ECOLOGY AND METAPHYSICS

ECOLOGY AND METAPHYSICS: METAPHYSICAL FOUNDATIONS FOR ECOLOGICAL THOUGHT AND ACTION

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Chapter 1. Substance and Attribute

We like to think that the beliefs we hold are well justified, that they are really what *we* think and not a blind repetition of ideas gained elsewhere. But our modes of thought belong not just to our own minds, but to history, where they emerged, were tempered, and integrated in manners that exceed our conscious assent. Even examined critically, the entirety of ideas we hold are not disclosed. There often remains, unbeknownst to teacher and learner the foundations and presupposition of thought which have shaped it. These do not need to be taught, they are lived in all the mechanisms that surround us, shaping the world we inhabit. Philosophy is not exempt from unexamined presuppositions. The history of the idea of substance and substance-attribute metaphysics carries with it some such presuppositions, that, having been discussed at length by an array of thinkers, have already shaped our modes of thought and living to the highest degrees. I propose to examine this history in light of these presuppositions as they relate to ecology and the climate catastrophe. It is in these presuppositions that I locate some of the attitudes creating and perpetuating ecological destruction. Environmentalists ask why it seems that humanity cannot change its behaviour in light of all the evidence that we can destroy the earth we inhabit. Truly believing that we can destroy the earth depends first on believing in change, not superficially but in every action as a source of novelty that has relation to others. These beliefs are not exchangeable on a whim, but are deeply rooted presuppositions of Western thinking. Understanding their formation requires, firstly, a historical analysis.

The history of substance and attribute metaphysics begins formally with Aristotle. It was not, however, an isolated philosophical creation. To understand Aristotle's account of substance we should first briefly examine his predecessors.

Central to Aristotle's account of substance is a priority of being over becoming. This prioritization is a result of—stated simply—the philosophical influence of Parmenides on Plato, and then Plato on Aristotle. Parmenides remains influential, with the primacy of being over becoming remaining central to the Western philosophical tradition, even after the objections and challenges of several philosophers of becoming and process over the last two centuries. Thus, before beginning an inquiry into the substance-attribute philosophy of Aristotle and its reception, we ought to investigate Parmenides's philosophy of being.

The philosophy of Parmenides, written in poetic form between 500 and 450 B.C.E., pushes a metaphysics founded on being to its utmost limits. While earlier pre-Socratic thinkers had reduced fundamental reality to elements such as water, fire or air, Parmenides made the bold move of reducing it to being itself. Everything is being, uniform and universal. Parmenides summarizes his doctrine with his oft repeated phrase "Being is."[1] Every particular being in the universe is ultimately reducible to being itself, and thus every particular being is identical with one another in a literal sense. All things share this property. Nothing is excluded. Nothing that exists is a non-being, and no non-being can create a being. It makes no sense to speak of being that was or will be, only Being which is.

Parmenides's account inspires the perennial question no metaphysician since can ignore: if "Being is," then what is being? Parmenides's answer to the question and the implications that follow are remarkable, both for their logical rigour and unacceptable conclusions.

Taken to its conclusion, the world of perception and change is, for Parmenides, ultimately an illusion. This conclusion is reached astonishingly quickly when being is asserted as the

[1] Parmenides, *On Nature*, in Charles M. Bakewell, *Source Book in Ancient Philosophy* (Charles Scribner's Sons, 1907), 13.

fundamental element of reality. What is being? Etienne Gilson writes "being appears as endowed with all the attributes akin to the notion of identity."[2] Being appears as self-identity, everything that shares in being *is*, while everything that does not is not. Since everything which is, is being, being is "unique and universal," it is one.[3] Going further, both a cause and an end to being is inconceivable. Being cannot arise out of non-being, and neither can a being exist which can cause non-being. Thus, being is both one and eternal. As eternal, it makes no sense to speak of being as past or future, but only present—hence Parmenides's insistence that "it is." Any reference to a being past or a being future implies that something must have vanished out of being and into non-being, and that is impossible. With no past or future, being is entirely devoid of change and motion. "Any modification in its structure," Gilson writes, "would imply that something which was not is becoming, or beginning to be, which is an impossibility."[4] Reality is therefore, in truth, changeless, motionless, devoid of history, and perpetually the same. If we perceive change, motion or relations in our world of sense, it is but an illusion obscuring the truth of the one eternal reality.

Yet change and motion seem to be part of all we encounter. Parmenides does not shy away from the seemingly absurd implications of his principles. He proposes being as fundamental and follows its implications to the end, to a position of completely static being. This position is contrary to all our experience, and hence Plato and later philosophers will struggle to create a metaphysics of being which does not lapse back into the stasis of Parmenides. The consequences Parmenides unwaveringly demonstrates continue, regardless, to haunt

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[2] Etienne Gilson, *Being and Some Philosophers* (Toronto: Garden City Press Co-operative, 1949), 7.
[3] Gilson, *Being and Some Philosophers*, 7.
[4] Gilson, *Being and Some Philosophers*, 7.

metaphysical accounts founded on being. The denial of change and relations in the world of sense will be a re-occurring theme in my argument and we can confidently say that Parmenides's philosophy is this denial in its clearest demonstration, fearfully unapprehensive. Future philosophers of being—and following Aristotle, substance—will be wary of such consequences and struggle to straddle a line between the perceptible world of flux and the static identities which seem to persist through it. Denial of change and relations are the consequences we shall see seeping beyond the realm of speculative metaphysics and into the sciences, from which they insert themselves in all manners of existence.

Like Parmenides, Plato identifies that which is most real with being. To avoid the pitfalls of Parmenides's account, he resolves the problem of being and becoming, of permanence and flux, differently. Plato divides reality in two: a world of eternal forms which are the only things truly deserving of consideration as beings, and a world of sense with which these forms participate in degrees. The world of forms is not just ontologically primary, but epistemologically superior, with our understanding directed at these eternal forms rather than the perpetually perishing world of sense. Through the character of Timaeus in the *Timaeus* Plato writes:

> What is *that which always is* and has no becoming, and what is *that which becomes* and never is? The former is grasped by understanding, that which involves a reasoned account. It is unchanging. The latter is grasped by opinion, which involves unreasoning sense perception. It comes to be and passes away, but never really is.[5]

The world of change does not deserve the title of being; as a world of mere shadows, it "never really is," and we can never really know it. Influenced by Plato, yet intent on refuting the theory

[5] Plato, *Timaeus*, 27d6-28a4.

of forms, Aristotle offers his theory of substance and attribute as an alternative, though the Platonic primacy of being persists in Aristotle's theory. It is through Aristotle's influential account of substance that this primacy will be reified, as an unquestioned presupposition, through the Western tradition.

Aristotle takes Plato's inquiry into being and transforms it into an inquiry concerning substance. He writes, "The question that was asked long ago, is now, and always will be asked… What is being?—is just the question, What is substance?"[6] Understanding being for Aristotle is understanding substance (and relatedly, attributes), and this substance-attribute dichotomy is the dominant manner in which subsequent Western philosophy discusses being.

For Aristotle every being, whether it is Socrates the human, red the colour, 2pm a time, or the forest a location, is a being due to its relationship with substance.[7] Appropriately, not all these beings are ontologically equal. Primary substances are particulars, such as Socrates, Achilles, Achilles's horse and this particular apple.[8] They are particular instantiations of a universal species: humans, horses, apples. But it is the particulars, not the universals, which are primary substances. Species and their genera (animals, fruits, following the example) are secondary substances. Secondary substances are contentious as to their actuality, the question as to whether they "are real or situated in bare thoughts alone" is famously raised in Porphyry's *Isagoge* and is not of much relevance to our inquiry.[9] Primary substances, as outlined in Aristotle's *Categories,* are "that which is neither said of a subject nor in a subject."[10] Aristotle is creating a distinction

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[6] Aristotle, *Metaphysics*, Z, I, 1028b1-5.
[7] C.D.C Reeve, *Substantial Knowledge* (Indianapolis: Hackett Publishing Company, 2000) xiii.
[8] Aristotle, *Categories*, 2a11.
[9] Porphyry, *Isagoge*, in Paul Vincent Spade, *Five Texts on the Mediaeval Problem of Universals* (Indianapolis: Hackett Publishing Company, 1994), 1.
[10] Aristotle, *Categories*, 2a11.

between substance (the first category of ten total), and attributes (categories two through ten). Attributes are, as opposed to substances, commonly said of and in subjects, in the way one may say Socrates (substance) is pale, short, or old (attributes said of this substance).

On Aristotle's view in the *Categories*, substances are ontologically independent, capable of subsisting individually in themselves. Attributes, conversely, are entirely dependent on substances for their being. Aristotle says, referring to attributes: "all the other things are either said of the primary substances as subjects or in them as subjects. So if the primary substances did not exist it would be impossible for any of the other things to exist."[11] Of the ten categories Aristotle presents, the first is (1) substance and holds this privileged ontological position. The other nine categories, all attributes, owe their being to substance. The other nine categories are (2) quantity, (3) quality, (4) relative, (5) where, (6) when, (7) position, (8) having, (9) affecting, (10) being affected.[12] An example such as colour exemplifies the dependence of attributes on substance. Colour must always belong to a body. Red cannot be conceived as apart from some body, existing independently, and neither can a quantity, location, or affect. All these attributes are predicated of some substance and are incapable of separate being. Substances are the beings that can stand separately. Aristotle writes "For if we do not posit substances to be separated, and in the way in which particular things are said to be separated, we will do away with the sort of substance we wish to maintain."[13] While the relationship between the separate substances and the dependent attributes is now clearer, we must endeavor to understand what a substance is itself.

[11] Aristotle, *Categories*, 2a34.
[12] Reeve, *Substantial Knowledge*, 103.
[13] Aristotle, *Metaphysics*, M 10 1086b16-19.

It has already been said that for Aristotle substance is separate. Furthermore, it is primary in many ways. Aristotle says that of the ways a thing is primary, "substance is primary in all of them: in account, in knowledge, and in time."[14] The account of substance is primary in each thing. Knowledge of a thing is primarily of the substance. Substance is prior in time to attributes.[15] This three-way primacy clarifies the reasons for substance's ontological independence, but it does so through a contrast with attributes, not adding much to our understanding of what a substance really is, which is more difficult to describe. The substance of the thing is its "whatness."[16] This "whatness" is detected through the "action" of the substance. Gilson writes, "Everywhere there is action, there is an acting thing, so that we first detect substances by what they do."[17] Gilson emphasizes that "in their innermost reality, substances are unknown. All we know about them is that, since they act, they are, and they are acts."[18] In understanding substances, we must therefore equate three terms: "what primarily *is*, the *substance* of that which is, *what* the thing is. In short, the "whatness" of a thing is its very being"[19] This "whatness" is the essence or the form of a thing, terminology which Aristotle employs in his account of form and matter, a theory known as hylomorphism.

In the hylomorphic account presented in the *Metaphysics*, substances are composed of form and matter. The form is the "whatness" of a thing and in analyzing a corporeal substance, it is primarily its form—that by which it is what *it* is that receives attention.[20] A corporeal

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[14] Aristotle, *Metaphysics*, VII 1 1028a31-33.
[15] Reeve argues for an understanding of priority in time which is not simple temporal priority. The argument in particularly complicated and not relevant to our inquiry. See Reeve, *Substantial Knowledge*, 8.
[16] Gilson, *Being and Some Philosophers*, 46.
[17] Gilson, *Being and Some Philosophers*, 43-44.
[18] Gilson, *Being and Some Philosophers*, 43-44.
[19] Gilson, *Being and Some Philosophers*, 46.
[20] Gilson, *Being and Some Philosophers*, 47.

substance can change its matter: the wax candle begins to melt, the statue rusts, an old car has a part replaced, yet Aristotle would say each thing remains that specific candle, statue and car, and is not an entirely new entity. The matter of a thing can change, but if the form of the statue were to change, it would cease to be the same statue.

Of course, matter is not reducible to form, just as attributes are not reducible to the substance they are predicated of. Both form and matter are essential to any corporeal substance. On Aristotle's account, the generation of a human involves a form (from the father) and matter (from the mother).[21] For any given human, their form is their soul, and this is the primary substance, their matter is the attributed material element which can change while the primary substance—their innermost being—cannot, or they would cease to exist.[22] Hylomorphic compounds explain change in the Aristotelian world. They are essential to the sciences, allowing observation of growth, decay and alteration while the entities remain essentially, in form, the same.[23] This is Aristotle's resolution to the problems of permanence and flux. Form remains the same while matter changes. Human beings, like all beings, share a species form, but their matter varies and causes individuation. But, that which is most essential remains the same, and beings are in this way preserved despite existing in a universe in utter flux.

An account as influential as Aristotle's has been attacked from every angle. I wish to review some critiques which pertain to change and relation in Aristotle's substance-attribute account. The goal is not naively to itemize their metaphysical errors as the cause for an ecological understanding today where meaningful change and relations are still obfuscated.

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[21] Aristotle, *Generation of Animals*, I 20 729a9-11.
[22] Reeve, *Substantial Knowledge*, 43.
[23] Reeve, *Substantial Knowledge*, 43.

Those who engage in anti-environmental actions today are not self-proclaimed Aristotelians, far from it. Rather, it is to trace the ways in which certain threads in these thinkers persisted and were reified through time. A subtle prejudice against change and relation neither begins nor ends with Aristotle, but is woven into his theory tightly, and would be woven thicker with subsequent thinkers. Untying these knots requires understanding how they first formed—or we risk falling victim to the assumption that these modes of thought are "natural." Most of us fall for this risk, and we are thus led to act against our values, perpetuating the unecological beliefs and actions we might consciously disavow.

Looking at change in Aristotle, there is a problematic priority of the species form resting on a presumption of eternity over that of the differentiated individual. Together they effectively eliminate novelty in the Aristotelian cosmos. Along with a denial of novelty, relations are ontologically inferior to substances, meaning that their significance in the world is obscured and their very existence minimized. This creates an array of conceptual difficulties in even making sense of relations.

Beginning with the issue of individuals, Aristotle seems, contrary to Plato, to ground his account not in the abstract idea of any *man* or *horse* but in actual men or horses. However, his account often reduces the matter of such entities to the form, with the attributes of particulars playing no essential role in their being. As Gilson writes, "Aristotle makes open profession to be interested [in individuals], and then goes on to prove that, since the form is the same throughout the whole species, the true being of the individual in no way differs from the true being of the species."[24] Despite Aristotle's explanation that matter is responsible for differentiation between

[24] Gilson, *Being and Some Philosophers*, 48.

species, the fundamental being of any two particular members of a species is identical—it is their shared form. The consequences of this arrangement are far reaching and run through the whole history of philosophy, inspiring centuries of debate through the Middle Ages on the problems of universals.[25] Despite Aristotle's attempt to bring Platonic forms down to earth, the account, on many interpretations, still reduces the attributes of actual individuals to the supposedly truer reality of their form or essence. While there is contention on the precise status of individuals in Aristotle, on some influential interpretations of his account of substance it is not the individual but the species form which is the true reality.[26]

Locating true reality in the species form might seem unintuitive to readers influenced by Darwin's idea of evolution. How could the true reality for humans be their form when just a few hundred thousand years ago, a tiny fraction in geological time, they were a different species? This problem never arises for Aristotle due to a presumption of eternity.[27] Asking why the human essence is as it is or how it came into being are the wrong questions. C.D.C Reeve writes, "No forms or essences come-into-being and none pass-away. They are either eternally in the world or they aren't ever there."[28] The organisms now are the same organisms there have always been. A lack of novelty is explained within the Aristotelian framework, eternity is well justified, it fits within Aristotle's larger metaphysical system and explains why things are as they are. However, the implications are a prejudice against the possibility of change, especially geologically and ecologically but socially and politically as well. Aristotle did not deny these possibilities outright, and made an effort to account for change more than his predecessors, but an emphasis

[25] Gilson, *Being and Some Philosophers*, 48.
[26] Gilson, *Being and Some Philosophers*, 48.
[27] Reeve, *Substantial Knowledge*, 295.
[28] Reeve, *Substantial Knowledge*, 295.

on substance prioritizes the static over the changing and for subsequent thinkers reinforced a prejudice against change and relations. Things are the way they are and have always been, and while any particular matter will eventually change the essences of beings do not.

Prejudice against change persisted throughout the following centuries, as Mediaeval philosophers such as Averroes interpreted the works of Aristotle.[29] Averroes' famous commentaries on Aristotle insist on the eternity of the world in Aristotle.[30] The world of substance as it is classically expressed in Aristotle has no history. It is "hermetically sealed against any kind of novelty," admitting "no newness, no development…what a dead lump of being the world of substance is!"[31] This last statement of Gilson's is powerful and somewhat polemic, but it rightfully highlights the consequences of this denial of novelty. While such an explicit denial on these grounds would not be accepted by many today, the account was widely held from Aristotle's time into the early modern period. Authors of tremendous consequence in the Modern period, such as Descartes (the next philosopher we will look at), were reading and influenced by the Mediaeval philosophers dealing directly with such views. In this manner, these ideas penetrate into our own philosophical thought. Before discussing Descartes's view of substance and how these philosophical presuppositions persist in his account, we need to look at the role of relations in Aristotle to appreciate why relations are poorly conceptualized in modern thought.

In Aristotle, relations are classified as mere attributes, ontologically subordinate to substances. There can be no relations without the substances which are said to "have" them, in

[29] Gilson, *Being and Some Philosophers*, 72.
[30] Gilson, *Being and Some Philosophers*, 72.
[31] Gilson, *Being and Some Philosophers*, 295.

the same way no colour can exist without the substance of which it is predicated. Consequently, relations are not a primary constituent of what any thing actually is, and their ontological status is a dependent one. The consequences of viewing relations as accidents of substance are evident in the later thinking of philosophers like William of Ockham, who argued that "relations do not exist except as intentions or concepts in the mind."[32] On Ockham's view, relations are thus reduced to purely mental entities with no physical existence. Ockham's view, originating in the classification of relations as attributes of substance, would influence the view of relations throughout the modern period.[33]

Universal relations pose a significant problem in Aristotle's account. C.D.C. Reeve explains that causal relations such as "calcium deficiency causes osteoporosis" seem to imply the existence of a universal relation between calcium deficiency and osteoporosis.[34] However, explaining the existence of this universal relation is difficult on the Aristotelian account, and is often circumvented by forms of reductionism, such as Ockham's, which consigns relations to a purely mental or logical existence.

Aristotle's account of substance will be transformed by modern thinkers such as Descartes, but several elements remain, including the primacy of being, a prejudice against change, and the reduction of relations to an ontologically inferior position. Cartesian philosophy would enable amazing innovation throughout the modern era, inspiring a mechanistic materialist science which could examine and predict nature acutely. But several abstractions, including a

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[32] William Ockham, Commentary on the Sentences, Book 1 (Ordinatio), Distinction 30, in Barry Allen, *Empiricisms: experience and experiment from antiquity to the anthropocene* (New York: Oxford University Press, 2021), 127.
[33] Allen, *Empiricisms*, 127.
[34] Reeve, *Substantial Knowledge*, 292.

denial of change, and reduction of relations a purely mental or logical existence, would become common presuppositions, not critically questioned. The rise of mechanistic materialism cements these presuppositions as common modes of European thought throughout the modern era, persisting even today.

Descartes transforms the Aristotelian account of substance dramatically, but he remains a descendant of Parmenides, re-affirming the primacy of being over becoming. Well-read in Aristotle's *Categories* and subsequent scholastic philosophy, Descartes asserts that, "by substance we can understand nothing other than a thing which exists in such a way as to depend on no other thing for its existence."[35] Strictly speaking, for Descartes, only God meets this definition, but Descartes includes corporeal bodies and minds in the category of substance, as they only rely upon God and no other thing. Material bodies and minds are the only two substances (aside from God) for Descartes. This is a radical change from Aristotle's account, which allows, in theory, for an infinite number of different substances, while Descartes allows for only these two, material bodies and minds, and they are defined by their respective properties, extension and thought. These two properties are what constitute the "nature and essence" of material bodies and minds. Material bodies are extended in space—in length, breadth and depth—and minds are thinking things.[36] These substances have modes, which are somewhat analogous to attributes for Aristotle. Modes are "modifications" of the substance; thus, while a

[35] Rene Descartes, *Principles of Philosophy*, AT VIII: 52, in Cottingham, Stoothoff, and Murdoch, *Descartes Selected Philosophical Writings* (New York: Cambridge University Press, 1998), 177.
[36] Rene Descartes, *Principles of Philosophy*, AT VIII: 53-54, in Cottingham, Stoothoff, and Murdoch, *Descartes Selected Philosophical Writings* (New York: Cambridge University Press, 1998), 177.

leaf might have a green mode in summer and change to red in fall, the underlying substance, a physically extended body, remains as a coherent identity while the mode changes.

We have therefore, for Descartes, the basic assertions of his famous substance dualism: there is world of extended bodies and a world of minds. These worlds are of course related, although how exactly they are related is a difficult question for Descartes and remains a problem in philosophy today. It was not, however, as great a problem for the discipline of mathematical physics. A conceptualization of the material world as a space in which volumes of matter collided to cause patterns of cause and effect was instrumental in a range of scientific developments. The philosophical problems this account poses became of less and less concern when these theories were of great practical success.

Descartes' account of substance is profoundly nonrelational. Extended objects and minds are *things* which endure through change, they are beings which need no relations to exist, and most perplexingly they seem not even to have relations among each other. It is accordingly unclear how minds can come into being, if there is no way for material bodies to interact with, and much less form, them. Explanations are usually theological; God is responsible for the presence of the mind within the human. Aside from the human mind, other creatures and nature as a whole are the result of the blind movement of matter. Nonhuman animals are outright denied the possibility of consciousness, being mere aggregates of matter without mind. Obscuring the relation between material bodies and minds has the effect of bifurcating the world: there is a material sphere which is the realm of science and a mental world of psychology, religion, value, and politics. This will be later elucidated as Whitehead's idea of the "bifurcation of nature." Such a bifurcation relies on a denial of relations. A distinction between the scientific sphere and the social/political sphere is naturalized through Descartes' dualism. There is the world of material

substance: scientifically measurable and objective, and that of mental substance: obscure, personal, and subjective. If things are in themselves nonrelational, there is no need to consider minds, experience, or politics when we deal with material bodies, which by definition, as substances, rely on nothing other than themselves (except perhaps God). An array of philosophers, scientists and artists could of course not accept Descartes' account of substance dualism or his mechanistic materialism, and my next chapter will touch on some "process" philosophers who also express this disagreement. But I wish to demonstrate, in the remainder of this chapter, how Descartes' dualism and its uptake in Europe and eventually throughout the world, spread by colonialism and then globalization, still permeates our thought in the sciences.

Working scientists today must reckon with evolution, relativity, quantum theory, and other relatively recent innovations, and are not at all mechanistic materialists in the way 17th, 18th and 19th century scientists often were. The contrast is clearest when you look at contemporary earth scientists, who must account for an enormous number of active living variables and who are therefore far from the view of matter as no more than mechanical interaction, which dominated the early modern period. It is, ironically, not scientists who suffer the conceptual consequences of substance-attribute thought and modern scientific materialism, but those who are educated in these sciences uncritically, merely by being brought up in a modern Western society. The sciences are taught as objective, while subjects pertaining to the social and politics supposedly remain on the subjective side of the bifurcation. The objective seems to represent what is really real, and this is not at all surprising considering the ontological status of substance. If we want to align ourselves with what seems to be true in the world, the brute facts of material substances interacting in patterns, presenting as "laws of nature," are alluring, while things such as the beauty of an orange glow at sunset are supposedly subjective and less real.

You do not need to be a serious scholar of the sciences to think of the world as comprised of substantial beings. The idea is present even in language, in the subject-predicate mode of speech. The tradition I have outlined here, beginning with Parmenides, surrounds us, though it has not gone without protest. Thinkers throughout the modern period argued against mechanistic materialism and its consequences. But its consequences only came into view through time. When the discoveries of geniuses such as Newton, Boyle, Huygens and countless others were dazzling the 17th and 18th centuries, protest fell on deaf ears, since the sciences substance metaphysics inspired seemed to be successful in all practical regards.

It is, I believe, this old understanding of the natural world that had deplorable consequences, even contributing to the ecological catastrophe the earth is currently undergoing. Because of the mechanistic ordering of nature and the denial of real relations inherent in the modern scientific view, true novelty in the occurrences of nature was precluded as a possibility. Modern philosophy, full of the most impassioned critiques of inequality, injustice, and human suffering, failed to recognize both the ecological changes and possibility for continued ecological change caused by their actions. The error lies in taking several abstractions, such as substance itself, and believing them to be fundamental to reality. Whitehead refers to this as the "fallacy of misplaced concreteness." The changes that the earth has undergone are an aberration to those who, tacitly or otherwise, follow a mechanistic materialist worldview built on the idea of substance. This view changes with the refutation of these presuppositions. How might our actions alter if we revise these abstractions, particularly with reference to nature and ecology? The way we conceive of scientific concepts changes drastically when we adopt different metaphysical stances. The way we conceive of ourselves, nonhumans, the earth and our environments (an awful term which implies a separation between entities and a background they

are situated in) becomes radically different. Following an outline of these different metaphysical stances in the tradition of process metaphysics in chapter 2, I will explain how these conceptions make a difference for ecology and our understanding of the earth in chapter 3.

Chapter 2. Metaphysics of Becoming

Metaphysical systems that prioritize becoming over being, often labeled "process metaphysics," argue against the substance-attribute metaphysics that has dominated Western philosophy. This prioritization of becoming is not entirely novel. Heraclitus argued for the priority of becoming over being. Buddhist and Daoist philosophy in the Eastern tradition emphasizes the continual becoming of all things and makes relationality fundamental to nature. The philosophers I review here, beginning with Friedrich Nietzsche in the 19th century, followed by Henri Bergson, Alfred North Whitehead and Gilles Deleuze in the 20th, oppose the substance-attribute metaphysics that has dominated Western philosophy and provide novel arguments for the priority of becoming over being.

Prioritizing being over becoming remains the dominant trend in Western philosophy and has proliferated through the centuries of European colonialism and globalization to become a default metaphysical position. The priority of being is not only reaffirmed in philosophy and science. Bergson argues it also has an evolutionary precedent and has become the background commonsense in our day-to-day interactions with each other, no less than with our artifacts and environment. This evolutionary precedent does not, however, indicate any fundamentality of being over becoming in metaphysics and only adds to the difficulty of escaping substantialist metaphysics. As I demonstrate in Chapter 3, when this mode of thought is mistakenly made a guiding truth, it promotes activities that contribute to the ecological catastrophes we can expect in the Anthropocene.

Evolutionary theory in biology played an important role in inspiring the kind of thinking that we find in philosophers such as Nietzsche, Bergson and Whitehead. Commenting on Whitehead, Isabelle Stengers writes that "to accept the doctrine of evolution in a radical manner

is to accept a form of empiricism that embraces change as primordial."[37] Evolution stands in contrast to mechanistic thinking. As previously discussed, the mechanistic sciences dominated the modern period, but biological life has always occupied a somewhat anomalous position within this framework, which was best suited to the physical sciences. There were two resolutions to the problem of life in mechanistic philosophy, though both are problematic. One is to reduce life and the organism to mechanical operations, while the other is to allow for design by some form of divine creator who escapes the mechanical operation of nature.[38]

The development of evolutionary theory in the 19th century began to dispel the contradictions between mechanism and finality in biology.[39] Organisms cannot be explained through mechanistic reduction; they must be considered in their evolutionary relationship to their environments. Nor can they be explained through reference to final causes, each being simply the current expression of an uninterrupted chain of evolution spanning millions of years and which will continue to change in the future.[40] Evolution demonstrates that, as François Jacob writes, "an organism is merely a transition, a stage between what was and what will be."[41] The species, composed of individual organisms, is always becoming, changing into entirely novel forms over evolutionary time. The static laws of nature that physics developed in the early modern period, motivated by increasingly outdated philosophical accounts of substance, stand in contrast to the dynamic character of evolution. Where philosophy had inspired science in the 17th-19th centuries, now science inspires philosophy, with the theory of evolution motivating philosophers

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[37] Isabelle Stengers, *Making Sense in Common* (Minneapolis: University of Minnesota Press, 2023), 7.
[38] François Jacob, *The Logic of Life: A History of Heredity* (New York: Pantheon Books, 1982), 4.
[39] Jacob, *The Logic of Life*, 4.
[40] Jacob, *The Logic of Life*, 5.
[41] Ibid.

to prioritize becoming over being. Thus, it is not a surprise that philosophies inspired by biology resonate today with earth systems science and ecology.

It would, however, be a mistake to group these philosophers in one unified tradition. Nietzsche for instance is seldom labeled as a "process philosopher." His work expresses ideas of becoming and relationality, but these themes are seldom presented systematically in his writing on epistemology, ethics and politics. He occupies a unique position within this collection of thinkers as a sort of progenitor, raising questions that have motivated subsequent thought on becoming. Bergson and Whitehead on the other hand are two of the most prominent philosophers of the early 20th century and both can be deemed "process philosophers," although the term is more closely associated with Whitehead and his magnum opus *Process and Reality*. This might create the impression that Whitehead is more significant for the tradition, but this is a misunderstanding, as his philosophy owes much to his admiration of Bergson's thought. Deleuze's metaphysics is closer to that of Bergson than to Whitehead. Graham Harman argues that the process tradition can be distinguished into two schools, which he labels "school X," composed of Whitehead and Bruno Latour, and "school Y," composed of Bergson, Deleuze, William James, Gilbert Simondon, Isabelle Stengers, and Manual DeLanda.[42] All these thinkers are united in prioritizing change over stasis, becoming over being, and relations over isolated entities. They differ in the way they conceive of becoming, with the former school emphasizing individual entities and the latter emphasizing continual flux.

Ultimately, this difference does not bear tremendously on the ecological application of these theories. But the conceptual differences are important for technical understanding and can

[42] Graham Harman, "Whitehead and Schools X, Y and Z", in Nicholas Gaskill and A. J Nocek, *The Lure of Whitehead* (Minneapolis: University of Minnesota Press, 2014), 233.

have relevant implications. Harman draws a distinction between Whitehead and Latour, on the one hand, who posit individual entities as the most fundamental reality, and Bergson and Deleuze, on the other, who posit a pre-individual flux of becoming. For the former line of thought, individual "actual entities" (to use Whitehead's language) or "actants" (in Latour's terms) are perpetually perishing and re-emerging, a continuous becoming of individual entities that creates the continuity of space and time. For the latter thinkers, a pre-individual flux is the deepest reality, with different thinkers in this group offering different accounts of how individuals are cut out of this primordial flux. All these thinkers prioritize becoming and relation, and offer a plurality of ways to think about becoming, but their accounts are not mutually consistent. It would be inaccurate to condense them into one tradition, though that is not to say their concepts cannot function together to allow us better to understand certain metaphysical problems. Their differences are slight in contrast to the substance-attribute metaphysics that they all oppose. It is here where we can turn to Nietzsche, perhaps the most idiosyncratic of the group, but one to whom all the others (apart from Bergson and Whitehead) owe a great deal due to his interrogation of and opposition to the dogmatic epistemological and metaphysical ideas of Western philosophy.

Nietzsche's idiosyncrasies invite multiple interpretations of his work. As Richard Schacht writes, many interpreters believe Nietzsche was critical of any metaphysical scheme, believing we must demolish metaphysics and move beyond it. Other interpreters, including Deleuze in *Nietzsche and Philosophy*, present Nietzsche's work as unashamedly metaphysical. Nietzsche's metaphysical views may not be systematic, but they are presented through his famous concepts, including the "will to power." Nietzsche criticizes traditional ideas of truth, knowledge, language, religion, and "the very idea of 'things-in-themselves' and the rest of the entire

inventory of the history of metaphysics."[43] Nietzsche writes in *The Will to Power: Notebooks of 1884-1886* that "the philosophers are prejudiced *against* appearance, change … everything human, even more the animal, more still the material; guided by instinctive value-determination, in which earlier (more dangerous) cultural condition are reflected."[44] These prejudices were present in the ancient and early modern philosophies previously examined and they continue in many philosophies today.

Nietzsche asks that we re-evaluate the values we dogmatically assume, refusing to repeat the old prejudices of Western philosophy in new form. Deleuze and Latour exemplify this refusal; both grant change, the human, the animal, and even the material the sort of philosophical expression they deserve. Deleuze finds continuity between human and nonhuman forms, and Latour refuses to reduce any entity, granting nonhuman and material actants an agency that substance-attribute metaphysics neglects. But Nietzsche is not just a critic asking others for new thought, he also provides his own new positive concepts, one of which is the famous "will to power."

For Nietzsche, the world is always becoming, and "*this world is the will to power—and nothing besides!*"[45] The innermost reality of *all* forces, not just conscious human willing, is will to power, "without beginning, without end," creating a world of continuous transformation. In place of a dualism of substances and empty space, Nietzsche describes the world "as a play of forces and waves of force, at once one and 'many'… a sea of forces raging and surging within

[43] Richard Schacht, ed., *Nietzsche Selections* (New York: Macmillan, 1993), 15.
[44] Friedrich Nietzsche, *Will to Power*, section 407, in Schacht, ed., *Nietzsche Selections*, 147.
[45] Nietzsche, *The Will to Power*, trans. Walter Kaufmann and R. J. Hollingdale (New York: Random House, 1968), section 1067.

itself … a becoming that knows no satiety."[46] The name of this world is will to power, we are will to power, everything is a continuous becoming of will to power. Relations of force create beings from the essential becoming that is the world of forces and tensions; stasis emerges from flux. Nietzsche ascribes an inner will to the idea of force, which traditionally refers to the world of inert substances causally colliding. He writes, "The *victorious* concept 'force' by which our physicists have created God and the world, still needs to be *completed*: an *inner* will must be ascribed to it, which I designate as '*will to power*.'"[47] However, will to power is not ascribed to force as a predicate, being instead internal and a complement to force.[48] All reality, for Nietzsche, as Deleuze observes, is "nothing but quantities of force in 'relations of tension.'"[49] In other words, wills dominating wills in varied configurations.

Nietzsche's account is radically novel. Contrary to his own tradition, he views the world as becoming and subordinates being to a world of dynamic forces in constant change. He decentralizes the human—it is no longer the human will, soul or cogito at the core of philosophy. Animals, plants, even materials have a will to power that is fundamentally the same as that of the human. Nietzsche's criticism of the Western tradition and his contrary account is thus groundbreaking, inspiring other novel accounts of becoming.

Bergson, however, was not a thinker inspired by Nietzsche. He writes very shortly after Nietzsche's collapse in 1889, publishing *Time and Free Will* in that same year. There are nevertheless complementary ideas in their philosophies. Whitehead read both Nietzsche and

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[46] Ibid.
[47] Nietzsche, *Will to Power*, section 619, in Gilles Deleuze, *Nietzsche and Philosophy*, trans. Hugh Tomlinson (New York: Columbia University Press, 2006), 49.
[48] Deleuze, *Nietzsche and Philosophy*, 49.
[49] Deleuze, *Nietzsche and Philosophy*, 40.

Bergson and credits Bergson explicitly in *Process and Reality* as a primary influence. Deleuze wrote monographs on both Nietzsche and Bergson early in his career and adopts significant concepts from both in his own metaphysics. Bergson was a celebrity in his time, an extraordinarily famous philosopher and one of the few to win a Nobel prize (1927). He dropped in popularity through the 20th century, and Deleuze is largely credited for reviving interest in his work for contemporary readers. Bergson's philosophy offers novel accounts of time, memory, life, and more. It is processual, relational, and inscribes novelty throughout the cosmos. His metaphysical account is largely developed through his revision of an uncritically passed down understanding of *time*.

Bergson is critical of philosophical accounts that *spatialize time*. This tendency, he claims, has dominated Western philosophy since at least Aristotle. Spatialization is a result of mistaking pragmatic use for intrinsic reality. We must spatialize the world in order to act on it. While language and perhaps even mathematics function spatially, we often mistakenly spatialize consciousness and time as well, which is to mistake an evolutionary adaption—an intellect capable of segmenting the world discreetly—for a fundamental reality. We render the changing world static and reduce becoming to finished actuality. This is evolutionarily necessary for a living organism, and Bergson refers to it as "the natural metaphysic of the human intellect," though the consequences are disastrous for philosophy when this conclusion is taken as an ultimate truth of nature. This spatialization of time is ubiquitous in the accounts of early modern thinkers and the mechanistic sciences of the early modern era. Time is reduced to a fourth dimension on the Cartesian grid, with entities mechanically determined and made predictable. Profound innovations in science and technology came out of these abstractions, even if, for Bergson, they are ultimately predicated upon an incorrect philosophical understanding. Time is

fallaciously spatialized and despite the pragmatic benefits of doing so, we mistakenly valorize the static over the dynamic, viewing things as beings and not events of becoming, thus misunderstanding the dynamic and relational aspects of reality. Bergson argues instead for an account of time as *duration (durée)*, and from this understanding he develops a philosophy in which becoming is primary, novelty abounds, and everything is relational.

Duration, for Bergson, is non-spatialized time, which is a significant and challenging philosophical innovation. Duration implies change, difference, and becoming. It entails a pure or "original" heterogeneity, a radical shift from a conception of homogenous matter as the fundamental reality. Space is discrete and can be cut into quantifiable portions. Conversely, duration is qualitative, even if we often attribute a quantifiable homogeneity to it, thus re-introducing space.[50] Writing about duration, Bergson notes, "pure duration might well be nothing but a succession of qualitative changes, which melt into and permeate one another, without precise outlines, without any tendency to externalize themselves in relation to one another, without any affiliation with number: it would be pure heterogeneity."[51] Duration is not a serial order of spatial states, moving stepwise from t1, to t2, to t3 and so on like the advancing hands of a clock. It is instead an interpenetrating, continuous succession of qualitative changes. Unlike spatial entities, which cannot exist in two places at the same time, the qualitative changes of duration, which are entirely non-spatial, can. Qualitative changes are not just different in magnitude; they differ fundamentally in kind as well, which makes duration pure heterogeneity. An example to help us conceive duration is melody. As Barry Allen describes, "A melody has no being at an instant, at any instant there is only silence. The very sounding of the melody is

[50] Henri Bergson, *Time and Free Will: An Essay on the Immediate Data of Consciousness*, trans. F. L. Pogson (Mineola, N.Y: Dover Publications, 2001), 104.
[51] Ibid.

intrinsically a duration, with duration's quality of interpenetrating succession without separation."[52]

Like a melody, the seemingly enduring objects of the world have no self-subsistent being and endure only through the succession of changes in duration. Consequently, for Bergson, the concept of a substance has no ground. There is nothing that endures changelessly. Any existing thing exists in duration, which means as a constantly changing entity. The differences of duration are ontologically prior to the identity of beings.[53] To affirm duration is to affirm the primacy of change and becoming. Allen writes, "Duration does not merely tolerate change, it requires it; duration is a way of changing, namely, continuously. Every moment of duration is transitional, a phase in a process, the passage to a new condition."[54] Every moment is meaningfully new, conditioned by the past. Duration is the keystone of Bergson's whole philosophy. The world is not one of stasis but change, novelty and relations. In every moment there is change, how we change involves our relations, and when we change it is often unpredictable, even when our present state is explained by what happened a moment ago. The future is entirely non-existent, wide open, so complex in all the relations that factor into the flow of duration that, "it is not only something new, but something unforeseeable."[55]

Alfred North Whitehead (1861-1947) was a mathematician-physicist who turned to philosophy late in his life, moving from Cambridge to Harvard in his sixties.[56] His work took on

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[52] Barry Allen, *Living in Time: The Philosophy of Henri Bergson* (New York: Oxford University Press, 2023), 21.
[53] Allen, *Living in Time,* 23.
[54] Allen, *Living in Time*, 21.
[55] Henri Bergson, *Creative Evolution*, trans. Arthur Mitchell (Mineola, N.Y: Dover, 2011), 7.
[56] Victor Lowe, *Understanding Whitehead* (Baltimore, MD: John Hopkins University Press, 1963), 5.

a new life at Harvard, where philosophy took precedence over his earlier concentration on mathematics. His philosophical writing has the precision and systematicity of a mathematician, but his ideas are creative, speculative and novel, inciting the reader's imagination like a work of art. He discusses classic problems of science, epistemology and metaphysics with none of the expected language, describing nature and metaphysics in terms of feelings, creative advances, adventures and love.

Whitehead's late-career work met with a mix of appreciation and dismay. His work challenges the Western tradition; as he writes in *Process and Reality*, "I am greatly indebted to Bergson, William James, and John Dewey. One of my preoccupations has been to rescue their type of thought from the charge of anti-intellectualism."[57] This "type" of thought is metaphysical, speculative, and takes seriously questions that are often dismissed in the wake of Kant's "Copernican revolution." Whitehead's work was widely read in the 1920s and 30s, with leading figures of the period, including Bergson, commenting on his work.[58] Bergson writes in a footnote in *Duration and Simultaneity* that Whitehead's *The Concept of Nature* "is one of the most profound works ever written on the philosophy of nature."[59] But like Bergson, Whitehead's work waned in popularity and influence through the 20th century. Between the influence of figures such as Wittgenstein, with his new emphasis on language and logic, and Heidegger's suspicion of metaphysics, Whitehead's work came to many to seem like "dubious speculation based on naïve neglect of the linguistic and epistemological structures of experience."[60] In America, his work found hardly any uptake amongst the analytic philosophers at Harvard, who

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[57] Alfred North Whitehead, *Process and Reality* (New York: Free Press, 1978), xii.
[58] Gaskill and Nocek, *The Lure of Whitehead*, 3.
[59] Keith Alan Robinson, *Deleuze, Whitehead, Bergson: Rhizomatic Connections* (New York: Palgrave Macmillan, 2009), 2.
[60] Gaskill and Nocek, *The Lure of Whitehead*, 4.

"balked at the unabashed metaphysics of [Whitehead's] work."[61] It was in theology that his work found the most interest, keeping a Whiteheadian body of literature alive but further disassociating his work from professional philosophy.

It is only more recently that interest in Whitehead has begun to rise, largely due to the work of Latour, Donna Haraway and especially Stengers (whose 2002 book *Penser Avec Whitehead* studies him at length).[62] These thinkers connect Whitehead's work to arguments in science studies, constructivism, and ecology where Whitehead's ideas have inspired efforts to overcome Modern thought and its associated paradoxes. This has motivated a body of literature that compares Whitehead with Deleuze and Bergson, such as, for example, Keith Robinson's anthology *Deleuze, Whitehead, Bergson: Rhizomatic Connections*. These connections are numerous. While Deleuze mentions Whitehead only a few times, he nonetheless holds him in high esteem. In *The Fold*, which contains Deleuze's only extended discussion of Whitehead, he writes that Whitehead "stands provisionally as the last great Anglo-American philosopher before Wittgenstein's disciples spread their misty confusion, sufficiency and terror."[63] Moreover, he references Whitehead to explain his own thinking in passages such as the following from *Dialogues*, written with Claire Parnet:

> I have always felt that I am an empiricist, that is, a pluralist. But what does this equivalence between empiricism and pluralism mean? It derives from the two characteristics by which Whitehead defined empiricism: the abstract does not explain, but

[61] Gaskill and Nocek, *The Lure of Whitehead*, 3.
[62] Gaskill and Nocek, *The Lure of Whitehead*, 5.
[63] Gilles Deleuze, *The Fold: Leibniz and the Baroque*, trans. Tom Conley (Minneapolis: University of Minnesota Press, 1993), 76.

> must itself be explained; and the aim is not to rediscover the eternal or the universal, but to find the conditions under which something new is produced (*creativeness*).[64]

It is worth noting that Bergson, Whitehead, and Deleuze all describe themselves as empiricists, even radical empiricists. This self-denomination presents a significant shift from the rationalism of thinkers such as Descartes. While these process philosophers are speculative and metaphysical, they never stray far from empirical reality. This empirical adherence emanates from and results in a deep affinity with natural science. All these thinkers align their metaphysical schemes with the scientific discoveries of their time, not as subordinate to the sciences but in communication with their empirical findings. This radical empiricism is a necessary and beneficial element for dealing with ecological concepts, ensuring that philosophy, earth sciences and ecology are not disconnected enterprises. Empiricism establishes this necessary connection for dealing with anthropogenic climate change in an open dialogue between philosophy and science. As such, the Anthropocene, its scientific study, and the discoveries of the future can be better understood when conceptualized together through these philosophies.

Returning to Whitehead, there are several elements of his work that merit further exploration. Reflecting on the developments of relativity and quantum theory, Whitehead realized that Newtonian physics relied on irreconcilable and even misplaced presuppositions, reflecting abstract ideas rather than empirically confirmed facts. In his earlier philosophy, including *The Concept of Nature* and *Science and the Modern World*, he criticizes the mechanistic physics and substance-attribute metaphysics of early modern philosophy. Much of

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[64] Gilles Deleuze and Claire Parnet, *Dialogues*, trans. Hugh Tomlinson and Barbara Habberjam (New York: Columbia University Press, 1987) vii.

his discussion surrounds what he describes as the bifurcation of nature, which he sees as vitiating modern thought. Largely to evade this bifurcation, Whitehead develops his own so-called philosophy of organism, which describes reality as process and offers a speculative metaphysics that, in his view, better accounts for the sciences of his day.

The bifurcation of nature refers to a separation of the "nature apprehended in awareness and the nature which is cause of the awareness."[65] This is most explicitly expressed in the modern doctrine of primary and secondary qualities, though it is also identifiable in nascent form in earlier theories of substance, including Aristotle's distinction between substance and its attributes. Galileo, Descartes, and Locke all espouse a theory of primary and secondary qualities, according to which primary qualities explain the motion of extended objects, while secondary qualities are introduced by perception. The bright red glow of hot coals is really just molecules in motion and radiant energy, with the redness being a psychic addition furnished by the perceiving mind—the red is apprehended in awareness, but the motion of molecules is its real cause. Whitehead protests against this assumption most clearly in the following passage from *The Concept of Nature*:

> What I am essentially protesting against is the bifurcation of nature into two systems of reality . . . namely into the nature apprehended in awareness and the nature which is cause of the awareness. The nature which is the fact apprehended in awareness holds within it the greenness of the trees, the song of the birds, the warmth of the sun, the hardness of the chairs, and the feel of the velvet. The nature which is the cause of

[65] Alfred North Whitehead, *The Concept of Nature* (Cambridge: Cambridge University Press, 1964), 31.

> awareness is the conjectured system of molecules and electrons which so affects the mind as to produce the awareness of apparent nature.[66]

The bifurcation of nature is an assumption that haunts our modes of thought and stifles creativity. Yet it is a difficult trap to avoid, particularly because no philosopher ever explicitly argued for the bifurcation of nature as such. Consequently, Whitehead does not, and in a sense cannot, rebut any explicit argument for the bifurcation of nature, nor can he rebut the arguments for the primary and secondary qualities.[67] He identifies this bifurcation as a consequence of the Western metaphysical tradition, one that is ultimately "fatal to a satisfactory cosmology."[68] He does not talk about its practical harms, which are of course inextricable from unsatisfactory cosmology, though I shall discuss one of these—the ecological consequences of the bifurcation of nature— in Chapter 3. Whitehead encourages his readers to risk venturing beyond the safety of the Western tradition, which has created this bifurcation of nature, although many are hesitant to follow him on this point, largely due to fear of becoming involved either in "some manifestation of irrationality, a return of ancient beliefs, [or] a denial of the universal value of physical laws."[69] To think against the bifurcation of nature is, as Stengers writes, "to accept the risk, to try the adventure, to explore what the rejection of a bifurcation of nature obliges us to think."[70] This risk is necessary. As Whitehead says, "all we know of nature is in the same boat,

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[66] Alfred North Whitehead, *The Concept of Nature,* 29-31, in Isabelle Stengers, *Thinking with Whitehead: A Free and Wild Creation of Concepts*, trans. Michael Chase (Cambridge, MA: Harvard University Press, 2014), 38.
[67] Isabelle Stengers, *Thinking with Whitehead,* 38-39.
[68] Whitehead, *Process and Reality,* 290.
[69] Stengers, *Thinking with Whitehead*, 39.
[70] Stengers, *Thinking with Whitehead*, 40.

to sink or swim together."[71] The bifurcation condemns us to neglect relevant aspects of nature, and today the earth feels the repercussions of this neglect.

What is nature for Whitehead? He says it is "*what we are aware of in perception.*"[72] This statement is not as simple as it may seem. Who are we? And what is the role of awareness? Awareness emphasizes the subjective construction of the concept of nature. For the scientist whose awareness is fixed on molecules and electric waves, *that* is nature. On the other hand, the nature of the poet is different, described in terms of the senses, including the colours, odours, and sounds that the scientist usually disregards. As Whitehead explains, nature is both the molecules of the scientist and the senses of the poet, denying any bifurcation. The construction of nature is an activity that "we" engage in through the direction of our awareness and perception. It is important to note that Whitehead's usage of "we" can also serve as a warning. It is a reminder that nature is the construction of a perceiving entity, and one that inevitably perceives only a fragment of all nature and always runs the risk of mistaking that fragment for the whole of nature. Whitehead asserts that we must escape the bifurcation of nature and acknowledge that

> Everything perceived is in nature. We may not pick and choose. For us the red glow of the sunset should be as much a part of nature as are the molecules and electric waves by which men of science would explain the phenomenon.[73]

When we engage in the act of bifurcation with which "modern natural philosophy is shot through and through," we choose a restricted portion of the whole of nature. We commit a grave and dogmatic epistemological error and turn our backs on our own experience. As Whitehead

[71] Whitehead, *The Concept of Nature,* 148.
[72] Whitehead, *The Concept of Nature,* 28.
[73] Whitehead, *The Concept of Nature,* 29.

says, “we are instinctively willing to believe that with due attention, more can be found in nature than that which is observed at first sight. But we will not be content with less.”[74] However, some strains of Western philosophy have contented themselves with less and aligned themselves with a dichotomous and thus reductive view of nature.

Further, whether it is molecules or the redness of the sunset, these—what Whitehead would call “events”—are not just a product of our minds but really are *in* nature. When we perceive the red of a sunset it is always situated at a particular *locus standi*, or standpoint.[75] What is typically referred to as an act of perception is, for Whitehead, a “percipient event,” and “this event,” he says, “is not the mind, that is to say, not the percipient. It is that in nature from which the mind perceives.”[76] This allows Whitehead to conceptualize perception as an experience of the passage of events and an event itself, rather than a procedure in which a mind is a command post constructing according to categories.[77] Whitehead’s view is radically different than the views of the early modern philosophers. As Stengers notes, “the standpoint [of perception] does not belong to you unless it is in your quality as occupant, but it is what occupies you, much more than you occupy it.”[78] In Whitehead’s philosophy, nature, the whole of nature, electrons no less than the colours at sunset, is raised in epistemological importance and relevance. Whitehead’s idea of what he calls the percipient event also testifies to the relational nature of his philosophy, which is a point I shall elaborate on below in my discussion of Whitehead’s theory of “prehensions.” Stengers writes: “the event that provides you with a point of view belongs to the great impersonal web of events. Your standpoint testifies to the whole of nature, is connected to

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[74] Ibid.
[75] Stengers, *Thinking with Whitehead*, 62.
[76] Whitehead, *The Concept of Nature,* 107.
[77] Stengers, *Thinking with Whitehead*, 62.
[78] Stengers, *Thinking with Whitehead*, 65.

the whole of nature, even if it takes on a particular meaning that is required by the interpretation of perception as yours."[79]

When we take a particular perception or event in isolation, it is a habitual abstraction and not something given in our experience. Abstractions are, of course, a part of our experience, but they are not "concrete," that is, they are not present in the immediate experience of any event. Philosophy has typically understood this in reverse, taking substance—an abstraction—as primary and the concrete facts about its various properties as secondary. For Whitehead this is not the case: "The most concrete fact capable of separate discrimination is the event."[80] There is nothing more concrete than these events, which he refers to as the "actual entity" or "actual occasion."[81] Abstractions are not such actual entities, though they are a constant component of our standpoint. Whenever we recognize an object ("there it is again!"), we make use of an abstraction we could not live without, but which we nevertheless mistakenly take as a concrete fact.[82] Whitehead calls this the "fallacy of misplaced concreteness."

Philosophers often try to use such abstractions to explain the concrete, whether by a substance-attribute metaphysics, a mechanistic reduction, or various kinds of idealism. Whitehead says they are mistaken about the role of philosophy. They understand its role in reverse:

> [Philosophy's] business is to explain the emergence of the more abstract things from the more concrete things. It is a complete mistake to ask how concrete particular fact can be built up out of universals. The answer is, "in no way." The true philosophic question is,

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[79] Stengers, *Thinking with Whitehead*, 65.
[80] Stengers, *Thinking with Whitehead*, 77.
[81] Whitehead, *Process and Reality,* 18-19.
[82] Whitehead, *The Concept of Nature,* 189-90.

> how can concrete fact exhibit entities abstract from itself and yet participated in by its own nature? In other words, philosophy is explanatory of abstraction, and not concreteness.[83]

Thus, when philosophy begins with being, asserts substance as fundamental, and dismisses becoming either as illusory or secondary in relation to being, the concrete world of change is subordinated to static abstraction and philosophy falls into the grip of abstraction, losing the opportunity to explain the emergence of abstractions. But the assertion of substance as fundamental is just such an abstraction, one that makes less of nature than actually exists.

In *Science and the Modern World*, Whitehead discusses several abstractions that have dominated modern philosophy. Chief amongst these is what he calls the fallacy of misplaced concreteness, which includes the associated fallacy of simple location and even the whole of substance-attribute metaphysics. Like Bergson, Whitehead explains that "substance and quality, as well as simple location, are the most natural ideas for the human mind."[84] But it is a mistake to suppose that these familiar forms of thinking are concrete reality. They are simplifications of immediate matters of fact, and are justified only as fundamental through "logical constructions of a high degree of abstraction."[85] The fallacy of misplaced concreteness occurs when we take these abstractions for concrete realities and believe them to explain the actual functioning of the world in full.

According to Whitehead, simple location is one such fallacy, indispensable to mechanistic thinking but erroneous in philosophy. Whitehead allies himself with Bergson on this

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[83] Whitehead, *Process and Reality,* 20.
[84] Alfred North Whitehead, *Science and the Modern World* (New York: Macmillan, 1967), 52.
[85] Whitehead, *Science and the Modern World*, 52.

point, writing that Bergson had protested against simple location also in respect to time.[86] The idea is that matter exists at a definite position in both space and time and does not require for its explanation any reference to other regions of space-time.[87] Bergson's concept of duration demonstrates that this understanding of time is erroneous, that time primarily exists as duration, which necessarily interpolates with the past. Whitehead further explains that simple location allows scientists and philosophers to answer the old Ionian question, "What is the world made of?" In the early modern period, they answer: the "succession of instantaneous configurations of matter"[88] The question may be natural or even commonsensical, but the philosophical issues it raises are immediate and severe. Think for instance of induction. If there is no inherent reference to past or future in configurations of matter, it follows that nature at any one moment makes no reference to nature at any other moment.[89] Induction based upon observation is thus impossible, undercutting empirical science. This is what Hume protests in his discussion on cause and effect, and the paradoxes demonstrating the impossibility of induction that he explains presuppose this theory of simple location.

Substance-attribute is another example of the fallacy of misplaced concreteness. We perceive an entity with certain characteristics—grey, hard, round, silent—and observe these as qualities capable of changing in time and thus ascribe the role of substratum to the entity—calling it the substance—of which we predicate these attributes, some essential and other entirely accidental.[90] In regard to material bodies, having mass and simple location are essential, but

[86] Whitehead, *Science and the Modern World,* 50.
[87] Whitehead, *Science and the Modern World*, 49.
[88] Ibid.
[89] Ibid.
[90] Whitehead, *Science and the Modern World*, 52.

colour, sound, smell and relations to other entities are more complex.[91] Aristotle's explanation was long considered to be adequate but the transmission theories of light and sound in the 17th century complicated the ancient explanation. These later theories demonstrate that these phenomena are one and all caused by nothing more than the motion of material interacting with the organs of perception. Colour, sound and smell are not transmitted, but waves of material hit the retina, affect the nerves, affect the brain, and cause the appearance of colour. Along these lines, Galileo, Descartes, and Locke elaborate theories of primary and secondary qualities. Magnitude and motion are primary, while the qualities associated with the senses are secondary, being products of the mind. Descartes writes in *Principles of Philosophy* that "by our senses we know nothing of external objects beyond their figure, magnitude, and motion."[92] Locke's theory is perhaps the most sophisticated. Extension, figure, solidity, and motion are primary qualities and through these the order of nature can be explained in full. Secondary qualities are projected upon bodies by the mind, but are in fact additions made by the mind alone. We arrive, therefore, at a thoroughly bifurcated nature. The practical use of the system is astounding, as demonstrated by all the advances of modern science and technology, but the bifurcation is nevertheless entirely untenable. Whitehead writes with sarcasm and indignation, mocking such a conclusion: "*Nature is a dull affair, soundless, scentless, colourless; merely the hurrying of material, endlessly, meaninglessly*."[93] In his own account, Whitehead strives to avoid the bifurcation of nature and the misplaced concreteness that leads to an untenable philosophy, and in doing so he provides an alternative also to a static, bleak, and dead-on-arrival conception of nature.

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[91] Whitehead, *Science and the Modern World*, 53.
[92] Descartes, *Principles of Philosophy,* in Whitehead, *Science and the Modern World*, 55.
[93] Whitehead, *Science and the Modern World*, 54. Emphasis added.

Whitehead's metaphysics, which he describes as the "philosophy of organism," abounds with neologisms and conceptual innovations, so for brevity I will explain only his concepts of "actual entities" and "prehensions," both of which are necessary to understand the process-relational character of Whitehead's philosophy, which places the event at the centre. Actual entities, also termed actual occasions, are events and are fundamental to existence. The term "entity" might suggest substance, but actual entities are nothing of the sort. As Whitehead explains, "the actual world is a process, and . . . the process is the becoming of actual entities."[94] Change is primary, and thus "the notion of actual entity as the unchanging subject of change is completely abandoned."[95] Actual entities are a limiting type of event, a singular occasion, but they can only be understood as a relational becoming involving other elements. Actual entities are "the final real things of which the world is made up … [these] final facts are, all alike, actual entities; and these actual entities are drops of experience, complex and interdependent."[96]

Actual entities do not exist *in* an already constituted world, rather, they *are* the becoming of that world, infinitesimal drops of experience inextricable from a co-constituting web of relation. Reality, as experience, "grows literally by drops or buds," Whitehead says, quoting William James. Whitehead thus affirms what is often referred to as pan-experientialism. Experience is not a result of conscious human mentality but is continuous throughout nature. This is not to say that a human, an octopus, a tree and an electron experience the same reality, but merely that they do all enjoy experience. When *we abstract* this continuous experience into the minimal unit of a discrete event, this is the actual entity. We may speak of an actual entity as if "it" were an isolated being, but we must remember that, as Whitehead says, "how an actual entity

[94] Whitehead, *Process and Reality,* 22.
[95] Whitehead, *Process and Reality,* 29.
[96] Whitehead, *Process and Reality,* 18.

becomes constitutes what that actual entity is; its 'being' is constituted by its 'becoming.'"[97] When we thus analyze an actual entity, we must make reference to the "prehensions" that play a role in its "concrescence," because an abstract analysis of an actual entity "discloses it to be a concrescence of prehensions, originated in its process of becoming."[98] We must therefore discuss prehensions and concrescence.

The becoming of an actual entity involves a "decision" between the many things it might become into one settled thing it will be. This process of decision and becoming concrete is what Whitehead describes as concrescence. This process generates relevant novelty and true originality. Whitehead terms the principle of novelty "creativity." It is embodied by the actual entity, which is defined as "a novel entity diverse from any entity in the 'many' which it unifies … [and in which] the many become one and are increased by one."[99] Concrescence is ultimately this "production of novel togetherness,"[100] while prehensions are the terms in which Whitehead explains the elements of concrescence and the becoming of the actual entity.

In calling this concept "prehension," Whitehead appeals to the verb "prehend," or "to grasp."[101] Actual entities "prehend" past actual entities, and these "prehensions" of other actual entities are the elements of concrescence. We might also think of prehensions as analogous to perception, although not bound to or facilitated by consciousness, but Whitehead does not want to use this language, as the differences between the two phenomena are vast, and one is psychological while the other is metaphysical. There are three factors to every prehension: (a) a

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[97] Whitehead, *Process and Reality,* 23.
[98] Ibid.
[99] Whitehead, *Process and Reality,* 21.
[100] Ibid.
[101] C. Robert Mesle, *Process-Relational Philosophy: An Introduction to Alfred North Whitehead* (West Conshohocken, PA: Templeton Foundation Press, 2008), 98.

"subject-superject," this being the actual entity that is prehending and for which the prehension is a concrete element; (b) the prehended datum; and (c) the "subjective form," which is *how* the subject prehends the datum.[102] Prehensions can be physical, being data involving actual entities, or they can be conceptual, involving what Whitehead terms *eternal objects*: pure potentials that are not actual until they "ingress" into an actual entity.[103] What he calls eternal objects are pure potentials facilitating creativity in each concrescence. Most prehensions are *hybrid*, involving both physical and conceptual data.[104] Lastly, there are two types of prehensions: positive prehensions, which are "feelings" actively participating in the process of self-creation, and negative prehensions, which do not allow the data to enter into the "progressive concrescence of prehensions constituting the unity of the subject."[105]

Prehensions warrant further examination. These connect the world in a relational web, functioning as the way actual entities experience other actual entities, incorporating other entities into their own becoming. Whitehead says his philosophy "is devoted to the task of making clear the notion of 'being present in another entity,'"[106] which he calls objectification. Objectification is foreign to any metaphysics of substance, because no substance can be within another and all entities maintain their independence. Conversely, for Whitehead, when we allow for degrees of relevance, from slightly relevant positive prehensions to the vast quantity of largely irrelevant negative prehensions, "we must say that every actual entity is present in every other actual entity."[107] The whole past is objectified in every actual entity, and this occurs because the actual

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[102] Whitehead, *Process and Reality,* 23.
[103] Whitehead, *Process and Reality,* 23.
[104] Mesle, *Process-Relational Philosophy*, 98.
[105] Whitehead, *Process and Reality,* 24.
[106] Whitehead, *Process and Reality,* 50.
[107] Ibid.

entity prehends the whole universe. From the most trivial puffs of dust in far off space to the data of immediate sense perception, it is all prehended in the becoming of actual entities. A vast quantity of these prehensions are negative, and their relevance is thus minimal, but they are nonetheless related to any becoming. The data of prehensions are not just physical phenomena. Concrete facts to be prehended are neither purely extended bodies, nor purely mental phenomena. This is why Whitehead writes that "the theory of 'prehensions' embodies a protest against the 'bifurcation' of nature."[108] The separation of modes of prehending into distinct domains is an abiding error of traditional metaphysics. There are no "separations of perceptual fact from emotional fact; and of perceptual fact, emotional fact, and casual fact, from purposive fact," and imposing such a separation has "constituted a complex of bifurcations."[109] All these varied forms of prehension are related and combine in various ways to constitute nature, which is not a dull, colourless affair, but glimmers with the seemingly endless variety of actual entities.

The relevance of this universe of related actual entities to the concrescence of the particular occasion depends on the "decisions" of actual entities in their process of becoming. The agential language is no mistake. Whitehead's theory expands the notion of what constitutes agency, which is more than conscious human action. Electrons, cells, plants, animals and humans all make decisions, in the original sense of the word, "de-cision," to cut. I cut out the possibility of running when I sit down, a pet dog cuts out the chance of a treat when it disobeys a command, a plant cuts out options when it grows in a certain direction, an electron eliminates the option to swerve in one direction when it swerves in another. Decisions come in varying degrees and forms. The electron is not consciously moving, but as the quantum mechanics which were

[108] Whitehead, *Process and Reality,* 289.
[109] Whitehead, *Process and Reality,* 290.

developing in Whitehead's own time seemed to demonstrate, its behaviour is not a mechanistic, entirely predictable movement. We can predict much of the growth of plants, but we cannot explain why they decide to grow each particular branch in the shape and size they do. These decisions are not conscious. Consciousness is a subjective form pertaining to how humans make only some of our decisions. The subjectivity of other entities is vastly different, even though they too make decisions, prehend the world, and decide for or against the ingression of certain prehensions. The novelty of their becoming thus exhibits their own self-creation. Whitehead writes that "each occasion exhibits its measure of creative emphasis in proportion to its measure of subjective intensity."[110] When the electron swerves, that may not express the sort of creativity or novelty we typically associate with the terms, but it is a creative act in proportion to the entity. This novelty is continuous through nature, and the universe is fundamentally creative.

Seeking to escape the bifurcation of nature and the mistaken abstractions endemic to modern philosophy, Whitehead's system presents nature as processual, relational and creative, and as continuous across living and nonliving, material and conceptual, and human and nonhuman beings. This relational metaphysics operates with a set of abstractions and presumptions entirely different than that of the classical Western substance-attribute metaphysics, with which Whitehead breaks completely. Like other process thinkers, he prioritizes becoming over being, relation and events over isolated substances, and novelty over mechanism.

Before I examine the ecological implications of adopting this new set of abstractions, there is one last thinker of becoming whom I need to examine. The work of Gilles Deleuze

[110] Whitehead, *Process and Reality*, 47.

ranges from monographs on Spinoza, Hume, Leibnitz, Nietzsche, and Bergson to dense metaphysical works such as *Difference and Repetition* and the *Logic of Sense*, and his ambitious collaborations with Felix Guattari, *Anti-Oedipus*, *Kafka: Towards a Minor Literature*, *A Thousand Plateaus* and *What is Philosophy?* His influence is profound and extends well beyond the discipline of philosophy, despite Deleuze's claim to be a "pure metaphysician." Drawing from his own "counter-canon" of neglected philosophers, he develops a metaphysics that emphasizes becoming, difference, creativity, and the continuity between living and nonliving no less than human and nonhuman, that we have seen in other process philosophers. Due to the expansive and neologistic character of Deleuze's dense work, I shall discuss only two ideas, namely what he calls the univocity of being, and the concept of an "assemblage" that he develops with Guattari in *A Thousand Plateaus*.

In *Difference and Repetition*, Deleuze writes, "There has only ever been one ontological proposition: Being is univocal."[111] He thus affirms what is often referred to as a "flat ontology," in opposition to the hierarchical ontology we see in Aristotle's *Categories*. For being to be univocal means that it can only be said of in one way, a single consistently logical sense across all entities. There is no ontological privilege for any group of entities. Substances are not ontologically privileged over attributes, humans over nonhumans, the mind over the body, or primary qualities over secondary qualities. Being is distributed across many entities horizontally, not in a vertical rank, hence the ontology is described as "flat." However, that being is univocal does not mean being is One in the Parmenidean sense. There are real distinctions among entities, but not ontological distinctions, in the sense that being x composes this "simple location" here

[111] Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (New York: Columbia University Press, 1994), 35.

and being y is there next to it. Rather, as Deleuze writes, "Being is the same for all these modalities, but these modalities are not the same … the essence of univocal being is to include individuating differences."[112] The univocity of being thus eliminates ontological hierarchy but retains the differences amongst entities, not reducing them all to a singular identity, as did Parmenides.

In *A Thousand Plateaus*, Deleuze and Guattari adhere to this flat ontology, but make becoming primary. A central concept for them is what they call an assemblage (*agencement*). In *Dialogues II*, Deleuze explains this conception as follows:

> What is an assemblage? It is a multiplicity which is made up of many heterogeneous terms and which establishes liaison, relations between, across ages, sexes and reigns—different natures. Thus, the assemblage's only unity is that of co-functioning: it is a symbiosis, a "sympathy." It is never filiations which are important, but alliances, alloys; these are not successions, lines of descent, but contagions, epidemics, the wind.[113]

Assemblages are not simple unities. They are not homogenous and are capable of drastic change if any of the terms are altered. The grouping of the heterogeneous terms that form an assemblage is always in a dynamic state of becoming and accordingly assemblages have emergent properties that cannot always be predicted. Because their unity is a co-functioning, they have external relations of symbiosis with different terms rather than internal relations of filiation, and the assemblage is always changing as its terms enter into new assemblages. Assemblages draw together all sorts of entities in ever-evolving combinations. Take Deleuze's example of the

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[112] Deleuze, *Difference and Repetition*, 36.
[113] Gilles Deleuze and Claire Parnet, *Dialogues 2*, trans. Hugh Tomlinson and Barbara Habberjam (New York: Columbia University Press, 2007), 69.

human-animal-manufactured object assemblage MAN-HORSE-STIRRUP. The addition of the stirrup to the assemblage of man and horse dramatically changes the entire assemblage and grants it new capacities for movement and war. The co-functioning of the heterogenous parts define the assemblage, and subtle changes, new additions or losses, can radically change the assemblage.

"All we know are assemblages."[114] Reality is relational and dynamic on all scales; from the sub-atomic to the cosmic everything that exists is an assemblage. They thus deny the existence of a neutral matter that homogenously makes up the universe. Assemblages allow us to understand the co-constitutions we are enmeshed in. Deleuze and Guattari use the example of a wasp and an orchid. They form an assemblage and the two species have evolved together as an assemblage. When they interact, the orchid luring in the wasp with its form, there is a mutual becoming of the two, the wasp is becoming-orchid and the orchid becoming-wasp. Enmeshed in a world of assemblages, we are constantly engaging in such "micro" becomings at all levels. We are becoming-animal, becoming-plant, becoming-human, becoming-mineral, and more. This conception depicts us as an assemblage composing and composed of further assemblages and promotes a different conception of agency than that of a substance-attribute metaphysics, where a human subject is clearly delineated from associated attributes. The difference is that from a relational perspective, our agency is determined by and distributed through the world around us.

The functional whole of an assemblage has its own characteristic agency, but it also retains the agential impetus of its heterogenous parts. Jane Bennett elucidates this point with her

[114] Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 2007), 22.

concept of "distributive agency." The assemblage's source of action is not reducible to a single "actant" (to use Bruno Latour's language), but is uniquely determined by the assemblage's distinct form of unity. Thus, the agency is distributed across parts of the assemblages in which it figures, even if always unevenly and subject to change. The becoming of any one part can turn the assemblage in a new direction, from a slight deviation of typical functioning to unrecognizable alteration. Unlike intentional agency, where the mind has control over the body and a person can be free of external determination, reality conceived through assemblages forces us to acknowledge the vast array of entities that relationally determine our agential capacities. For example, human decisions are mediated by an array of constituent parts of varying degrees of relevance. There are hormonal, microbiotic, mineral, environmental, and social factors that do not just guide our agency but constitute it, resonating through our actions and the actions of other beings. Assemblages always exists in time and history, and the historical formation of the assemblage and its constitutive parts are central to its agency. Assemblages allow us to re-conceptualize the neutral "thing," often considered a homogenous substance, as a unity which does not reduce to one but remains multiple, while still functioning as one in different settings. In sum, assemblages are relational, dynamic, and agential multiplicities.

The tradition of process philosophy to which the thinkers I have discussed belong is ongoing. It is an assemblage of its own, with no single centre, whether in location, discipline or exponents. These concepts have found a place in science, politics, art, literature, social sciences, ecology, philosophy and other disciplines, forming an amorphous body that continues to grow. In the next chapter, I show the importance of the concepts of process philosophy for ecological thinking and for understanding the stakes of our current climate catastrophe. I compare the conceptualization of the earth from a substance-attribute perspective to that of a process

perspective and show how the former is ecologically untenable while the latter coheres with both the historical reality of the earth and the novel changes of the Anthropocene.

Chapter 3. Ecology, Gaia, and Process Metaphysics

In the previous two chapters, I have explored the traditions of both substance-attribute and process metaphysics, focusing on their different conceptions of change, relations, and novelty in the world. In this final chapter, I argue that substance-attribute metaphysics is not suited to ecological thinking. I offer arguments for why we should instead turn to process metaphysics as an alternative for ecological thought. To make this argument, I turn first to conceptions of the earth as an example of the advantages of process metaphysics and explore the ways in which our planet is often misunderstood through inappropriate substance-attribute modes of thinking. Understanding the earth is obviously critical in the epoch of the Anthropocene and in the context of the ongoing climate catastrophe. However, conceptions of the earth founded upon static metaphysics lead to an inadequate ecological response to such events. I argue that this inadequacy is rooted in the Western philosophical tradition of substance-attribute metaphysics, a metaphysics that does not reflect the fluxes and novelties of the natural world. In the Anthropocene, where natural history and human history are now definitively intermixed, traditional substantialist metaphysics is an inappropriate conceptual tool for understanding and addressing the ecological challenges we face.

To be a productive force for addressing climate change and adapting to the state of our earth, ecology requires a foundation reflective of the reality that has produced an Anthropocene. Process metaphysics, with its emphasis on relation, novelty, and change, provides this needed foundation. It allows us to cultivate sensitivity to the modes of becoming that populate our world and which our neglect endangers. These relations are obscured by many of the ideas that contribute to a substance-attribute metaphysics. This metaphysics operates in terms of independent beings, simple divisions between parts and wholes, and autonomous, self-identical

entities—all abstractions that obscure the relations that bind the whole system together in a functional whole. A philosophical foundation based on processes rather than self-identical entities emphasizes the opposite, namely, the interconnected and intensely related becomings of the world, facilitating the thought (and it is hoped the action) necessary for addressing ecological issues. Our metaphysical assumptions are a crucial component of how we handle these issues, and unless those assumptions are explicitly addressed and revised, they will infect any changes we attempt to enact, whether political, economic, or ecological. Process metaphysics is therefore required if we want to think as creatures that can survive through and beyond the Anthropocene.

The earth is always at the heart of ecological discourse. There are many figures of the earth, and complex assumptions are contained in dominant, seemingly innocent images such as the Globe, which re-imports many of the abstractions characteristic of traditional Western metaphysics. To understand the drastic changes of the earth over time, we need to avoid the seemingly timeless figures of the earth that reflect outdated modes of thought. A novel figure of the earth, one that depicts it with both scientific and philosophical accuracy, is the figure of *Gaia*. However, the concept of Gaia is surrounded by the specters of old figures of the earth and as such Gaia is often misunderstood. As I will argue, this is largely due to our attempts to understand Gaia with the conceptual resources of an incompatible substance-attribute metaphysics.

The Gaia hypothesis, the radical idea that life plays a significant role in shaping the earth, was first introduced by the scientist and inventor James Lovelock. Working at NASA in the 1960s on a mission concerned with the exploration of Mars, Lovelock was faced with the

question: "how would one detect life on a further planet, such as Mars or Venus?"[115] He chose to measure and compare planetary atmospheres. Lovelock found that, of Mars and other observed planets, only the earth's chemical composition was beyond predicted thermodynamic equilibrium. He hypothesized that unexpectedly high levels of chemicals such as methane and oxygen on earth must be due to the presence of life on the planet. Therefore, Lovelock proposed that life must be a critical component in shaping the composition of the earth's atmosphere. This proposition stood in stark contrast to previous hypotheses that invoked only chemical and geological factors to explain planetary conditions. Throughout the 1970s, and partly in collaboration with biologist Lynn Margulis, Lovelock developed this new idea into what he termed the Gaia hypothesis.

Despite the empirical evidence that gradually confirmed the Gaia theory, opposition to the idea arose in several disciplines for different reasons. Some scientists disavowed what they saw as a teleological theory that a holistic entity called Gaia supposedly regulates the earth for the benefit of life. Some disregarded the whole idea, thinking it was nothing but a metaphor. But Lovelock was neither writing ecological poetry about ancient gods nor reintroducing a telos into earth sciences. He was first and foremost a scientist. He was attempting to describe an entity that did not fit established scientific or philosophical concepts. As a result, Gaia's description was a constant challenge and Lovelock often struggled with ambiguity. This is a predictable result of trying to describe a novel processual entity in the old language of the static and substantial. Margulis writes, "since [Lovelock's] was a new idea, he hadn't yet developed an appropriate vocabulary," and this issue of vocabulary certainly persists, as Gaia remains contentious in

[115] Sébastien Dutreuil, "James Lovelock's Gaia Hypothesis: 'A New Look at Life on Earth' ... for the Life and the Earth Sciences" in Michael R. Dietrich and Oren Harman, *Dreamers, Visionaries, and Revolutionaries in Life Sciences* (Chicago: University of Chicago Press), 274.

contemporary sciences.[116] Today, climate change makes understanding Gaia more relevant than ever, and sets a new and important task for Earth Systems Science, a growing interdisciplinary field that emerged out of Gaia theory and its study of the Earth System. However, even in this Gaian discipline, Gaia is not wholly accepted, and many prefer to leave Lovelock's contentious and often misunderstood concept out of their "strictly scientific" endeavors, referring instead to the "Earth System."[117] The term "Earth System" reduces the complexity of studying Gaia and presents itself as a field of study that can be undertaken from the outside standpoint of a disinterested scientific observer.[118] With Gaia you are unmistakably inside the system, unable to retreat to the "scientific" position of a disinterested observer. As a result of past and present opposition to Gaia, many scientific and philosophical tensions Gaia reveals are brushed aside.

In other disciplines, the idea of Gaia has attracted diverse scholars: philosophers, anthropologists, and interdisciplinary thinkers such as Donna Haraway, Isabelle Stengers, and Bruno Latour. Latour's book *Facing Gaia* examines the concept philosophically, politically, and theologically. Latour re-opens the discussion of Gaia, demands we form new understandings of the human and the non-human, and challenges the assumptions that we take for granted in thinking about the earth. I will explicate Latour's understanding by drawing on resources from process metaphysics. In doing so, I will develop a better understanding of earth, unhindered by substance-attribute metaphysics.

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[116] Lynn Margulis, "Gaia is a Tough Bitch," in John Brockman, *The Third Culture: Beyond the Scientific Revolution* (New York: Simon & Schuster), 139-140.
[117] Bruno Latour, "Why Gaia is not a God of Totality," *Theory, Culture & Society* 34, nos. 2-3 (March-May 2017): 62-63.
[118] Ibid.

In thinking of Gaia, we always risk falling back into familiar models, particularly those associated with substance-attribute metaphysics. Gaia is a dynamic and relational figure of the earth, and at every turn Gaia risks being misunderstood as an isolated system. Lovelock's descriptions are no exception. His own language often leans toward teleology, biological metaphors, and substance-attribute metaphysics. However, as Latour emphasizes, Lovelock's language is almost always eventually corrected, precisely to prevent us from resting with any frozen view of Gaia.[119] Accordingly, Latour, Haraway, and Stengers often use different epithets for Gaia, and "*Gaia-Thousand-Names*" is perhaps their most fitting.[120] In attempting to define Gaia against dominant figures, I begin by discussing what Gaia *is not*, above all explaining that it not teleological, not an organism, and not a Globe. As I show, these misunderstandings have roots in common assumptions fostered by substance-attribute thought.

Lovelock is clear that there is no teleology for Gaia. That is, it is not a new green deity, as critics or over-zealous environmentalists might suppose. Lovelock writes:

> Gaia, like an invention, is difficult to describe. The nearest I can reach is to say that Gaia is an evolving system, a system made up from all living things and their surface environment, the oceans, the atmosphere, and crustal rocks, the two parts tightly coupled and indivisible. It is an "emergent domain"—a system that has emerged from the reciprocal evolution of organisms and their environment over the eons of life on Earth. In this system, the self-regulation of climate and chemical composition are entirely

[119] Latour, "Why Gaia is not a God of Totality," 70.
[120] Ibid.

> automatic. Self-regulation emerges as the system evolves. No foresight, planning, or teleology are involved.[121]

As this implies, the living things of earth do not form a whole that regulates them as component parts, nor does life regulate itself toward any given end, as if by foresight. Despite Lovelock's emphasis, when scientists describe Gaia, as the Earth Scientist Toby Tyrell does in his book *On Gaia*, teleological language is often employed, muddling both the scientific and philosophical understanding of Gaia. Latour criticizes Tyrell for writing the following:

> The Gaia hypothesis is nothing if not daring and provocative. It proposes *planetary regulation* by and for the biota, where the "biota" is the *collection* of all life. It suggests that life has *conspired* in the regulation of the global environment, so as to keep conditions *favorable*.[122]

Latour analyzes many comparable passages from Tyrell's book. In the passage I have cited, his words "by and for the biota," "conspired," and "favorable" all imply a teleological understanding of Gaia. However, and contrary to Tyrell's explanation, life "conspires" to nothing. Even amongst prominent earth scientists such as Tyrell, teleology can easily creep into our language when we try to describe a novel entity such as Gaia. When scientists restrict their usage to "earth system," this is no different, and they only add the difficulty of using a term that conceals complexity instead of accepting the to many unfamiliar term "Gaia." This pervasive teleological

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[121] James Lovelock, *The Practical Science of Planetary Medicine* (London: Oxford University Press: 1997), 11.
[122] Toby Tyrell, *On Gaia: A Critical Investigation of the Relationship between Life and Earth*, cited in in Latour, "Why Gaia is not a God of Totality," 65.

misunderstanding often implies another, which is that Gaia is itself some kind of living organism.

Gaia is often referred to as the "living planet," since it is profuse with life and inseparable from it. However, these qualities do not make it an organism. Lynn Margulis is emphatic on this point, arguing that Gaia cannot be an organism because "no organism eats its own waste."[123] The organism metaphor is not only scientifically inaccurate, but also imports a host of further problematic assumptions. One such assumption is that Gaia is a system in which one whole organizes many subordinate parts. This assumption may seem intuitive because it allows us to depict Gaia through comparison to the structure of our own bodies. But when we think of our bodies, we think of them precisely as *organi*zed, arranged with a reference to the maintenance of a whole. Every part has its proper function in respect to the whole. Gaia does not function in that way; its parts no less than the overall totality are constantly changing. The organism metaphor inappropriately implies a determined composition which contradicts the dynamic structure of Gaia. To be properly understood, Gaia requires a new way of understanding systems that does not rely on the overly familiar metaphors of body and organism. These new ways of understanding can be unintuitive and thus require new conceptual resources. I argue that these resources are available in process metaphysics.

One idea that supports the novel understanding of Gaia that we need is Gilles Deleuze's concept of assemblages, which I discussed in chapter 2. Gaia contains assemblages on all scales. From the planetary scale to the microbiotic, we find heterogeneous assemblages of interpenetrating changes. All of these assemblages are interconnected and can be considered as

[123] Margulis, "Gaia is a Tough Bitch," 140.

belonging to one system. The movement of tectonic plates is no less Gaia than an elk calling out across the forest. This assertion challenges the dichotomy between natural and artificial, because all these assemblages are, in the Anthropocene, mixed with objects of anthropic origin. These merging planetary assemblages make each entity entwined among others in a way that challenges the classical metaphysical (Aristotelian) idea of a substance. The agency of these assemblages is also distributed, as was noted in chapter 2. Gaia thus demands a complete redistribution of agency, undermining the long-assumed centrality of substantialist thinking. Alongside a redistribution of agency, the very notion of what it means to be a part of something is reconceptualized.[124] Being part of Gaia is not akin to being an organ in an organism or being an attribute of a substance. Hence, we must understand Gaia and its relations through different models that are not derived from substance-attribute metaphysics, including the model of the organism. The value of new conceptual resources is made clear through examining Gaia in terms of metabolic flows. This is a method that Latour suggests can orient us towards processes rather than substances.

Often, a biological entity may be conceived by focusing on the organism and situating it *inside* its material context, its environment.[125] For Gaia, this method is fraught with problems. Instead, Latour emphasizes starting with some metabolic activity and thinking in terms of being inside a feedback loop.[126] In metabolic activity, there are upstream, midstream, and downstream components. The upstream components consist of the other entities that metabolic activity takes as input; the midstream is the activity itself, while the downstream activity is the output, which

[124] Latour, "Why Gaia is not a God of Totality," 74.
[125] Sébastien Dutreuil, Bruno Latour, and Timothy M. Lenton, "Gaia as Seen from Within" *Theory, Culture & Society* 41, no. 5 (September 2024), 78.
[126] Ibid.

then becomes input for other processes. When we consider an entity as a substance, we observe only a small part of its total metabolic activity. Looking at an animal, for example, we see an entity that has an extremely tight coupling between the upstream and downstream effects, such that the connection between input and output is direct and obvious. The input and output are taken as given and can be considered elements of the environment, separate from the organism, while priority is given to the midstream activity of the organism. The fact that food, water, and air are taken in (upstream) and waste is released (downstream) is taken for granted. The focus is then placed on the processes internal to the organism taken in isolation. This ignores their upstream and downstream relations and inappropriately conveys an overly narrow view of natural processes, making it seem as though the tight coupling observed in organisms is common. However, on a geological scale, this kind of tight coupling is extremely uncommon on earth, where loose couplings that span vast ranges of time and space prevail. The tight coupling as a model for nature presupposes both a divide between an inside (the organism) and an outside (its environment), and the presence of clearly delineated entities that persist through their own metabolic activity. Loose couplings, on the other hand, demonstrate the complex ways multiple actors must become relationally in order to perpetuate both themselves and their material surroundings. There is not a simple input of upstream elements or a simple output of downstream elements, but constantly interpenetrating cycles of material which involve vast assemblages and therefore allow no clear delineation between an inside and outside or an organism and its environment. Gaia is composed of these loose couplings, and they are a far more appropriate model of natural processes than an organism.

Expanding the scope of metabolic activity, we begin to see processes with loose couplings that span geological time scales everywhere. For example, one might ask: What is the

connection between bacteria in the Amazon rainforest and the formation of undersea minerals? The coupling is loose, and its perception requires both scientific instruments and data accumulated over long periods of time, but billions of these complex couplings form the feedback loops that make up Gaia and create the upstream conditions that allow organisms to survive. To think in terms of Gaia is to think of these entangled relations as central, rather than beginning with the model of the organism. When we start from the middle in this regard, the following lines by Latour become self-evident:

> Organisms can be considered as fluctuating eddies in a flowing river; they are locally interesting but don't define the up and down of the flow. Furthermore, it's clear they are not really bounded by any sort of durable wall … any entity always resides in some "inside" made by an other … the notion of an isolated organism is a contradiction.[127]

We cannot understand Gaia if we begin with an isolated organism. We must replace isolated entities with relational processes. Process metaphysics provides the conceptual tools necessary to make this shift in understanding. For the process metaphysician, organisms lose their privileged position in nature. Rather than a model of the world, organisms can be understood as particularly coherent beings that are always relational and depend on the upstream conditions that make their existence possible. No organism is isolated, and Gaia cannot be conceived as an isolated organism on a larger scale. The conceptualization of the earth as a unified organism is a simplification of Gaia promoted by substance thought.

Gaia presents a system that has "connectivity without holism," writes Latour, and this unique form of connectivity requires process thought to be understood.[128] Gaia has unity, but

[127] Dutreuil, Latour, and Lenton, "Gaia as Seen from Within," 79.
[128] Latour, "Why Gaia is not a God of Totality," 75.

cannot be called united, because its parts have no whole that dictates their place. Its unity is thus never finished but is rather a continually emerging unity derived from the changing relations of the parts. Therefore, Gaia is relational and interconnected but it cannot be described as holistic, since it possesses no properties as a whole beyond its parts. The relation of a creator to its creations, an organism to its organs, or an outside to its inside all fail to provide appropriate models of the form of connectivity Gaia embodies. To imagine Gaia in any of these ways is to import metaphors founded on an incompatible metaphysics. In these metaphors, the creation is already finished, the organism is organized, and the outside is delineated. The degree to which change can occur is prematurely limited. This damages our understanding of Gaia because Gaia's changes remain completely open, without pre-determined organization. Gaia is constantly unfolding new relations and extending beyond what it was moments before. This is crucial to realize for ecology, as anthropic actions play a leading role in this mode of becoming. This becoming is also not always spatial unfolding, and our tendency to spatialize, which both Bergson and Whitehead lament, is the third misconception I want to highlight.

The problem with our tendency to spatialize is that an overly spatialized notion of the earth, such as that we adopt when we think of it as a single global system, causes a premature closure of the earth's possibilities for novelty. We deceive ourselves into thinking that we have discovered all its physical properties. This assumption overemphasizes Gaia's quantitative limits, thereby missing its qualitative aspects. More than discovered geographical spaces, Gaia contains undiscovered and ever-developing relations. There is a perpetual novelty to Gaia that prevents us from speaking of it a whole, because at any moment it is qualitatively, not spatially, extending beyond any "whole" to which we have attempted to confine it.

Unlike an Aristotelian cosmos, which is presumed to be eternal, we must understand Gaia's novelty by employing the cosmological ideas developed by thinkers such as Whitehead, for whom the cosmos is ever becoming and always advancing into novelty. Gaia is an active region of novelty, the most active part of which is called the critical zone, referring to the thin layer near the surface of the earth where life exists. Gaia exists as the becoming of novel relations. Gaia is not "inside" a delineated spatial boundary in the way we might imagine the Globe as spatially demarcated. As mentioned previously, Gaia demands a reconceptualization of what it means to be a part of another entity. Substance-attribute metaphysics spatializes this notion, reducing qualitative relations to quantitative spatial relations. Gaia requires a way to think of the interpenetration of entities that is not purely spatial and can make sense of changing non-spatial relations. A system of process metaphysics such as Whitehead's allows us to discuss Gaia without this reduction. Whitehead explicitly states that his philosophy "is mainly devoted to the task of making clear the notion of 'being present in another entity.'"[129] Whitehead's philosophy is thus suited to describing the interwoven relations that make up Gaia, whereas using substance-attribute metaphysics to explain Gaia is inadequate to its dynamism. This is why a radical shift in thought from the static to the dynamic or from substance to process metaphysics is required to for an accurate conception of the earth. A metaphysics of substance must fail to fully reflect the reality of the earth.

Despite its importance and our best intentions, avoiding the reimposition of substance-attribute metaphysics is difficult. It is not a simple matter of being aware and moving on. Our way of philosophizing, for those of us taught in the Western tradition, is steeped in terminology and concepts that presume a world of substances. Western linguistic structure itself reflects the

[129] Alfred North Whitehead, *Process and Reality* (New York: Free Press, 1978), 50.

subject-predicate understanding of the world. The question thus becomes how to stop thinking in terms of substance. We must identify the presumption of substance everywhere and work critically to alter the terminology and concepts we practically unconsciously adopt. Two such concepts are the notions of "self-regulation" and "autopoiesis," both of which are terms imported from cybernetic systems theory. Autopoiesis is a biological term used to describe something self-regulating. Gaia is sometimes referred to as a self-regulating or autopoietic entity, but in several ways this terminology reintroduces substance-attribute metaphysics.

The first way, obvious though seemingly innocent, is through the reference to a "self" that is regulated. Reference to a "self" presumes that there is a natural equilibrium of the entity that must be maintained, which also implies a stable essence or substance whose conditions an entity is bound to maintain. This notion precludes the possibility of novel change in Gaia. The self-regulating entity might change superficially, but so long as it is viewed as having an essential state reflective of its true self, the change is not meaningful—it implies no sustained becoming. So, we might think, an increase in global temperature is no cause for alarm—Gaia will self-regulate. Similarly, if species are going extinct at unprecedented rates, we should not be overly concerned—Gaia will self-regulate. While an overblown idea of the earth's capacity to maintain stability may not always be intended in the notion that Gaia is self-regulating, the description nonetheless carries this implication. Therefore, as long as Gaia is conceived as a "self" with a capacity for regulation, the severity of climate *change* is always limited. Gaia's "self" implies a limitation, as if it cannot change beyond a certain predetermined limit lest it cease to be Gaia at all. But it is not limited by regulations that come from itself, as if Gaia is a unified agency that is actively making a decision.

The second misunderstanding implicit in the idea of self-regulation is that Gaia has a sort of unified agency that does the regulating. Gaia is in fact not self-regulating; it is emphatically other-regulated. Gaia is a historical entity that has emerged from the interaction of millions of component agencies without any unified aim. Gaia has no "self" that could withstand the loss of its relations, the way Aristotelian substances are ontologically prior to all their attributes. Upon investigation, it becomes clear how misconceptions are introduced by language such as "self-regulation" which has been used since Gaia's inception, even by Lovelock himself.

In the face of such misunderstandings, a shift in language must occur. Donna Haraway has noted the difficulty of the expression "autopoiesis," suggesting instead the term sympoiesis.[130] Sympoiesis describes a "making with" that emphasizes the relationality present in all creation. Accordingly, it implies a "relational regulation" rather than any form of self-regulation. This language forces a shift from thinking in terms of substance, reflected in the model of the individual organism that self-regulates, to thinking in terms of relations, reflected in metabolic flows of Gaia that involve a multitude of actors. Haraway's suggestion is an example of how to use language that reflects relationality rather than language that reaffirms the assumptions of substance-attribute metaphysics.

Through careful work, the concept of Gaia can surpass the limitations of our old modes of thought. Taken seriously, such new concepts amount to nothing less than a change in worldview and can thus have the force required to inspire action. In a world of isolated substances, our actions seem less likely to bear on entities beyond those we are immediately acting upon. But when we assume the metaphysical priority of process, in which relations are

[130] Donna Haraway, *Staying with the Trouble: Making Kin in the Cthulucene* (Durham, NC: Duke University Press), 58.

central, any action we take affects all the interrelated changes that make up Gaia. We begin to see ourselves as part of the sympoietic processes of the earth. Thus, an action that many may take carelessly, something like dropping a cigarette in one's own yard, is no longer an action concerning just oneself and *one's own* property. It does not bear only on the ecology of the backyard. The cigarette immediately enters the relational webs and feedback loops that sustain the world around us. There is no such thing as a merely "local effect" one can uncouple from the whole earth Gaian effect. The action cannot be extracted from the becoming-polluted of Gaia itself, and it cannot simply be regulated away. A Gaian worldview alters how we see such ecological actions and, properly developed, creates an expanded awareness of the relations in which we take part.

In cultivating this ecological awareness, we need to avoid a thoughtless notion of what we conceive as "nature." A littered cigarette is a simple example of a human action that bears on ecology, one that many might find innocent, but the possible effects of our action on Gaia can be more nuanced. Here we can appeal to Whitehead's concept of the bifurcation of nature, a tendency that exists in the Western philosophical tradition to separate nature into primary and secondary qualities, or qualities like mass, extension and motion contrasted to those like color, sound and smell that are considered perceptual additions.[131]

Working from a bifurcated worldview, we are apt to separate the natural and the artificial, relegating certain experiences and entities to the human or social world while others are considered truly "natural." As a complex of assemblages, Gaia cannot be categorized in this way, which does nothing but obscure the hybrid relations all around us. We cannot think ecologically

[131] Alfred North Whitehead, *The Concept of Nature* (Cambridge: Cambridge University Press, 1964), 31.

unless we dismantle this distorted perspective. Process theories such as Whitehead's provide a foundation for directing our attention to the relations of which we are often ignorant, allowing us to escape a bifurcated view of nature.

Colour and sound are two examples of potentially relevant qualities that the bifurcation of nature disregards, even though such disregard may lead to destructive human actions. When we think in terms of a bifurcated nature, the colours and sounds we experience seem to be simply perceptual additions to the world. They are conceived as *ours*, a contribution of our perception. If colour and sound belong to minds and not to nature, it becomes difficult to imagine the relations between the natural world of large-scale processes such as ocean currents, atmospheric composition, and terrestrial climate, and the human world of music, paint, and flashing lights. However, when we move beyond the bifurcation of nature, the inseparability between the natural and the human is excruciatingly clear and the relations evident.

One such relation is between the colour of roads and global temperature. The colour of paved roads is often somewhere between black and grey. Such roads have a low albedo, meaning they absorb a tremendous amount of sunlight rather than reflecting it back, thus acting as a heat sink. This might seem insignificant, but when millions of kilometers of pavement around the earth share this same albedo, there are significant consequences for heat capture. The worst effects occur in cities that experience "heat islands," where heat absorbed and stored in low albedo surfaces can cause a temperature increase of several degrees above surrounding rural areas.[132] Heat islands are only a localized consequence, and the seemingly innocent local decisions of road material impacts several other climate systems. Even slight increases to global

[132] Chidozie Maduabuchukwu Nwakaire et al., "Urban Heat Island Studies with an Emphasis on Urban Pavements: A Review," *Sustainable Cities and Society* 63 (2020): 102467.

temperature can have large effects downstream on plants and animals, on the role of these organisms in carbon, phosphorous, nitrogen and other cycles, and the effects of these cycles on global climate. In response to these phenomena, many cities are now implementing "cool pavements" to curb the consequences.[133] The issue results from an incapacity to imagine a possible relation between a human quality such as colour and the scientific processes of nature. What is now a problem to be solved could have been prevented with considerations coming from an attuned Gaian perspective. Future situations of the sort—oversights only to be realized after downstream effects have emerged—might continue to surprise those who think in terms of a bifurcated nature. However, from a relational perspective it would be much more shocking for changes *not* to occur. One task for ecological thinkers is to conceive of such potential relations before they develop into catastrophe.

The same point can be made with sound. As is well documented, noise pollution disturbs the capacity of animals to communicate and can have tremendous downstream effects, leading to whole ecosystem collapse.[134] Birdsong is an example that demonstrates the significance of noise pollution and the relevance of the bifurcation of nature to our awareness of such of phenomena. On a bifurcated view of nature, the melodies we hear in birdsong are nothing more than vibrations in the air, and their scientific explanation makes reference only to such primary qualities. Melody and our perceptual experience of the movements in the air also give way to neurological explanation. These scientific explanations take precedence over the experience of

[133] Hessam AzariJafari et al., "Urban-Scale Evaluation of Cool Pavement Impacts on the Urban Heat Island Effect and Climate Change," *Environmental Science & Technology* 55 (2021): 11501-11510.
[134] Masayuki Senzaki et al., "Sensory Pollutants Alter Bird Phenology and Fitness Across a Continent," *Nature* 587 (2020): 605-609.

the melodies themselves and the feelings that accompany hearing such melodies—wonder, beauty, awe—are merely our perceptual experiences, not experiences of nature itself. Thus, the feelings that are motivated by hearing these melodies are obscured and degraded. What is an experience of beauty in nature, one that has the capacity to motivate attentiveness and care for those of us who hear it, loses its allure. The wonder of the birdsong is taken away from the birds, put out of nature, and instead made anthropocentric, as if our perception were something other than a natural event. Whitehead writes mockingly about such an absurd consequence of the bifurcation of nature:

> Nature gets credit which should in truth be reserved for ourselves; the rose for its scent; the nightingale for his song; and the sun for his radiance. The poets are entirely mistaken. They should address their lyrics to themselves, and should turn them into odes of self-congratulation on the excellence of the human mind[135]

As Whitehead conveys, within a bifurcated nature it is not nature that is responsible for the qualities the poets describe; they are qualities that solely belong to human perception, and hence we should praise ourselves. If we step beyond the bifurcation and allow ourselves to engage with the melodies, we can notice their vital importance in ecological relations. We can follow the melodies like a metabolic flow—from bird to bird, to mating and new generations, to interactions with the broader ecosystems. Such attentiveness can be a common feature of an ecological orientation to the world; it need not be the purview solely of a few devoted ethologists. It becomes apparent if we pay attention to the fact that the birds are caught up in an entanglement of relations that we belong to as well. But a theory that bifurcates nature demotes the melodies to

[135] Alfred North Whitehead, *Science and the Modern World* (New York: Macmillan, 1967), 54.

a condition of superfluous furnishings. The bifurcation denies us the possibility to expand our knowledge of ecological relations and reaffirms our fallacious understanding of ourselves as isolated organisms. The melodies that also constitute Gaia are denied their proper respect and attention, and it becomes all too easy to destroy them with noise pollution. If we grant priority to relations, we can cultivate the ecological sensitivity required to live with Gaia. With a bifurcated view of nature, this cultivation is impossible.

In both cases, ecologically destructive actions are due to ignorance of the relations they involve. We can remedy this ignorance by adopting a more process-relational metaphysical stance. Both situations misunderstand broader ecological relations and how anthropic actions can have both immediate and also delayed downstream consequences. By shifting our focus onto relations rather than independent, substantial objects, we can cultivate an awareness of the relational consequences of our actions. It is useful at this point to bring in Whitehead's concept of prehensions, discussed in the previous chapter. If we think of ourselves as living in a world of prehensions rather than substances, our priorities change immediately, from those of an anthropocentric worldview of isolated entities to others appropriate to a world of interrelated processes.

In the concrescence of prehensions, true novelty can occur. There are no relations exempt from such concrescence. Everything in the universe is prehended, these prehensions just vary in degree of relevance. If the furthest stars have a relation to us and our environment, how could we doubt that the pavement beneath our feet, the lights and sounds from our houses, and the birds in our backyards have a comparably relevant relation? To think your dropped cigarette bears *no* relation to a honeybee elsewhere in Gaia is an absurd idea—everything becomes a matter of degrees of relevance. On a cosmic scale, the relevance of our Gaian relations is so much more

than our relation to other cosmic bodies that ideas such as abandoning the earth for Mars become unthinkable. If you view yourself as an independent substance, you might deceive yourself into thinking that you are all you will ever need, whether on earth or Mars. But to see yourself as composed of prehensions, constantly becoming in relation with the beings around you, what could *you* be without the network of Gaian actors that create, sustain and propel you into the future? Hence, the albedo of pavement, noise pollution and birdsong, pollution in the neighborhood, all gain an intuitive relevance in a relational perspective. The question changes from "does this (road, paint, noise, light, cigarette) have any negative effects?" to "What are the effects it *must* inevitably have? How bad are they? What is the degree of relevance?" Nothing is eliminated in advance from consideration for ecological relevance. Nothing is preemptively closed. And the possibility of novel occurrences that force us to reexamine these relations and their degrees of relevance remains open. For the person who adopts a stance of process metaphysics, such changes are not an affront to their eternal Globe but an affirmation of the changing earth.

By adopting a process-first stance, we can develop habits of vigilance when considering ecological questions. It would not be absurd to ask "how will this pollution be prehended by Gaia? What novelty might be generated?" Answering the first question with "predictably" and the second with "none" is the prelude to catastrophe. Yet that is the answer a substance metaphysics provides and a process-relational metaphysics disallows. Process-relationality is a prudent stance, one that makes us realize the impact of our behaviors and the inherent ecological repercussions of everything we do on Gaia. To appreciate the relationality and novelty of a world in process involves understanding the sensitivity of what has, until now, seemed eternal. The Anthropocene is a prime example. What seemed unchanging through lifetimes is now

understood to possess the dynamism once restricted solely to human actors. A planet with agency! It is an aberration for many, but ought to become a reality for all.

Becoming ecology and caring for Gaia constitutes more than a change in ethical values. It necessitates an upheaval of inherited modes of thought. Philosophy has the important role of diagnosing the abstractions that are incompatible with the world. Many of these abstractions are aspects of substance-attribute metaphysics that cannot suitably conceptualize ecological ideas. In regard to the earth, it is evident how substance-attribute metaphysics causes us to misconceptualize Gaia and desensitizes us to the myriad ways we can affect it. Gaia is misunderstood as teleological, as a living organism, as a spatialized sphere, and all through a bifurcated view of nature. The earth is the case I discuss here, but substance-attribute metaphysics's difficulties with ecological thought extend to many domains and subjects, all of which require careful analysis to see the subtle ways uncritical metaphysical assumption can impede our thinking. Ultimately, without a philosophy that can appreciate change, novelty, and relations, an entity such as Gaia is doomed to be misunderstood. Misunderstanding easily turns into mistreatment, often unselfconsciously by those who want to be ecological and hope to preserve the earth they call home. To rid ourselves of the erroneous modes of thought that destroy the earth, a relational turn to process metaphysics can foster and enhance an ecological mode of thought and action for all of us who find ourselves living on a changing and fragile planet.

Conclusion. Ecological Metaphysics

This thesis has argued that process metaphysics provides a more suitable foundation for ecological thought and action than the historically dominant substance-attribute metaphysics. This is true for thinkers who might unknowingly impose a substance metaphysics on the dynamic concepts they study, as was demonstrated in the case of the earth. It is also true for everyday people who live in an isolated and non-relational way, unaware of the many ways that their actions and decisions might affect the manifold ecological processes constituting their world.

In Chapter 1 I explored the tradition of substance-attribute metaphysics and its prejudice against change, relations, and novelty. I traced the history from Parmenides's philosophy of being, to Aristotle's development of a metaphysics of substance, to Descartes' modifications of this account and its development into the mechanistic materialism of early modern science. The presuppositions of substance-attribute thought—an absolute emphasis on being over becoming, and the subsequent denial of change, relations, and novelty—were shown to result in numerous conceptual difficulties in making sense of the changing world of experience. These conceptual difficulties remain pervasive, propagated in globally dominant scientific and philosophic schemes that condition our modes of thought. The denial of foundational aspects of the ecological world contribute greatly to the climate catastrophe and ecologically dangerous thought and action.

In Chapter 2 I introduced the tradition of process philosophy and examined this metaphysical alternative to the dominant substantialist metaphysics. Process metaphysicians all prioritize becoming over being and their metaphysics are dynamic, relational, and inscribe novelty into the world. I examined the views of Friedrich Nietzsche, Henri Bergson, Alfred

North Whitehead, and Gilles Deleuze, overviewing their arguments against substance-attribute metaphysics and their various concepts for making sense of the relational world, such as will to power, duration, prehensions, and assemblages. All these philosophers provide valuable conceptual resources for making sense of the changing world of ecology for which substance-attribute metaphysics has no equal. They are a wellspring of potential for ecological thinking.

In Chapter 3, I considered the example of the earth to demonstrate how process metaphysics can advance accurate ecological concepts (i.e. ecological concepts that reflect the empirical reality of earth) which substance-attribute metaphysics obscures. I discussed Gaia, a contemporary figure of earth which is often misunderstood. I showed these misunderstandings—that Gaia is teleological, an organism, a Globe—to all have roots in attempting to understand the earth with a substantialist metaphysics. I further explained how these misunderstandings are deeply ingrained in the language and scientific concepts we use to attempt to describe the earth, always unconsciously reasserting a metaphysics of being over becoming. Conversely, I demonstrated how a clearer understanding of Gaia is created with the relational concepts of process metaphysics, such as assemblages and prehensions, and with an expanded view of nature that refuses a bifurcation into substances and attributes. Through the ideas of process metaphysics, we can understand the earth properly as a dynamic and relational entity. A renewed understanding of earth has the capacity to cause dramatic changes in worldview, inspiring the ecological thought and action needed in the Anthropocene. Beyond understanding the earth, process metaphysics can allow us to revise a host of dangerous abstractions that are remnants of centuries of substance-attribute metaphysics and remain fatal to satisfactory ecological thought.

Process metaphysics results in an orientation towards the world that highlights the relationality, change, and novelty around us. These are aspects of reality that most people would

never know they unconsciously neglect. Thus, it falls to philosophy to make the unconscious presuppositions and abstractions we engage in recognizable. Only then can said abstractions be confronted, ameliorated, or replaced. A task that is urgent when abstractions contribute to immense harm, as in the case of the climate catastrophe.

I have shown that in the changing world we occupy, process metaphysics has a place for all those who want to live ecologically. Unecological living will only perpetuate the collapse of all the relations that sustain humanity. I can think of no greater impetus for all of us to revise our thinking. In this sense, metaphysics is not a lofty affair, nor is it something only a select few philosophers should be concerned with. It becomes, more and more, important for the common person who finds themselves and those around them engaged in a lifestyle that slowly destroys the world they rely on. There is nobody that does not stand to gain from the critical revision of old metaphysics and its replacement by new ecological metaphysics.

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