

# The Self-Poetizing Earth: Heidegger, Santiago Theory, and Gaia Theory

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*Although Heidegger thinks cybernetics is the “supreme danger,” he also thinks that it harbours within itself *poiēsis*, the “saving power.” This article provides a justification of this position through an analysis of its relation to Humberto Maturana and Francisco Varela’s Santiago theory of cognition and James Lovelock and Lynn Margulis’ Gaia theory. More specifically, it argues that Maturana and Varela’s criticism of cybernetics and their concomitant theory of “autopoiesis” constitutes the philosophical disclosure of “Being itself,” and that the extension of Santiago theory’s various different conceptualizations of *poiēsis* to Gaia theory makes possible the rise of the “saving power.”*

## Outline of the Argument

Philosophy, Heidegger claims, has come to an end. In its place, there stands cybernetics, today’s “fundamental science,” whose basic concepts—information, communication, control, feedback, etc.—unify the human and the natural sciences into a common theoretical framework (1993c, 434–35; 1993d, 108). Heidegger further claims that cybernetics underlies the technological attempt to regulate and control nature, and thereby also what he calls the “domination” and “desolation” of the Earth (1991, 124; 1993e, 67). This places him in an ambiguous relation to most contemporary environmental and ecological theory: on the one hand, he clearly shares the concern of environmentalists and ecologists regarding humankind’s currently destructive relation to the Earth; on the other hand, he could not agree with the widely held view (e.g., Odum 1997) that the application of cybernetic principles to ecology provides a suitable theoretical framework within which this destruction may be overcome. This raises the important question—which this article attempts to answer—of whether Heidegger’s thought makes possible the elaboration of a viable environmental philosophy that in some sense transcends cybernetics.

Heidegger’s criticism of technology/cybernetics centers on the claim that it conceals *poiēsis*, a Greek word meaning both “making” and “bringing forth” (1993f, 320). This concealment of *poiēsis*, Heidegger thinks, has three key implications: first, because “Being itself” is

*physis* (1991, 64; 2000, 15), and *physis* is *poiēsis en heautōi* (1993f, 317), the cybernetic concealment of *poiēsis* means that Being itself is also concealed; second, because philosophy is the attempt to think Being itself, and yet cybernetics makes Being itself unthinkable, philosophy has come to an end (2003, 63); third, whereas for the Greeks both handicraft and poetic/artistic production were interpreted as *tekhnē*, the cybernetic concealment of *poiēsis* has led to the exclusion of the “poetic” aspect of *tekhnē*, such that all that remains is a purely technological mode of revealing that, unlike poetry/art, prevents us from “dwelling” on and thus “saving” the Earth (1993g; 2001a), and instead impels us to exploit the Earth as a mere “standing-reserve” (*Bestand*) of “raw materials” and “energies which can be extracted and stored as such” (1993f, 320–24). Nevertheless, while Heidegger claims that this technological/cybernetic concealment of *poiēsis* is the “supreme danger,” he also draws on Hölderlin’s poetic saying—“where danger is, grows / the saving power also”—in order to claim that technology harbours within itself *poiēsis*, “the saving power” (1993f, 332–35).

This article analyzes the relation between this criticism of cybernetics and two influential theories that emerged in the field of the life sciences in the 1970s: Humberto Maturana and Francisco Varela’s Santiago theory of cognition, and James Lovelock and Lynn Margulis’s Gaia theory. The aim of this analysis is to demonstrate two theses: 1) Maturana and Varela’s criticism of the application of cybernetic concepts to biological phenomena and their concomitant theorization of the concept of “autopoiesis” (from the Greek *auto* [self] + *poiēsis* [bringing forth]) constitutes the philosophical disclosure of “Being itself” anticipated by Heidegger;<sup>1</sup> and 2) The extension of Santiago theory’s various different conceptualizations of *poiēsis* to Gaia theory makes possible the rise of what Heidegger calls “the saving power,” for it lays the foundations for a general philosophical framework within which the destruction of the Earth could potentially be averted.

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1. It is important to realize that Maturana and Varela’s concept of autopoiesis emerged in complete independence from the work of Heidegger. Moreover, while Varela does occasionally reference Heidegger, these references typically amount to little more than either an acknowledgement of the importance of European phenomenology in general (1996, 92), or of Heidegger’s criticism of Cartesian subject/object dualism (1979, 209, 270). It should also be pointed out that this article concentrates on Maturana and Varela’s early work on autopoiesis, and that it is not necessarily entirely in agreement with the positions they adopt in later works (e.g., Varela, Thomson, and Rosch 1993; Maturana, 2004).

### Relation of the Argument to Other Works

Heidegger's criticism of cybernetics as concealing *poiēsis*, and thereby obstructing philosophy and poetry, has been carefully documented by such environmentally concerned commentators as Michel Haar (1987), Bruce Foltz (1995), and Miguel De Beistegui (2005). Where the present article differs from their work is not so much in the broad outline of its argument as in the way it seeks better to support Heidegger's criticism of cybernetics through an investigation of its relation to Santiago theory and Gaia theory. A significant advantage of this approach is that, whereas there remains something of a conceptual leap from Heidegger's diagnosis of technology as the "supreme danger" to his prognosis of poetry/art as the "saving power," the present article shows how the extension of Maturana and Varela's concepts of autopoiesis, heteropoiesis, and allopoiesis to Gaia theory lays the philosophical foundations for a coherent theorization of how *poiēsis* and poetry/art could potentially "save the Earth."

The present article also differs from existing work on the topic of Heidegger and Santiago theory, most of which focuses on *Being and Time* (e.g., Mingers 1995). One partial exception to this is Fernando Ilharco's article, "Building Bridges in Phenomenology: Matching Heidegger and Autopoiesis in Interpretive Research" (2003), which claims that Heidegger's understanding of *physis* as *poiēsis en heautōi* is essentially the same as Santiago theory's understanding of autopoiesis. Importantly, however, this insight remains largely undeveloped, and the rest of Ilharco's article instead concentrates on the relation between autopoiesis and *Being and Time*. In contrast with this, the present article places greater emphasis on three texts in which, as we will see, Heidegger is more directly concerned with the relation between cybernetics and autopoiesis: *The Fundamental Concepts of Metaphysics*, "The Question Concerning Technology," and *The Principle of Reason*.

Another thinker whose work is sufficiently similar to the present article to merit consideration is Fritjof Capra. In such works as *The Web of Life* (1997) and *The Hidden Connections* (2002), Capra draws on three theories also discussed in this article: Santiago theory, Gaia theory, and Michael Braungart and William McDonough's cradle-to-cradle theory of ecological design (C2C). Where the present article differs from Capra's work is that, whereas his presentation of deep ecology as a new theoretical paradigm has little bearing on his subsequent discussion of Santiago theory, Gaia theory, and C2C (all of which are accepted more or less in toto), the focus of the present article on Heidegger allows for a much more discriminating analysis of these theories.

A final work which bears a significant relation to the present article is Mary Midgley's *Science and Poetry*, the stated aim of which is to ask "how we can bring together our ideas of *science* and *poetry* within a whole

that has a place for both of them” (2001, 1). This whole, Midgley goes on to claim, is Gaia theory (23–24). She does not, however, provide any concrete arguments for why Gaia theory allows space for both science and poetry, and instead concentrates on defending Gaian holism from neo-Darwinist reductionism (237–288). In contrast to this, the present article argues that both neo-Darwinism and orthodox Gaia theory remain in thrall to cybernetics, and that it is only through the extension of Santiago theory’s various different conceptualizations of *poïesis* to Gaia theory that there can emerge a viable philosophical framework within which poetry could potentially find a place.

### **Autopoiesis is Being Itself**

The Santiago theory of cognition arose through Maturana’s attempt to answer two questions: “What is the organization of the living?” and “What takes place in the phenomenon of perception” (1970, xii)? In what follows we will see that Heidegger (1995a) also attempts to answer these two questions and that the answers he gives are broadly in line with those of Santiago theory.

Let us start by considering the first question: what is the organization of the living? According to Norbert Wiener (1988), the founder of cybernetics, animals and other living beings are self-regulating systems analogous to such human-made machines as thermostatic ovens (26). According to this line of thinking, just as animals maintain a constant temperature through a variety of different feedback mechanisms (e.g., shivering and sweating), so thermostatic ovens also maintain a constant temperature through comparable feedback mechanisms (the automated turning on or off of a heat source). Now, while Maturana and Varela agree that living beings can indeed be seen as self-regulating systems, they distinguish living beings from human-made cybernetic machines on the grounds that only the former are “self-producing” or “autopoietic.” Indeed, for Santiago theory, living beings constitute that sub-class of self-regulating systems characterized by the fact that the variable they maintain constant is their own autopoietic organization (Maturana and Varela 1973, 79).

In order better to distinguish this theory from the strictly cybernetic interpretation of living beings, Maturana and Varela coin the term heteropoiesis, which they define as “the space of human design” (136). The importance of this term is that it allows them to argue that the strictly cybernetic interpretation of living beings, according to which they are “teleonomically” directed towards accomplishing specific purposes, imports concepts from the space of human design into the space of living beings (85–87). This is not to say that cybernetic concepts cannot be invoked to describe living beings, but simply that if this becomes the only way of describing them, as has actually happened in the neo-

Darwinist interpretation of the organism as a cybernetic machine whose teleonomic “purpose” is to enable its genetic programme to replicate itself (e.g., Jacob 1970; Monod 1970; Dawkins 1989), then their essential characteristic, which is their autopoietic organization, will be entirely concealed (Maturana and Varela 1973, 75).<sup>2</sup>

Maturana and Varela also distinguish autopoiesis from allopoiesis: whereas allopoiesis involves the subjective observation of a *linear* chain of causes and effects in the world of objects, autopoiesis involves the *circular* productivity and causality characteristic of living beings, according to which the organism is neither produced by, nor productive of, something other (e.g., matter or energy), but rather produces itself (113). This is not to say, of course, that living beings cannot be interpreted as allopoietic beings by human subjects, but rather that in doing so their specificity as living beings is concealed, just as surely as it is concealed when they are interpreted as teleonomically directed towards some sort of purpose (110).

Let us now compare Santiago theory’s interpretation of the organization of the living with that of Heidegger (1995a). Heidegger’s theory of the organization of the living arose through his engagement with Hans Driesch’s organismic biology, the main discovery of which was the holistic nature of the organism. But while Heidegger agrees with Driesch’s critique of the mechanistic interpretation of life as nothing more than the sum of its physico-chemical parts, he differs from Driesch in that his aim is to avoid mechanism without resorting to the teleology and entelechy of Driesch’s neo-vitalism. To do this, he makes a distinction between, on the one hand, tools, equipment, and machines, which are produced by man in order to serve a purpose and which he thinks can neither regulate nor renew themselves, and, on the other hand, organisms, which are characterized by their “self-regulation,” “self-production,” and “self-renewal” (222–23, 261–62).<sup>3</sup>

Now, it is important to bear in mind that these distinctions were formulated prior to the emergence of cybernetics, and that, while a small number of self-regulating machines did exist at the time (James Watt’s steam engine, for example), they had not yet been theorized in

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2. It would be interesting, but beyond the scope of this article, to investigate the extent to which the neo-Darwinist interpretation of the world in terms of the “will” of selfish genes (and memes) not simply to survive, but also to replicate themselves as widely as possible, is in line with Nietzsche’s concepts of the “will to power” and the “will to will,” which Heidegger sees as underpinning contemporary technological nihilism. See Thomson (2005, 55–56).

3. Compare this criticism of organismic biology to that of Maturana and Varela: “[a problem arises] when organismic notions are used that emphasize the unitary character of living systems but do not provide a mechanism [i.e., auto-poiesis] for the definition of the individual” (1973, 115).

anything like the detail of the post-war period. In view of this, it is understandable why Heidegger at this point saw self-regulation as a distinctive trait of living beings. A further important point to note is that whereas Heidegger seems at this point to see living beings as in the first instance producing themselves and thereafter renewing themselves, Santiago theory's concept of autopoiesis covers both these processes. These differences should not, however, obscure the fact that Heidegger's critical engagement with Driesch leads him to an interpretation of the organization of the living that, particularly in its analysis of organisms as self-producing, is broadly complementary with that of Santiago theory.

Let us now consider Santiago theory's second question: what takes place in the phenomenon of perception? According to Maturana and Varela, the fact that the Greek word *poiesis* does not only signify "producing" but also "bringing forth" implies a clear conceptual difference between autopoiesis and self-production: autopoiesis not only describes the self-producing organization of living beings, but also a process of biological cognition which "brings forth a world" (1987, 169). But what, then, is the "world" of the organism like? One way of understanding the world brought forth through autopoiesis is by distinguishing it from the worlds brought forth through heteropoiesis and allopoiesis. Heteropoiesis, we have already seen, is the space of human design, which is to say, a space consisting of tools allowing humans to accomplish their projects. Moreover, precisely because these projects are directed towards the future, this space implies what we might call a "projective" temporality. Allopoiesis, by contrast, is the space in which human subjects observe objects bringing each other forth, as when the chemical reaction of hydrogen and oxygen "brings forth" water. This space also has its own specific temporality that we might call "objective," for it describes the standpoint of objective science, according to which any given physical event may only bring forth other events which it chronologically precedes. In contrast to heteropoiesis and allopoiesis, the "world" opened up by autopoiesis involves neither the "projective" cognition of beings as tools used to accomplish projects, nor the "subjective" cognition of beings as objects caught up in chronological chains of cause and effect, but rather what Maturana calls "biological cognition," which is to say, the perception of triggers or perturbations specified by the organism's autopoietic organization, a cognitive process whose temporality is oriented neither by future projects nor by past events, but is instead entirely absorbed in the present (1970, 18).

How does this interpretation of the "world" of living beings compare with that of Heidegger? In *Being and Time* (1995b), Heidegger argues that the Cartesian interpretation of the world as a totality of "present-

at-hand” objects existing in a three-dimensional world-space, and the concomitant interpretation of time as a chronological series of “nows,” derives from a more primordial spatiality and temporality, according to which the world consists of a relational whole of “ready-to-hand” tools appearing in a space relative to the projects of Dasein, and whose temporality is oriented primarily toward the future. In *The Fundamental Concepts of Metaphysics*, Heidegger extends this analysis beyond the world of Dasein, arguing that animals are “world-poor”, by which he means that they have no access at all to beings, whether ready-to-hand or present-at-hand (1995a, 196–98). Moreover, because he thinks beings only become manifest through their being understood “as” something, he further claims that animals have no access to the Being of beings, which is to say, that “as” which beings appear (247, 274). But this is not to say that Heidegger denies all “openness” to animals, for he draws on the work of Jakob von Uexküll in order to argue that animals possess an encircling ring, which, in prescribing what can affect them, makes them “open” to specific environmental triggers (255–261). It is not hard to see that this analysis is broadly in line with Santiago theory: the world of present-at-hand objects is brought forth through “allopoiesis,” the world of ready-to-hand tools through “heteropoiesis,” and the world-poor encircling ring of the organism through “autopoiesis.”<sup>4</sup>

If it has now been demonstrated that Heidegger’s analysis of the organization and cognition of the living is broadly commensurate with that of Maturana and Varela, it remains to be seen what autopoiesis has to do with Being itself. In order to answer this question, let us consider Heidegger’s critique of Leibniz in *The Principle of Reason*. In this work, Heidegger claims that the thought of Leibniz not only determines the development of logistics and thinking machines (automata), but also underlies what he calls “the metaphysics of the modern age” (1991, 33). In saying this, he is echoing the view of Norbert Wiener (1961), who claims Leibniz as the “patron saint” of cybernetics on the grounds that Leibniz’s work centers on the two closely related concepts of a universal symbolism and a calculus of reasoning (12). From this perspective, the thought of Leibniz underlies the development of cybernetics into the “fundamental science” of the contemporary epoch, and therewith also what Heidegger calls the “complete concealment of Being” (2003, 63).

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4. Although Jakob von Uexküll is widely regarded as the key forerunner of biosemiotics, the autopoietic perspective of Heidegger and Santiago theory implies that the attempt of contemporary biosemioticians (e.g., Hoffmeyer 2008) to see living beings not just as communicating through the exchange of information, but also as having a functional understanding of the meaning of this information, depends on heteropoietic concepts imported from the space of human design, and so does not describe the experiential “world” of the organism.

Heidegger's analysis of this concealment focuses on Leibniz's famous *principium rationis* (principle of reason, *Satz vom Grund*).<sup>5</sup> Now, as Heidegger notes, what Leibniz calls the "vulgar" formulation of this principle is *nihil est sine ratione* (nothing is without a reason) (1991, 3). Heidegger further explains that Leibniz also gives the principle of reason a "strict" formulation as the *principium reddendae rationis* (the principle of rendering reasons) (26–27), which can in turn be stated in a short form: "nothing is without a why" (35). But even the strict formulation of the principle of reason, Heidegger observes, is not its "complete" formulation, for Leibniz thinks that a complete explanation of any given being requires that "sufficient" reasons be rendered for it (32–33). This process of rendering sufficient reasons, Heidegger claims, underpins the totality of modern thought: it underpins the modern university, in which the ceaseless pursuit of "research" always involves trying to provide sufficient answers for "why" things are the case (24); it underpins modern science, for when contradictions appear in a scientific theory the principle of rendering sufficient reasons demands that we develop a more encompassing theory that explains "why" these contradictions appear (30); and, in pursuing a complete understanding of beings as "calculable stuff," it also underpins the technological domination and control of nature (120–24).

So why, then, does Heidegger think that the Leibnizian understanding of the principle of reason conceals Being? In order to answer this question, he invokes the following verse of *The Cherubic Wanderer* by the mystical poet and thinker, Angelus Silesius: "The rose is without a why: it blooms because it blooms." Now, as Heidegger notes, the first part of this verse—"the rose is without a why"—*contradicts* the strict formulation, which says that "nothing is without a why." By contrast, the second part of the verse—"it blooms because it blooms"—Heidegger notes *accords* with the vulgar formulation—"nothing is without a reason"—for in saying that the blooming has a "because" it attributes it a reason. It follows, Heidegger concludes, that Silesius's verse denies the "equivalence" posited by modern cognition between the vulgar and the strict formulations of the principle of reason (1991, 38–39). Modern cognition, Heidegger notes, could of course reply that this denial arises because, in keeping with the fragment's "mystical" character, it not only "contradicts itself" (36) but also indulges in "vacuous talk" (42–43). In opposition to this, Heidegger maintains that the fragment describes "all that is in the manner of the rose" (38), which, given that he also says

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5. It is important to bear in mind that the German word *Grund* means both "reason" and "ground."

“the rose here stands as an example for all blossoming things, for all plants and all growth” (36), would appear to mean “all living beings.”<sup>6</sup>

So what, then, is this way of being characteristic of living beings that escapes the strict formulation, but not the vulgar formulation? According to Heidegger, the reason the rose is without a “why,” but not without a “because,” is that instead of looking outside itself for a ground that it represents to itself, it is rather the case that the rose’s blooming refers back to and is grounded in itself:

The rose is without why, but not without grounds. The “why” names the reason that always grounds in such a way that it is simultaneously represented as a ground. However, in order to be a rose, that is, in order to bloom, the rose does not need expressly to represent the ground of its blooming. Yet the rose that “blooms because it blooms” is not without a ground. The “because” names a ground, but an odd and presumably distinguished ground. What does this mean, the rose “blooms, because it blooms?” Here the “because” does not, as is ordinary, point off toward something else which is not a blooming and which is supposed to found the blooming from somewhere else. The “because” of the fragment simply points the blooming back to itself. The blooming is grounded in itself, it has its ground with and in itself. (1991, 57)

Heidegger immediately goes on to observe that this causally circular, self-referential blooming is what the Greeks called *physis* (57), which, in *The Question Concerning Technology*, he interprets as *poiēsis en heautōi*:

*Physis* . . . the arising of something from out of itself, is a bringing-forth, *poiēsis*. *Physis* is indeed *poiēsis* in the highest sense. For what presences by means of *physis* has the irruption belonging to bringing-forth, e.g., the bursting of a blossom into bloom, in itself (*en heautōi*). (1993f, 317)

In view of this, there can be little doubt that what Heidegger variously calls *physis*, *poiēsis en heautōi*, and Being, which is to say, the causally circular, self-referential bringing forth characteristic of living beings, is essentially the same as what Maturana and Varela call autopoiesis.

So how, then, does the Leibnizian inability to distinguish between the strict and the vulgar formulations of the principle of reason conceal autopoiesis? According to Heidegger, we observers can refer to something “other” than the blooming that causes/grounds it, such as the energy the rose receives from the sun and the nutrients it receives from the soil (1991, 42–43). However, says Heidegger, while these grounds

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6. Even humans, Heidegger thinks, are in essence the same as the rose: “humans, in the concealed grounds of their essential being, first truly are when in their own way they are like the rose—without why” (38).

do indeed hold “in the case of the rose,” which is to say, inasmuch as the rose is “the object of our cognition,” and thus also something about whose grounds we seek “information,” they do not hold “for the rose,” which simply “blooms because it blooms” (38). It is in this sense, then, that the rose is without a “why”: it does not look outside itself for information by means of which it represents the grounds/reasons that cause it to bloom; its blooming causes/grounds itself (37, 42). It follows that as long as we seek to explain the rose’s blooming by referring to something “other” than its blooming, as Heidegger thinks is required by the principle of rendering reasons, we close ourselves off from *physis*/autopoiesis, and instead interpret the rose as something produced by, and productive of, something else. This quite clearly corresponds to the claim of Maturana and Varela that external observers may interpret autopoietic beings as allopoietic, and thus as “representing” their environment in the form of “information” transferred from the environment to some sort of physical location within the organism, such as its nervous system or genetic program (1973, 99).

The above analysis of the relation between autopoiesis and allopoiesis also sheds light on *tekhne*. In contrast to *physis*, Heidegger interprets *tekhne* as *poiēsis en alloi*. But does this imply that *tekhne* corresponds to what Maturana and Varela call allopoiesis? One obvious objection to this proposal is that, unlike when we interpret the rose as the object of our cognition and thus try to situate it in a chronological chain of causes and effects, there is a purposive, heteropoietic dimension to *tekhne* such that, to take Heidegger’s (and Aristotle’s) example, the silver chalice is *intentionally* brought forth by the craftsman. But important as this distinction no doubt is, it remains true that both what is being observed (in the case of the rose) and what is being intentionally produced (in the case of the silver chalice) are products of things other than themselves. And in that case, both the observation of *linear* chains of cause and effect, and the *linear* production of beings with a view to achieving specific ends, interpret beings as allopoietic. Heteropoiesis, it would seem to follow, is simply that form of allopoiesis in which it is future projects and not past events that bring forth the present. This very much accords, moreover, with Heidegger’s claim that the principle of rendering reasons does not only apply in the domain of actuality, but also in the domain of possibility (1991, 117).

It is, however, important always to keep in mind that modern cognition articulates the relation between possibility and actuality very differently from Heidegger. Modern cognition assumes the absolute priority of actuality (objective spatiality and temporality) and thereafter seeks to provide sufficient reasons for; first, the cybernetic teleonomy of living beings (projective spatiality and temporality), which it explains by the theory of natural selection (see Monod 1970); and, second,

human consciousness, which it cannot explain and which thus appears as what Heidegger calls a “disruptive factor” (2001b, 21).<sup>7</sup> Heidegger, by contrast, starts from *Dasein*’s average, everyday world of possibility, and thereafter seeks to demonstrate: 1) How actuality (allopoiesis, objective temporality) arises as a secondary restriction of possibility (heteropoiesis, projective temporality) (1995b); and 2) How “taking out” *Dasein*’s everyday experience of possibility provides access to purely biological cognition as the self-grounding clearing (autopoiesis, presence) on the basis of which, and only on the basis of which, spatially and temporally differentiated ready-to-hand and present-at-hand beings (heteropoiesis and allopoiesis) can *come to presence* in the world of *Dasein* (1995a).<sup>8</sup>

In view of all this, it is quite clear that there is an essential connection between the strict formulation of the principle of reason and the concealment of Being: in demanding grounds/reasons for any given being in a being other than itself, the strict formulation conceals the Being of living beings (humans included), which is their self-grounding, autopoietic character.<sup>9</sup> From this point of view, it is also clear why Heidegger thinks that the complete withdrawal of Being is commensurate with the technological domination of nature: instead of letting beings “be,” which is to say, produce and ground themselves, it instead seeks everywhere to render reasons for them in such a way that they can be regulated and controlled. But this does not lead Heidegger to conclude that we must abandon reason, but rather that what modern

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7. The closest that modern cognition can get to solving what has revealingly become known as the “problem” of consciousness is the following: consciousness is not simply a “special” object (one capable of observing other objects), but rather a “special” tool (one capable of intentionally manipulating other tools). It is from this perspective, for example, that Hoffmeyer writes: “What might be the *function* of an experiential world? In other words, what good is the having of experiences in a biological sense” (2008, 179)? But regardless of whether consciousness is interpreted as a “special” object or a “special” tool, it is still explained—in accordance with the principle of rendering sufficient reasons—as *a being*. Moreover, in both cases its specialness remains a “problem.”

8. From this point of view, consciousness (if the word is still appropriate) is not at all a being (an object or a tool) brought forth by other beings; it is the coming to presence of beings within the self-grounding clearing of Being.

9. This implies a radical revision of the concept of “things in themselves”: the self-grounding character of autopoietic beings implies that they alone are “in themselves” (*en heautōi*); allopoietic beings, by contrast, are grounded in something other (*en allōi*), and so cannot be said to be “things in themselves.” Moreover, to the extent that cybernetics mistakenly claims to describe “things in themselves” it not only conceals autopoiesis, but also the phenomenological domains of allopoiesis (observation) and heteropoiesis (design), thereby giving rise to the generalized concealment of *poiēsis* diagnosed by Heidegger.

cognition can only see as the “mystical” (i.e., irrational) and “vacuous” (i.e., circular and thus tautological) insight—“the rose is without a why: it blooms because it blooms”—ultimately allows us to see that the strict formulation of the principle of reason constitutes its *restriction* to the domain of beings, thus concealing a *broader* interpretation of the principle compatible with the vulgar formulation and capable of disclosing Being itself as autopoiesis.<sup>10</sup>

### ***Poiēsis* is the Saving Power**

For Heidegger, it was highly significant that the historical epoch that emerged after the Second World War came to be known as the “Atomic Age.” Indeed, he thinks that a technological world structured by the principle of rendering sufficient reasons, and thus also by the cybernetic concept of information, necessarily defines itself in terms of its need for an atomic energy source capable of providing “sufficient” quantities of energy (and thus be the sufficient ground) for the ever-increasing technological domination of nature as “calculable stuff”: “In the form of information, the powerful Principle of providing sufficient reasons holds sway over all cognition and thus determines the present world-epoch as one for which everything depends on the provision of atomic energy” (Heidegger 1991, 124). James Lovelock’s increasingly influential Gaia theory provides a remarkable example of this way of thinking: according to Lovelock, the Earth is a single cybernetic system, Gaia, which can only be kept habitable (for contemporary humanity) through the worldwide adoption of atomic energy. In what follows, we will see that, while Lovelock’s cybernetic interpretation of Gaia is the “supreme danger,” it also harbours within itself *poiēsis*, the “saving power.”

Gaia theory emerged in large part through a criticism of the Darwinian concept of adaptation (Lovelock 1991; 2000a; 2000b; 2004; 2007; 2009; 2010). According to Lovelock, Darwinism mistakenly supposes that life simply adapts to a physical environment that itself develops independently of life in accordance with the principles of

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10. Given Heidegger’s claim that the principle of rendering sufficient reasons underlies the modern university, this disclosure of “Being itself” clearly has profound implications for Thomson’s project (2004; 2005) of developing a Heideggerian philosophy of education. Indeed, it suggests that the role of the university is not the *restricted* one of studying beings, but rather the *broader* one of trying to understand the coming to presence of beings within the self-grounding clearing of Being. This in turn suggests that the study of any given discipline (interpreted as an ontical domain) should be grounded in the study of philosophy (interpreted as fundamental ontology).

“textbook geology” (weathering, plate tectonics, etc.).<sup>11</sup> In contrast to this, Lovelock argues that life does not simply adapt to its physical environment, but also adapts the physical environment to itself so as to “make it and keep it a home” (2000b, 63). This mutual adaptation between life and the material environment, Lovelock further claims, gives rise to a number of regulatory mechanisms teleonomically directed towards maintaining certain variables (temperature, pH, ocean salinity, etc.) within a specific range compatible with Gaia’s overall goal of keeping the Earth habitable.<sup>12</sup>

Lovelock further notes that a number of human activities—burning fossil fuels, deforestation, etc.—are giving rise to global warming (or “global heating” as he prefers to call it), thus threatening to drastically reduce, if not necessarily entirely destroy, the habitability of the Earth. But what does Lovelock propose to do about global warming? In order to answer this question, it is first necessary to consider his understanding of its root causes. Lovelock is strongly opposed to any clear ontological distinction between humans and animals. Indeed, he thinks that any differences there might be are merely a question of degrees of intelligence. Nevertheless, he also thinks that it was the evolution of human intelligence, and in particular tool use and agriculture, that led humanity to fall out of harmony with Gaia, for it allowed us to grow in numbers to a point where the combination of over-population and modern technology is giving rise to global warming. However, despite the importance Lovelock attributes to human intelligence, he also worries that we may be “too stupid” to do anything about global warming, for the genes we evolved in the vastly different circumstances of hunter-gathering are simply not suited to living in harmony with Gaia. The likely outcome of the current crisis, Lovelock concludes, is a massive reduction in the human population, an event from which he thinks there may emerge a species that has evolved the requisite genes to live intelligently as a partner of Gaia (2010, 150–59).

This raises the question of what it would mean to live intelligently with Gaia. For Lovelock, there are two basic answers to this question: first, we must learn to assist Gaia in the regulation of various different variables she was previously able to regulate on her own, a project which will in turn require the massively increased (self-)regulation of human activity (2010, 21, 159); second, the world as a whole should

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11. Lynn Margulis and Gregory Hinke (1991, 13–14) attribute this assumption to Darwin himself. Eileen Crist, by contrast, makes a strong case for saying that Darwin’s last book on the geological impact of worms would nowadays count as Gaian thinking (2004, 61–68).

12. See Bateson (1978, 309, 420) for a comparable explanation of how “mutual adaptation” gives rise to cybernetic ecological mechanisms.

adopt nuclear power, for it is the only way of securing sufficient quantities of the reliable, economically efficient energy that is required to power modern civilization without further destroying Gaia (2010, 17). In short, Lovelock thinks that self-regulation and nuclear power are the two basic solutions to the current destruction of Gaia.

So how, then, is *poiēsis*, the “saving power,” harbored within the roots of this way of thinking? Heidegger shares Lovelock’s fundamental insight that the Darwinian concept of adaptation is mistaken, for it fails adequately to understand the ecological question of how organisms make themselves at home by adapting the environment (in) to themselves:

The word ecology derives from *oikos*, the Greek word for house. It signifies the investigation of where and how animals are at home in the world, of the way in which they live in relation to their environment. But in Darwinism precisely this was understood in an external manner in the light of the questioning concerning adaptation. In Darwinism such investigations were based on the fundamentally misconceived idea that the animal is present at hand, and then subsequently adapts itself to a world that is present at hand, that it then comports itself accordingly and that the fittest individual gets selected. Yet the task is not simply to identify the specific conditions of life materially speaking, but rather to acquire insight into the *relational structure between the animal and its environment*. . . . The organism is not something independent in its own right which then adapts itself. On the contrary, the organism adapts a particular environment *into* it in each case, so to speak. (1995a, 263–64)

There is, however, a significant difference between Heidegger and Lovelock concerning the question of adaptation: whereas Lovelock sees life’s adaptation of the environment to itself as an objective scientific fact that has been born out through empirical investigation, Heidegger interprets it as a cognitive process taking place within the “opening” that is the animal’s encircling ring.<sup>13</sup>

Now, as we have already seen, Heidegger’s analysis of living beings as “open” to triggers prescribed by their encircling ring, but “closed” to beings, is broadly in line with Maturana and Varela’s claim that organisms are “closed organizations” and that the concept of “environment” is thus observer-dependent (1987, 135). However, where Maturana and Varela go further than Heidegger is in their claim that the adoption of an “allopoietic” perspective towards ecology, according to which organisms exchange matter and energy with their environment, makes

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13. This difference of perspective presumably explains why Lovelock says organisms adapt their environment “to” themselves, whereas Heidegger says they adapt it “into” themselves.

visible what they call “structural coupling,” a concept which clearly corresponds to the Gaian concept of “mutual adaptation” (99–102). They further claim that structural coupling may give rise to “higher-order” autopoietic entities possessing their own cognitive domains (1973, 109–110).

The claim of Santiago theory that higher-order autopoietic entities may emerge from the structural coupling of living beings and their environment has been applied by Lynn Margulis to Gaia theory: for Margulis, Gaia is in fact a higher-order autopoietic entity (Margulis and Sagan 1997, 266; Capra 1997, 208–211).<sup>14</sup> This application of the concept of autopoiesis to Gaia theory has two important implications: first, Maturana and Varela’s claim that self-reproduction only arises as a secondary complication of autopoiesis allows Margulis to defend a view of Gaia as alive, despite the fact that she has not (yet) reproduced herself (Margulis and Sagan 1995, 17–23); second, whereas Lovelock emphasizes how mutual adaptation between life and the material environment gives rise to the cybernetic regulation of specific variables, Margulis instead emphasizes how structural coupling gives rise to an entity capable of maintaining her unity as a living being through the constant recycling of her material components: “One organism’s waste is another organism’s food. Failing to distinguish anyone’s food from someone else’s waste, the Gaian system recycles matter on the global level” (1998, 119).

There is, however, a problem with Margulis’s extension of the concept of autopoiesis to Gaia theory: she fails to integrate Maturana and Varela’s concepts of heteropoiesis and allopoiesis into her analysis, and thus fails to recognize that they constitute distinctively human phenomenological domains. The consequence is the constant undermining of the distinction between humans and other living beings, the most illuminating example of which is her claim that the Greek concept of the “chain of being” is rightly rejected by the scientific worldview as “absolute nonsense” on the grounds that “all beings are equally evolved” (3). The problem with this claim is that it entirely overlooks phenomenology, and thus fails to understand that, in contrast to purely autopoietic beings that are entirely absorbed in the present, the distinctively human phenomenological spaces of allopoiesis and heteropoiesis make humans open to both the past and the future.

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14. The claim that structural coupling gives rise to Gaian autopoiesis bears some similarity to Heidegger’s claim that “[a]ll things of earth, and the earth itself as a whole, flow together into a reciprocal accord” (1993h, 172). The connection between this description of the Earth and Gaia theory has also been noted by Kenneth Maly (2009, 50–51).

This in turn means that Margulis cannot elaborate any sort of viable “project” for the resolution of the ecological crisis.<sup>15</sup>

So how, then, does a coherent articulation of Santiago theory’s various different conceptualizations of *poiēsis* in the context of Gaia theory allow us to see how the Earth may yet be saved? In order to answer this question, let us examine Braungart and McDonough’s (2009) cradle-to-cradle (C2C) theory of ecological design. According to this theory, nature makes things in a circular way such that her material components are constantly being recycled. This interpretation of nature as a circular way of making things clearly accords with the autopoietic interpretation of Gaia outlined above, and it is thus hardly surprising that Braungart and McDonough embrace the “waste equals food” (92) principle also adopted by Margulis. Where they go beyond Margulis, however, is in their claim that in contrast to nature’s circular, *cradle-to-cradle* way of making things, our current industrial infrastructure employs a linear, *cradle-to-grave* way of making things (17). The consequence of these linear production methods, they claim, is the all-too-familiar problem of environmental destruction (26–27).

In response to this problem, they think that humankind must concentrate not on making linear, cradle-to-grave production methods more efficient, for, taken on their own, such measures involve simply “fine-tuning the existing destructive framework” (Braungart and McDonough 2009, 90), but instead on intentionally making things that accomplish nature’s circular, cradle-to-cradle way of making things (104). This theory of “re-making the way we make things” in accordance with the circular productivity of nature can clearly be expressed in terms of *poiēsis*: to save the Earth, we must adopt the heteropoietic project, presently obstructed by the worldwide reign of the Leibnizian interpretation of the principle of reason, of only making things which accomplish the higher-order autopoiesis of Gaia.<sup>16</sup> Moreover, it is also

15. The tendency of Gaia theorists to reject the distinction between humans and other living beings, and thus to reach pessimistic conclusions about the likelihood of our overcoming the present crisis, reaches its logical extreme in John Gray’s *Straw Dogs* (2002), an uncompromising celebration of technological nihilism which has been enthusiastically endorsed by Lovelock (2007, 8–9). According to Gray, Gaia theory requires us to interpret man as an “exceptionally rapacious primate” (7), a viewpoint which leads him to conclude that the most likely outcome of the current crisis is “a large-scale decline in human numbers” (12). In keeping with this, Gray explicitly dismisses Heidegger’s interpretation of Dasein as “world-forming” on the grounds that it is part and parcel of the humanist delusion that Dasein is not just another animal. (48).

16. Braungart and McDonough’s (2009) *Cradle-to-Cradle* is for the most part written in such casual, conversational language that its philosophical significance is far from immediately apparent. The phenomenological interpretation

significant that the clear-cut distinction between humanity and nature implicit in the idea that only humans can *intentionally* partake in nature's circular productivity implies a position according to which humans are not cybernetic robots programmed to replicate their genes (or their memes), but instead have meaningful projects by virtue of which they have a distinct ethical status from all other beings.

Another significant aspect of Braungart and McDonough's argument is the idea that cradle-to-cradle is often more economically profitable than cradle-to-grave, for, whereas the latter transforms raw materials into useless waste products, the former obviates the need to purchase a constant stream of raw materials. In view of this, they argue that environmental regulation should be considered the consequence of an original "design failure" and that "good design [i.e., C2C] can require no regulation at all" (Braungart and McDonough 2009, 61). This is not, of course, to deny the need for regulation in certain cases, but rather to say that increased regulation only appears as the *sole* solution to ecological problems in a world in which the underlying problem—the concealment of autopoiesis—is by definition invisible. In keeping with this criticism of regulation, Braungart and McDonough also criticize what they see as a "culture of control," whose aim of "overwhelming and controlling nature" they think leads to the "forbidding" of such natural beings as cherry trees on the grounds that their "blossoming" cannot be perfectly calculated in advance (84–86).

If Braungart and McDonough advocate making things that, like cherry trees, partake in nature's circular productivity (78–79), which energy sources do they think should power this process? Just as nature uses renewable energy sources, all of which, with the exception of geothermal and tidal, derive from solar energy, so Braungart and McDonough think we must renounce our current practice of extracting non-renewable energy from the Earth's crust (oil, coal, uranium, etc.), and instead adopt the project of using only renewable energy (136–37). From this perspective, the basic problem with nuclear fission is that its toxic by-products cannot be converted back into fissile material. So, while nuclear fission may well be "efficient," in the sense that it liberates large amounts of relatively cheap energy in a way that can be perfectly calculated within an elaborate technological framework, it is still a linear, cradle-to-grave process that, if pursued on a global scale, will soon transform the Earth's "standing-reserve" of fissile material into toxic waste. Moreover, in the absence of a worldwide recognition of the need to intentionally partake in Gaia's circular way of making things, there is every likelihood that nuclear energy will only be deployed

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of the theory in terms of *poiesis* advanced here goes some way to overcoming this problem.

as the “sufficient ground” for the powering of other cradle-to-grave manufacturing processes which further destroy Gaian autopoiesis.<sup>17</sup>

## Conclusion

The two theses put forward at the beginning of this article have now been demonstrated: Maturana and Varela’s theory of autopoiesis has been shown to constitute the philosophical disclosure of “Being itself,” and the extension of Santiago theory’s various different conceptualizations of *poiēsis* to Gaia theory has been shown to make possible the rise of the “saving power.” What remains to be shown is how this re-appearance of *poiēsis* also allows poetry to re-appear, and why Heidegger thinks that poetry has a key role to play in the general unfolding of the saving power.

Now, while these questions cannot be fully answered here, the fact that the Greeks made no clear ontological distinction between handicraft and poetry, but instead interpreted both as *tekhne*, does nevertheless suggest a possible answer: the project of accomplishing the autopoiesis of Gaia constitutes the unfolding from within the roots of technology/cybernetics of a way of relating to nature that is essentially poetic. Moreover, it seems to me that one potential way of justifying this answer

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17. Heidegger puts forward a different yet complementary criticism of current energy generation:

The revealing that rules in modern technology is a challenging, which puts to nature the unreasonable demand that it supply energy which can be extracted and stored as such. But does this not hold true for the old windmill as well? No. Its sails do indeed turn in the wind; they are left entirely to the wind’s blowing. But the windmill does not unlock energy from the air currents in order to store it. In contrast, a tract of land is challenged in the hauling out of coal. . . . The earth now reveals itself as a coal mining district. . . . [U]ranium is set upon to yield atomic energy. . . . [E]ven the Rhine itself appears to be something at our command. The hydro-electric plant is not built into the Rhine River as was the old wooden bridge that joined bank with bank for hundreds of years. Rather, the river is dammed up into the power plant. (1993d, 320–21)

In view of this, it would seem that what Heidegger calls the “setting-upon that challenges the energies of nature” consists of the extraction and storage of various different forms of potential energy (chemical, nuclear, gravitational), which can be kept on hand as “standing reserve” for powering technological activity in a way that is perfectly controlled and regulated. In contrast to this, Heidegger would appear to be in favour of wind, run-of-the-river hydroelectric, and solar energy, which are not stored as “standing reserve,” but are instead left entirely to the wind’s blowing, the river’s running, and, above all, the sun’s shining.

lies in the work of the French phenomenologist, Mikel Dufrenne, who argues that poetry treats language neither as a physical object, nor as an everyday tool, but rather as the accomplishment of what the Greeks saw as the original “*poiein of physis*,” which he takes to mean, the original “poetizing of nature” (1963, 14–15, 171). From this point of view, *physis*/nature is not just autopoietic, but “self-poetizing,” and poetry is the way in which the “self-poetizing” of nature is accomplished in the world of humans.

Whether or not this argument would stand up to rigorous analysis cannot be decided here, but it does at least suggest that the conceptual leap identified at the beginning of this article between Heidegger’s diagnosis of technology as the “supreme danger” and his prognosis of *poiēsis*/poetry as the “saving power” could be further bridged through a phenomenological analysis of the relation between the autopoiesis/self-poetizing of the Earth and the poetry of the world. Similarly, it also suggests that Midgley’s as yet unsubstantiated intuition that poetry could find a place within Gaia theory may well prove true, in which case perhaps Heidegger was not only right to say that *poiēsis*/poetry is the “saving power,” but also that “only a God can save us” (1993b).<sup>18</sup>

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