenomenon as a whole. Moreover, these practices must not simply be performed in addition to the modernist science, but must thoroughly and intra-actively inform this science. This has a profound effect, because it requires the scientist to acknowledge that they are not solely in charge of this inquiry, that there is nothing determinate about which this inquiry is, and that they themselves are iteratively being redefined as part of this inquiry. Although the inquiry must begin with some particular focus, which may or may not be formulated as a question, it must be open to ongoing transformation based on intra-actions that are guided not solely by the agency and values enacted as part of our human constitution (though human participation is still relevant and important). Furthermore, in order to be satisfied, this inquiry does not require a particular answer, whether in the form of new knowledge or a new ability;

its consummation is achieved simply through a more successful regeneration of livable common worlds.[173]

A key question here is what it means to successfully regenerate livable common worlds, or to enact mutual flourishing. In Chapter 5, we developed this notion as appropriate for collaboration in an agential realist onto-world, in contrast to the good of the whole toward which the devas and nature spirits collaborate in Findhorn's onto-world. We determined that in contrast to a notion such as "good", which can easily be construed in terms of a fixed essence to which one should conform, notions such as "mutual flourishing", "livable common worlds", and "regeneration" offer greater possibilities for ethical engagement by requiring responsibility for issues such as whose common world is being investigated, whose flourishing is being taken into account, what counts as livable or regenerative (and for whom), and what exclusions are being made. We will keep these questions in mind as we ponder some ways in which collaborations with devas and nature spirits could be included as part of our scientific practices in an agential realist onto-world, specifically in regard to the nanobionic spinach plant discussed above.

But first, it is important to emphasize that we cannot simply import devas and nature spirits into modernist scientific practices and put them to work in service of the

[173] This raises a question regarding the role of laboratories, which are utilized in modernist scientific practices to provide an environment in which phenomena are reduced to their component parts and analyzed in an ideal isolated manner (as we discussed in Chapter 2 as part of modernism). The laboratory is an apparatus in the production of scientific knowledge, but it is not clear whether it is possible to work toward the creation of livable common worlds in a laboratory, because such endeavors might be excluded by the modernist function of laboratories. Minimally, we can say that in addition to modernist laboratory practices, a science based on participatory collaborations requires non-laboratory practices.

human values driving modernist science. That is, the modernist scientific values of gaining knowledge about and control over "nature", as discussed in Chapter 2, are not necessarily in line with collaborative endeavors that value the regeneration of a common world that is livable not only for humans, but also for "nature", including any potential "objects" of technoscientific research.[174] This brings up an interesting point, because as we learned in Chapter 3, for Findhorn, the devas and nature spirits will collaborate with humans only in service of the good of the whole, whereas humans tend to act in selfish ways because they have lost their sense of oneness. Although we are not utilizing the notion of the good of the whole in an agential realist onto-world, this evidence from Findhorn suggests that virtual and transphysical beings might be constituted in a manner that is more likely to enact livable common worlds, and that by participating in collaborations with them, humans could possibly be constituted in ways that could increase the likelihood of being attentive to those possibilities that enact livable common worlds.[175]

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[174] As part of this discussion, it is important to honor the role of Indigenous peoples. As one example, during a 2019 conference on "Indigeneity and Climate Justice" at the University of California, Santa Cruz, Chairman Valentin Lopez of the Amah Mutsun Tribal Band (native to the greater Monterey Bay area) explained not only how the knowledge and land of his people have been destroyed through repeated colonization and continuing subjugation, but also that in order for balance and flourishing to be restored – e.g. in the context of climate change – Indigenous peoples must lead the way, based on their understanding of caring for the land through the kinship of all beings (Lopez 2019). My focus in this project is on collaborations with devas and nature spirits, but this certainly does not exclude collaborations with Indigenous peoples, nor does it exclude the possibility that Indigenous knowledges and relationality to land are indeed crucial for the global regeneration of livable common worlds. As Chairman Lopez furthermore pointed out, such regeneration begins with a mutual healing process between Indigenous peoples and the colonizers (and their descendants) who continue to enact these destructive patterns (Lopez 2019). This will be further discussed on Chapter 8.

[175] We can take this discussion a bit further based on our analysis from Chapter 6 regarding how virtual beings (e.g. devas) can be said to take responsibility as part of participating in collaboration. We acknowledged that virtual beings are not mutually spacetimemattering along with their collaborators but that they can still be said to participate in collaborative meaning-making practices in the sense that they are the very condition for the possibility of such practices. Similarly, we proposed that virtual

With the nanobionic spinach plant, then, the goal is not to determine how virtual and transphysical beings could help "us" with "our" technoscientific agendas, but to explore how enacting collaborations with virtual and transphysical beings might change the nature of this agenda – and the nature of "us" – altogether. For example, as part of our ethical obligation to question for whom our practices are beneficial (or not), we need to question our current practices of making forceful changes to plants through physical manipulations, such as by implanting spinach plants with carbon nanotubes. We know from Findhorn that such physical manipulations are not necessarily beneficial for the plants; moreover, we know that the devas and nature spirits are, in some cases, willing to modify their own patterns in collaboration with us, where these modifications would affect the physical growth and development of the associated plants without requiring these possibly harmful physical manipulations by humans. Additionally, enacting collaborations with virtual and transphysical beings could open up new possibilities for the framing of this practice, as part of which we could investigate what a livable common world might look like if the flourishing of the plants is also taken into account – not according to human values, but according to the virtual and transphysical beings that are integral aspects of these plants. For example, as suggested above, collaboration with the Spinach Deva could have the potential to result in a novel method of receiving

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beings are part of the condition for the possibility of taking responsibility, because they actively present possibilities through virtual intra-action, differentially luring the intra-action toward particular outcomes and not others. In this way, collaborating with virtual beings might increase our awareness of the possibilities that might lead to mutual flourishing.

communications regarding the level of explosives in the soil without having to implant nanotubes in the spinach plants.

Then again, perhaps the devas would not at all be willing to collaborate on a project having to do with explosives or other militaristic agendas, or with any manner of extracting information from "nature" if that information is utilized by particular groups of humans for their individual benefit. Continuing with this hypothetical example, if the devas are in fact constituted in a manner that is more likely to enact livable common worlds, their refusal to cooperate on such a project could suggest, for example, that this human engagement with explosives is not necessarily geared toward livable common worlds. Or it could suggest that these types of industrial practices of extracting information (or other resources) from "nature" do not lead to mutual flourishing and need to be rethought altogether. But until we begin engaging in empirical research in which collaborations involving virtual and transphysical beings are enacted, we can merely acknowledge that such collaborations could have profound effects on our scientific practices, on the entangled ethical and political practices, and on our constitution as scientists. Minimally, we can say that for ethically responsible working relationships with plants, it could be useful to be able to communicate with the relevant plant devas and nature spirits in order to frame our scientific and technoscientific practices in a manner that is aligned with the work of these virtual and transphysical beings, or possibly to rethink these practices altogether.

When we take seriously our responsibility to investigate the hidden and excluded aspects of the entangled relationalities of our scientific practices with plants, we help to ignite a shift from studying plants as simple objects for scientific and technological progress, to responsibly co-creating a mutually flourishing world through our collaborations with devas and nature spirits (and other human, non-human, virtual, and transphysical beings). This is part of a more general shift from a modernist science that studies nature in apparent isolation from social, political, or other contextual influences, to science as a politics of intra-actively coordinating a livable common world among and for a multitude of enacted beings.

8. Conclusion

In this project, we have provided support for the thesis that agential realism is a framework that allows for the possibility of coming to terms in a scientific way with the efficaciousness of Findhorn's practices of plant-human collaboration by overcoming the limitations of implicit modernist constructions. With agential realism, we overcome human exceptionalism, making room for collaborators other than humans, and through the fundamental in/determinacy of matter, we can overcome physicocentrism, presenting the opportunity to make sense of devas as virtual beings, and of nature spirits as transphysical beings. We showed that virtual and transphysical beings are not excluded from participating in collaborations, and we construed collaboration in an agential realist onto-world in terms of jointly taking responsibility as part of mutual intra-action, where this means being responsive to the possibilities that might lead to mutual flourishing, or to the regeneration of livable common worlds. Moreover, we addressed what might be involved in a scientific engagement with plant-human collaboration: using agential realism, we sketched out a possible way in which images or measurements in a laboratory experiment could be understood as physical traces of virtuality or transphysicality; we also considered our responsibility to include these otherwise hidden apparatuses as part of our scientific practices, for example through collaborations with the relevant virtual and transphysical beings.

As part of these philosophical and scientific engagements with plant-human collaboration, which advocate a shift from treating plants as simple objects for human

purposes to considering how to engage with plants as complex material-discursive phenomena, we briefly touched upon, but did not provide a thorough analysis of, some of the interrelated ethical and political issues. With agential realism, in order to avoid perpetuating problematic practices, these relevant entangled issues must be intra-actively thought together as part of any proper analysis. Early on in the dissertation process, as I was grappling with the difference between the individualism of the modernist onto-world and the in/determinate relationality of the agential realist onto-world, I asked myself what it could mean to live – as the human individual I felt myself to be – as part of an entangled, fully relational, ever-shifting universe, and I recognized that this included ethical and political (and ecological, social, economic, historical, etc.) forces. Yet at the time, and throughout most of the writing of this dissertation, despite being aware of the importance of these other factors, I did not recognize the importance of including their rigorous analysis as part of my dissertation. Thus, I will reiterate once again that because this dissertation focuses almost exclusively on the philosophical and scientific issues of plant-human collaboration, it should not be uncritically taken up in the absence of a more thorough analysis of the relevant interrelated ethical and political factors.

As part of engaging intra-actively with these entangled philosophical, scientific, ethical, and political issues, an agential realist analysis requires us to take account of how "we" are iteratively reconfiguring with respect to these issues. Thus, I will conclude this project in a more personal manner, modeling the importance of an intra-active engagement with, instead of a detached investigation of, the frontiers of

plant-human collaboration. Findhorn's plant-human collaboration, in which humans were able to collaborate with devas (virtual beings) and nature spirits (transphysical beings) in service of the good of the whole, has served as my context in this project, and now I will address my further stakes in this project – bringing virtuality, transphysicality, and collaborative modes of engagement that go beyond the physical (measurable) into scientific practices – in terms of my own iteratively shifting constitution as part of this process.

Whereas my upbringing was mostly modernist, and I attempted for the first thirty-five years of my life to fit my world and experience firmly and safely into this modernist box, I found that I could not continue living with integrity in this way, because my experience, or my reality, did not match up with modernist reality in a way that I could make sense of. For one, given advances in science such as quantum physics, our most promising scientific theories do not match up with our common-sense way of seeing and acting in the world, an inconsistency which unsettles me and causes me to strive for new ways of seeing and acting. As part of this issue, the practice of science and technoscience, as I engaged with it as an undergraduate student at the University of California, Berkeley, and subsequently during a 10-year career in biotechnology, did not feel ultimately satisfying to me. Also, living in a world that to me seems to be filled with countless crises and no clear way in which to overcome them – where I have engaged mostly in terms of ecological crises – has led me to seriously question modernist assumptions. Finally, whereas I had established a neat and safe world for myself in modernist (physical) reality, I began to feel and

experience things that I could not explain, and that tugged on me over a period of years, urging me to more deeply explore the nature of reality and our human involvement as part of this reality.

Findhorn's plant-human collaboration is only one example of practices that I learned about or otherwise engaged with, that felt right to me but did not fit into my modernist onto-world. It has been fruitful to weave my dissertation around this example, because it suggests the involvement of quantum physics (even if only through vague references and incoherent appropriations), and importantly, because it describes a radically novel way to address current crises, particularly ecological crises. In Dorothy Maclean's words:

> In the Findhorn garden, we saw what the cooperation of humans and devas could bring about, each realm contributing a unique and vital energy. But the implications of such cooperation extend far beyond simply growing successful gardens. At a time when it appears that material solutions to ecological crises are not sufficient, perhaps the devas are offering us a real alternative on how to restore the upset balance of nature on our planet. (Findhorn Community 2003, 76)

It was clear to me, however, that Findhorn's collaborative practices could not be made sense of in a modernist onto-world, but the New Age onto-world, as I engaged with it, did not satisfy my scientific and philosophic expression; I was also vaguely aware that it did not satisfy me in some deeper way, which I could not yet articulate. That is, my boundaries as a human could have been reworked such that I became the sort of human that is satisfied by New Age explorations, but instead, my boundaries habitually seem to be enacted according to patterns of scientific and philosophical rigor: I needed to find a way to be able to make sense of Findhorn's collaborative

practices in terms of a different framework that was still scientifically and philosophically rigorous (and coherent) but that had an expanded sense of reality.

Recognizing that this would require a shift in the underlying assumptions of modernism, I was happy to discover alternative ontological frameworks – exemplified in this project by Karen Barad's agential realism – that rework these fundamental modernist assumptions while also being rigorously based on current scientific theories, notably quantum physics. With such frameworks, I could see that Findhorn's collaborative practices need not be dismissed outright and might even have a chance at being engaged with scientifically. Because quantum theory suggests such a radically different understanding of reality that cannot be conceptualized in the same visual manner we are accustomed to, it was plausible to me that we would have to so completely change our common-sense understanding of reality that the radical-seeming idea of collaborating with devas and nature spirits could make sense. But what took me longer to realize is that as a consequence of completely shifting our underlying assumptions, what I previously considered to be (modernist) science would also have to be radically extended. This extension includes both the agential realist sense of ethics as implicated in scientific practices, and also the fact that in order to engage scientifically with virtuality and transphysicality – which become part of the real by virtue of the fundamental in/determinacy of matter in an agential realist onto-world – as more than mere physical traces, scientific practices need to be extended beyond the merely physical, or beyond what we can see and measure with our physical senses and their technological extensions.

What took me even longer to recognize is the extent to which issues other than the philosophical and scientific – e.g. ethical, ecological, social, economic, political, historical – are not only implicated in but are inextricably interwoven with the philosophical and scientific issues, and that it is therefore necessary to think through these issues in intra-action with one another. Most poignantly, for me, was the recognition that entities such as devas and nature spirits were banished as part of the rise of the modernist onto-world not only because they did not fit in with the emerging philosophical and scientific understanding, but crucially, because of the concurrently developing political and economic systems that de-spirited the land, eradicated the humans who continued to engage in non-dualistic ways with spirits (mostly women and Indigenous peoples), and rendered both land and human as resources to be utilized for individual human gain (see Chapter 2). This speaks to my dissatisfaction with the New Age onto-world as based not only on its lack of a rigorous philosophical and scientific basis, but also on its inability to move beyond modernist politics and economics. In other words, not only is it necessary to think through topics such as plant-human collaboration in these interrelated ways, but it will not be possible to fully birth any new philosophical or scientific system without concomitant transformations in the economic and political systems that continue to reinforce problematic political practices based on the (modernist) philosophical and scientific understanding of the primacy of the (human) individual, the dualistic separations between nature/culture and matter/mind, and as I have focused on heavily in this dissertation, the physicocentrism.

Regarding physicocentrism, with agential realism's basis in and coherent interpretation of quantum physics, I was able to go beyond the modernist idea of physical reality to include virtuality and transphysicality, as well as collaborations with virtual and transphysical beings, thereby achieving a sense of academic validation of my own experience and sense of reality. More recently, however, I have come to recognize that overcoming physicocentrism is not only a philosophical and scientific project, because collaborations with virtual and transphysical beings – which are based on mutual flourishing – do not make sense in a modernist onto-world with its economic and political systems that function in terms of individual gain and de-spirited matter. Thus, my ongoing query regarding how "I" can become more aware of "my" shifting constitution as a human in relation to all other co-constituting beings, is more accurately a query regarding how "we", with "our" economic and political systems, co-constitute in relation with all other beings, and how these interrelated systems must shift in order for "us" to recognize the participation of virtual and transphysical beings in the regeneration of livable common worlds.

I am utilizing these terms "we" and "us" in an attempt to think in terms of a relational ontology in which "we" are not determinate individuals, but we-in-the-process-of-becoming are mutually intra-acting subjects iteratively reconstituting in relation to all others-in-the-process-of-becoming, within and as part of the differentially constituting universe. But it is also a matter of convenience – of modernist convenience – to utilize these terms that make it possible to continue speaking as if "we" are indeed separate individuals. Moving beyond this limitation in

order to more fully embody relationality means recognizing in a deeper way that there are no pre-existing others toward whom to express relationality. Instead, relationality requires an intra-active engagement with – and a taking responsibility for the specificities of how – particular relations are enacted. This need for a deeper engagement with relationality is part of the ongoing process by which I am overcoming the modernist limitations that continue to shape me in pervasive and individualist ways. Part of being trapped in a modernist box, for me, has been a palpable estrangement from "nature" (not to mention from other humans and even from myself), but this estrangement has slowly been dissolving, and I have begun to feel that my boundaries are being reconfigured according to different patternings. This is a result not only of my analytical engagement with this project, but by practices such as sitting with all sorts of plants in different situations, by remaining curious and inquisitive, by feeling into my iterative co-constitution with plants, and more generally, by breaking the habit of allowing the plant world to remain backgrounded. With the iteratively shifting dynamics of intra-action, we can furthermore become alive to new possibilities as part of these practices: time and space may become less restrictive, boundaries more dynamic, inside and outside less discrete, objects less rigidly defined, possibilities more influence-able, communication more expansive.

To conclude, I will provide one relevant example suggesting how the philosophical analysis of Findhorn's plant-human collaboration presented in this project could be utilized in a critical engagement with current issues. As part of my

ongoing investigation on topics related to plant-human collaboration, I was privileged to hear Chairman Valentin Lopez of the Amah Mutsun Tribal Band (native to the greater Monterey Bay area of California) speak at a 2019 conference on "Indigeneity and Climate Justice" at the University of California, Santa Cruz. Lopez (2019) shared the story of his people, including how their knowledge of the plants and of working with the land has been partially lost through repeated colonization, while their social structures and worldviews regarding the kinship (relationality) of all beings have stayed intact. Based on their practices of caring for the land through the kinship of all beings and through their recognition of the spiritual importance of this relationality, Lopez (2019) explained that Indigenous peoples must lead the way in order for us to be able to restore balance and flourishing in the face of climate change. Importantly, as Lopez (2019) furthermore pointed out, this must occur in conjunction with a mutual healing process between Indigenous peoples and their colonizers (who continue to enact destructive colonizing patterns), and this healing must also be inclusive of all other beings – such as the plants – that have been affected by colonialism. Healing from colonial violence as part of shifting these ongoing patterns of violence is not something that must be done *in addition* to (re)learning how to care for the land through the kinship of all beings, but it is an intra-active endeavor in which the political, ethical, ecological, scientific, and philosophical must transform together, not only in an analytical sense but in the specificities of how relations are enacted, which materializes the world in certain ways and not others.

Working with local Indigenous peoples in the specificities of their relationality with the plants, animals, spirits, land, etc., provides a relevant context in which to situate my project, in which I have focused only on Findhorn's plant-human collaboration with its devas and nature spirits. This particular focus provided the necessary challenge to the physicocentrism of the modernist onto-world that I wanted to address, but my analysis of how it could be possible to overcome modernist limitations need not be limited to Findhorn's devas and nature spirits, as it could be applied to diverse practices of relationality including all sorts of beings. In terms of working with local Indigenous people regarding issues such as climate change, we could, for example, utilize this philosophical analysis in critical engagement with the entangled political issues to help modernists engage with Indigenous peoples and their practices that might otherwise be dismissed outright, which could be an important intra-active factor in the mutual healing process that is a necessary part of such collaborations. Specifically, with insights from agential realism, we can move beyond the modernist interpretation of individual human agents that must somehow communicate across realms with individual non-physical entities (such as spirits), to a dynamically shifting in/determinate universe that is inclusive of both virtuality and transphysicality, within and as part of which collaborations are enacted that open new possibilities for the regeneration of livable common worlds that are productive of a multiplicity of diverse beings.

Appendix A – Plant Sentience in the Scientific and Philosophical Literature

The term "plant sentience" is being used to include various other terms such as "plant cognition", "plant intelligence", "plant consciousness", and "plant neurobiology", which generally refer to the study of plants as something more than inanimate objects. When discussing specific research, I will utilize the particular term used by the researcher(s). This brief survey of plant sentience is not meant to be exhaustive, but is intended to show that plant sentience is becoming increasingly accepted in both the scientific and philosophical literature. In general, the research presented here presupposes modernism, but the "embodied" and "ecological" approaches presented below challenge modernist assumptions regarding the boundaries both between pre-existing individuals and between mind/matter.

In a 1997 article in the *Journal of Consciousness Studies,* Alexandra H.M. Nagel argues for the importance of undertaking a rigorous scientific examination of plant consciousness, based on her survey of the current state of this topic in both the scientific literature (including social science literature such as anthropological studies on Indigenous cultures), and what she refers to as the "non-scientific" literature, such as folk and esoteric literature, for example in which humans interact directly with "nature intelligences" (206). For historical purposes, it is worth briefly describing the four clusters into which Nagel categorizes her findings. Cluster I is scientific literature from the biological sciences, in which anthropomorphic language – e.g. "memorization", "communication" – is used for convenience to render complex plant

phenomena understandable, but with no intention of ascribing any kind of consciousness to plants (Nagel 1997, 217-218). Cluster II is scientific literature in the fields of social sciences and parapsychology, targeted at showing that plants must have some kind of awareness or "primary perception" because they respond differentially to human activities such as prayer, attitude, and healing. This research includes Cleve Backster's famous polygraph measurements of plants' electrical potentials, which change in response to the mental activity of humans.[176] According to Nagel (1997), these Cluster II studies generally involve a belief in something like plant consciousness, but they do not provide rigorous evidence for plant consciousness, let alone conclusive evidence for any sort of awareness or "primary perception" in plants (220). Cluster III includes social and anthropological studies focusing both on the relationship between Indigenous peoples and the spiritual aspects of nature, as well as on mystical encounters with nature in which (non-Indigenous) humans come into contact with spiritual forces in nature, such as devas and nature spirits, or otherwise feel the consciousness inherent in nature (Nagel 1997, 221-222). The belief here is that plants do have consciousness, and that there is no need to back it up through modern scientific methods of examination. Cluster IV is similar to Cluster III, but goes a step further with the assertion that humans can cooperate with plants, where the plants are treated as conscious beings. The Findhorn experiment is mentioned in this Cluster, as well as Machaelle Wright's work at

[176] Though Backster's experiments are discredited because they have not been rigorously repeatable (though some experimenters are able to repeat them), it is argued that the experimenter must have established a certain relationship with the plants in order for the experiments to function, complicating the matter (Nagel 1997, 220).

Perelandra, which is a sort of modern-day continuation and expansion of Findhorn's practices (Wright 1990, Wright 1993). According to Nagel, these incidences of plant-human cooperation cannot be confirmed but neither can they be rejected outright. In summary, at the time of Nagel's (1997) paper, interest in the topic of plant consciousness had been exhibited in diverse fields, but no rigorous scientific investigation in the biological sciences had been undertaken.

The study of plant consciousness – this time framed as "plant neurobiology" – was reinvigorated in 2005 with the creation of the peer-reviewed journal "Plant Neurobiology", bringing into the biological sciences the willingness to seriously consider whether plants have the "machinery" to support information processing. Action potentials in plants had been measured as early as in Charles Darwin's time (it was Darwin who first initiated these experiments), and it was gradually shown that these electrical signals were common to all plants and linked to important plant processes such as photosynthesis; however, it was initially believed that plants did not possess any structures able to act as nerves (Stahlberg 2006, 6-7). Later, it was realized that plants do have various types of nerve-like structures that enable long-distance electrical signaling in plants; thus, the study of the neurobiological aspects of plants became relevant (Stahlberg 2006, 7). The emerging field of plant neurobiology was, however, highly controversial (Alpi 2007, Brenner 2006, Brenner 2007), and in 2009, the title of the "Plant Neurobiology" journal was changed to "Plant Signaling and Behavior", though they are still geared toward illuminating the information processing capabilities of plants:

> The goal of this field is to illuminate the structure of the information network that exists within plants. Plants are dynamic and highly sensitive organisms that actively and competitively forage for limited resources both above and below ground. Plants accurately compute inputs from the environment, use sophisticated cost-benefit analysis, and take action to mitigate diverse environmental insults. Plants are also capable of refined recognition of self and non-self, and are territorial in behavior. This view sees plants as information processing organisms with complex, long-distance communication systems within the plant body and extending into the surrounding ecosystem.[177]

We will consider how several key prejudices against plant sentience are dismantled through recent scientific findings and philosophical examination. This is not intended to be an exhaustive review of the literature, but a brief consultation of particular studies focused on plant motility, plant communication, and the plant brain.

One of the prejudices that prevents an easy acceptance of plant sentience in a modernist onto-world is the apparent fact that plants do not move in the way that humans and other animals do. As asserted by neuroscientist Patricia Churchland, movement requires cognition and intelligence: "If you root yourself in the ground, you can afford to be stupid. But if you move, you must have mechanisms for moving, and mechanisms to ensure that the movement is not utterly arbitrary and independent of what is going on outside" (as quoted in Calvo 2016, 9). However, a variety of research has contested the belief that organisms rooted in the ground do not engage in movements of their own.[178] It is mostly the application of human time-scales to plants that makes it appear as if plants are non-motile, but observant and patient

[177] "Plant Signaling & Behavior." Our Mission. Accessed June 8, 2018. http://www.plantbehavior.org/about-us/.

[178] There are obvious examples of movement in plants that can be observed in real-time, such as when the carnivorous Venus Flytrap closes its leaves to trap insects, but the general belief is that plants are separated from animals by their lack of movement.

individuals such as Darwin recognized the movement of plants, not only in terms of how they move in response to stimuli like light, touch, or gravity, but also how, in order to adapt to changing environmental circumstances, plant shoots and root tips move in circular or elliptical patterns during growth (Darwin and Darwin 1966). With the advent of time-lapse photography, it has been possible to photograph this motion of plants on the time-scale appropriate to plants. The common example is that of the climbing bean plant, in which the tendrils move in wide circular patterns as they seek a support around which to vine. An internet search on the twining motion of plants reveals a multitude of time-lapse videos; watching such videos helps introduce the possibility of plant sentience by portraying plants as active and intentional, rather than sessile, beings.

A further difficulty with the consideration of plant sentience within a modernist onto-world is that plants do not seem to communicate with humans, nor is it immediately apparent whether or how they communicate with one another or with other organisms. However, scientific research has provided evidence for a multitude of communicative abilities, both within an individual plant (between its roots and its shoots), and between plants and other organisms. In order to communicate, plants must be able to perceive their environment through various parts of their plant body and then coordinate this information into a response. As summarized by Karban (2017) from numerous recent studies, plants detect and distinguish between different types of light, they perceive chemicals in the atmosphere and in the soil, they detect and respond to touch, and they perceive temperature, electricity, and sound (4-10).

These abilities are utilized for communication between the cells of a single plant, between multiple plants, and between plants and animals. For example, when a plant is attacked by a pathogen, the various results – such as mechanical damage to the plant or the presence of particular chemicals – manifest as action potentials or as chemical signals that convey this information to the rest of the plant, allowing for a coordinated response. As part of this defense, which may include the uptake of particular nutrients and their conversion to chemicals that discourage the pathogen, plants may emit volatile chemicals both to attract the appropriate organism to assist in removing the pathogen, as well as to warn their plant neighbors of the presence of the pathogen (Karban 2017, 13-14). In addition to utilizing volatile chemicals as signals, a more recent topic of investigation is bioacoustical communication, based on the fact that plants both emit and respond to sound waves (Gagliano 2013) (Gagliano, Mancuso, and Robert 2012). Finally, plants also communicate through underground networks of micorrhizal fungi (Karban 2017, 16).

But a key shift in the understanding of plant communication involves a reconsideration of language in general, including its anthropocentric bias. Gagliano and Grimonprez (2015) suggest that a reductive approach may be limiting: "How many more chemical compounds or light wavelengths do we need to detect and analyze before we can truly access, understand, and appreciate plant language?" (150). Instead, in an *ecological* approach, language is not mechanically manifested by individual organisms, but meaning emerges dynamically through interactions and relationships between interdependent organisms in a multispecies ecology. In the

case of plant-human communication, the concept of nonverbal plant language can be developed as the corporeal and ecological presence of the plant, where humans interpret this language through their own sensory perceptions of the plant, taking care to recognize this communication as an interplay between humans and plants (Gagliano, Ryan, and Vieira 2017, xxvii). The redefining of language through an embodied, ecological approach is only one way in which an ecological approach can be helpful in our consideration of plant intelligence; we will continue this discussion below in regards to plant cognition.

Another barrier to the acceptance of plant intelligence within the modernist scientific community is the fact that plants do not have a brain, nor do they have neurons or a nervous system. As mentioned above, it is anthropocentric to assume that intelligence requires a brain, and more specifically, a brain grounded in neural anatomy. Nevertheless, this lack of a human-like brain in plants is a significant barrier and must be dealt with. In fact, one of the main avenues of research among plant intelligence scientists – underscored by the original choice of the journal name "Plant Neurobiology" – is to figure out how it could be the case that the plant's anatomy supports brain-like behavior, where brain-like behavior is generally taken as computational. How can plants take in information from their environment, represent it subjectively in some neural-like substrate, and then process this information into an output action? Plant neurobiology is based on the theory that the plant's vascular system, in addition to transporting nutrients through the plant, acts as a parallel distributed electrical information processing system by virtue of networks of electro-

sensitive cells that can fire and spread activation through the system (see, for example, Baluška, Mancuso, and Volkmann 2006). In this way, plants are able to store memory, make predictions that are compared with the information coming in from the environment, engage in abstract "offline" processing, and engage in proactive intelligent behavior (Calvo 2018).

These scientific advances in plant neurobiology are based on a computational model of brain behavior that relies on the representationalism inherent in a modernist onto-world, so these are not necessarily the ways in which we are seeking to understand plant intelligence in this project. But it is not necessary that intelligence must include the ability to engage in formalisms and abstract processing. For example, Trewavas (2017) draws an analogy between swarm intelligence and plant intelligence: "On this analogy, the assessment of environmental signals and the necessary decisions to be taken by plants arise simply from the complex communication between cells, tissues and organs involving numerous feedback and feedforward processes. Assessment in plants does not necessarily require the equivalent of a brain although a functional equivalent may be present" (10-11). Moreover, we can view intelligence as the ability to engage with the environment in an embedded and interactive sense through meaningful physical relationships that are dynamically changing. We already considered an embodied, ecological approach to language above, and now we extend this approach to cognition.

The philosopher Paco Calvo (2016) has developed a non-representational approach to plant cognition based on embodied cognition and the ecological

psychology developed by James Gibson (1979). With embodied cognition, both cognition and intelligence take on broader definitions that are not based on the human as the prime example. Embodied cognition is the biological ability of an organism, through its sensorimotor system, to manipulate the environment for its ultimate benefit (Calvo and Keijzer 2011, 161-162). Furthermore, embodied cognition does not require a human-like neural substrate but is based on how the organism couples with its environment, given whatever substrate it does have, such as a plant body. According to Calvo, Raja, and Lee (2017), in Gibsonian ecological coupling, the environment is considered to be a rich source of information that can be directly detected, as opposed to being processed through a series of mental inferences; while this is generally accepted for animals, the authors provide experimental evidence that it is also the case for plants (3). Taking the example of a vining bean plant and a pole around which the bean plant vines, the plant and pole are dynamically coupled in ongoing action-perception loops that allow the tip of the vine to eventually intercept the pole.[179] Although this coupling is dynamically changing, the plant is guided toward the support by particular invariant properties that are relational with respect to the coupled system.[180] These invariant properties are directly detected by the plant,

[179] A useful example to illustrate this theory is the "outfielder problem", which examines how a baseball outfielder manages to position themself correctly in order to catch a fly ball. A computational model predicts that the outfielder would have to computationally gauge the trajectory of the ball. An ecological model predicts that the outfielder engages in action-perception loops with the moving ball, such that the outfielder directly perceives the ball's trajectory by continuously moving their body so as to line themselves up with the moving ball.

[180] A common way to understand these invariant properties in humans is optically, through the changing size of the target image in our retina, but the direct detection of invariant properties does not require the utilization of sense organs such as eyes. Still, Baluška and Mancuso (2016) have proposed a model for proto-vision in plants, in which the cuticle, epidermis, and mesophyll layers of plants are,

without the need for cognition as an intermediary (Calvo, Raja, and Lee 2017, 3); thus, the focus shifts from examining what is inside the "head", or inside the vascular system of the plant, to the environment with which the plant is engaging.

Importantly, the unit of analysis in this embodied ecological approach is not the plant or the environment, but the coupled system as a whole (Calvo, Raja, and Lee 2017, 2). Neither the plant nor the objects in the environment exist except in relation to this larger whole, and any associated perception, cognition, or meaning emerges from the system as a whole, as opposed to belonging to an individual. In Gibsonian terminology, the plant perceives not a pole (an object), but a possibility for action – the *affordance* of "climbability" – and the environment is presenting this possibility to the plant (Calvo, Raja, and Lee 2017, 2). In other words, the plant does not represent the pole abstractly, but the plant in conjunction with the environment, or the plant-pole coupled system, enacts climbability. In this sense, it seems more appropriate to refer to agential intra-action than to the coupling of a plant and the affordances in its (external) environment. With agential realism, we could say that neither the plant nor the pole are pre-given individuals, but that they are *both* iteratively and relationally differentiated within and as part of material-discursive phenomena, in which the perception of the pole as climbable is one possibility for how the indeterminacy could resolve. With the terminology of intra-action, we are less likely to assume a plant with given boundaries interacting with a pre-given environment.

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respectively, cornea-like, lens-like, and retina-like. In this way, the plant would literally "see" with its body, similar to how Barad (2007) describes the optical capability of the brittlestar (369-370).

With this basis in embodied cognition, we can consider whether particular plant behaviors – understood as the behavior that emerges from the coupling of (the intra-action of) a plant and its environment – exhibit mere adaptation or actual intelligence. Trewavas (2017) summarizes various investigations on the requirements for intelligence, determining that for plants, intelligence requires that individual plants exhibit behavior such as learning and memory that increases their survival, with these adaptations being based on their changing needs in any given particular environment (2). Similarly, Calvo (2018) describes plant intelligence as requiring goal-oriented behavior with the capacity for anticipation and with sufficient flexibility in adaptation on the particular time scale of the organism, as opposed to the adaptation of the species in general. According to Calvo (2018), particular types of learning that exhibit this intelligent behavior are habituation and conditioning; we will consider one example of each, making the case both that plants can learn and that plants can be considered intelligent in an embodied ecological sense.

To test whether plants exhibit habituation – a primitive form of learning in which an organism must memorize particular relevant details in its environment and then access these memories in order to modify its reactions to external stimuli, Gagliano et al. (2014) repeatedly dropped *Mimosa* plants. These sensitive plants responded to this mechanical disturbance by folding their leaves, but once they recognized that the dropping did not pose them danger, they ceased to fold their leaves. They retained this memory for as long as 28 days, but only in response to the habituated stimulus of dropping (i.e. they still folded their leaves in response to other

mechanical disturbances). Conditioning, or associative learning, is a more sophisticated form of learning in which two different stimuli are associated with one another, requiring what we traditionally think of as the ability to think abstractly, or to form an association "in our heads". Gagliano et al. (2016) demonstrated that pea plants can associate the presence of light, which plants obviously desire, with a conditioned stimulus such as a blowing fan, which plants generally avoid. More specifically, in response to the placement of a fan in a Y-maze, plants were able to anticipate both when and where light would appear, after they had been conditioned to associate the fan with light. According to Gagliano (2017), associative learning is based on some form of subjectivity and awareness, and thus "plants too must evaluate their world *subjectively* and use their own experiences and feelings as functional states that motivate their choices" (3). Though this particular analysis of associative learning is based on representationalism, it is helpful to deconstruct the notion that only animals and not plants have access to representations and subjectivity.

We can also talk about both habituation and conditioning in terms of an embodied ecological model, in which intelligence is not assigned to the plant as an individual, but intelligence emerges from the coupled system as a whole. This is reminiscent of the intelligibility that is a part of every agential intra-action. A phenomenon differentiates in such a way that one part of the phenomenon (the "environment") becomes intelligible to another part of the phenomenon (the "plant"), so that intelligibility is part of the intra-action as a whole. The key difference here is that every intra-action enacts intelligibility, while we have here been distinguishing

between ecological couplings that exhibit intelligence – habituation and conditioning – and those that do not, such as mere adaptation. With the latter (ecological) approach, some kind of human bias is still being employed in determining what kinds of behavior, or what kinds of learning, constitute intelligence. In contrast, in an agential realist onto-world we can say that intelligibility is always enacted, and then we can discuss different approaches to intelligibility, such as what we as humans call adaptation or learning of various sorts.

Given this philosophical examination of the scientific evidence for plants as engaging in intelligent coupling with the environment, we can sum up this investigation with plant anthropologist Natasha Myers' (2016) approach. When it comes to discussing the intelligence, intentionality, subjectivity, and agency of plants, Myers finds that we are faced with the kinds of questions that challenge the notion of an ontology that presupposes separate subjects and objects. First of all, what kind of subject could a plant be if its "centers of indetermination" are the root tips, meaning that any given plant, with its multitude of root tips, has a number of control centers, in contrast to the single head of a human. Moreover, plants are not autonomous but are enmeshed in ecologies, acting as catalysts for ecological relations, yielding a sort of collectivized agency in which the organisms that are involved cannot be separated. Myers' approach toward plants as thoroughly entangled with their ecologies seems to be compatible with agential realism, but even from within a modernist onto-world, there are compelling reasons to consider plants in a new light. Myers (2016) points out, for example, that the capacity of plants to do photosynthesis is a remarkable

achievement and power, and that humans rely in a very basic sense on this capacity and should be recognizing plants as allies who deserve our gratitude:

> Photosynthesis can teach us … our entire political economies turn around plants. Every aspect of … however we adorn ourselves, everything we build our homes with, everything we nourish ourselves with, everything we drug ourselves with, is plant-derived. And even the plastic itself comes from the petroleum, which is plant derived. So … these are world-making beings, these plants, and they need their due.

In this way, even a modernist who may be in principle opposed to the possibility of plants as sentient beings could be urged to take a new stance of curiosity toward plants. Myers asks the question, "what are plants up to?" – maybe plants are up to something interesting, something worth us trying to find out (Myers 2015). According to Trewavas (2017), the scientific community *is* beginning to consider plant sentience seriously: "From an initial and controversial beginning in 2003 [7], plant intelligence investigations are now spreading into different areas of study that find the concepts productive and even beginning the complex consideration of the meanings of plant cognition [154,155]. The frontier continues to expand" (15).

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