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The Wholly Enlightened Earth...

We do not encounter the earth under conditions of our own choosing, and its revelation is not under our control. Such is the animating principle of *Artificial Earth*. At a first glance, this might seem like a strange starting point for something written in the midst of a climate emergency, with a rising global average temperature, shrinking ice sheets, an increased frequency of extreme weather events, and degradation of ecosystem services. Since at least after World War II, the emergence of humanity as a geological agent has begun to register on a global level, which is to say that the earth is symptomatically expressing the effects of collective human activity on a planetary scale. In the context of either a catastrophic or optimistic narrative, it seems all but certain that human agency has never played a more fundamental role in deciding the future of our planet. Surely, if dangerous climate change and serious ecological harm are to be avoided, then it is precisely a question of what we as humans choose to do, based upon an assessment of the best available research. Yet, if the essential aim of technological intervention into the natural world has been to bring it under human supervision, then, as our current predicament shows, it has in practice only resulted in leaving it less controllable. Hitherto taken for granted as an immutable background for human flourishing, our planet's geospheres have through various ecological, climatological, and

other global environmental crises begun to reemerge front and center, defiantly striking back at the very heart of Western society's techno-industrial hubris.

Let us take the words of the atmospheric chemist and Nobel laureate Paul Crutzen as an example. Summarizing the biogeochemical evidence for how industrial civilization has radically and permanently disrupted our planet's carbon and nitrogen cycles, ocean chemistry, and biodiversity — each one the product of millions of years of evolution — Crutzen concluded that, in terms of our scientific and technological mastery of the earth, “we are still largely treading on *terra incognita*.”¹ Such an emphasis on the ontological alterity of the earth is arguably a psychoanalytic gesture. It seeks to perform a defamiliarization of the most familiar thing of all — the archetypally Freudian notion of Mother Earth, the collective home for every being, each according to its naturally endowed role. Indeed, it was Sigmund Freud who famously defined phenomena experienced as familiar yet at the same time foreign as “uncanny.” The German word for the same experience, *Unheimlich*, which literally translates into “unhomely,” captures even better the paradoxical notion that, according to Freud, our most haunting experiences of otherness indicate that the alien is most cleverly concealed at home. Or, as the second constellation of meaning of *Unheimlich* would have it: concealment is greatest where common sense tells us that everything has already been fully enlightened. Put differently, nearness does not mean obviousness, as was, for instance, made apparent at the moment that global warming became thinkable. Computational power allowed us to conceive of phenomena beyond the grasp of quotidian experience, but it did not so much integrate them into the emphatic dramaturgy of narrative temporality as it opened up a whole new fractal dimension of complexly bounded levels of reality. Now that the dust has settled after an intense period of globalization, and reason has shone its illuminative light on the last dark corners of the world,

1 Paul J. Crutzen, “Geology of Mankind,” *Nature* 415, no. 6867 (2002): 23. Unless otherwise stated, all emphases in quoted material are original.

enlightenment seems only to have exploded the notion of existence as an all-inclusive receptacle into a plurality of multiple perspectives and scalar shifts. Rather than reassuringly holistic and harmoniously universal, the global phenomena of the twenty-first century point toward a fragmentary assortment of systems operating in disjointed concert — connecting, by way of weirds loops, the microscopic worlds of algae, bacteria, and viruses to the mesoscopic worlds of aquatic ecosystems, international travel, and global agriculture, all the way up to the macroscopic worlds of ocean food webs, atmospheric greenhouse gas concentrations, and global carbon and nutrients cycles. As it turns out, we live enfolded by more timescales than we can grasp.² With an accelerated modernity, the cumulative effect of individual lives suddenly jeopardizes the well-being of future generations, the pace of technological innovation threatens to alter the course of natural evolution, and the march of human history proves uncontainable even by the perennial rhythms of geological time. But conversely, mundane actions, when aggregated, also linger in an eerie way, as a presence felt only indirectly through, for instance, the uncanny rift between the familiar experiences of weather and the statistics of climate. Once the freak event of an unusually warm summer starts recurring, it points toward something more than a mere coincidence, yet the spectral nature of long-term averages is such that we cannot directly perceive climatological hazards, but only learn to discern their traces. On the one hand, then, conditions for life negotiated over millions of years are currently being undone in comparatively the blink of an eye, but, on the other hand, seemingly innocent everyday behavior is now capable of leaving imprints that will continue to haunt the earth for the foreseeable future and beyond.

2 Timothy Morton, *Dark Ecology: For a Logic of Future Coexistence* (New York: Columbia University Press, 2016), 25.

If the uncanny is the name for an “[in]between that is tainted with strangeness”³ — that is, a disturbance to the natural order or to the customary separation of phenomena to appear within the confines of traditional registers — then it is surely the experience par excellence of global environmental change.⁴ In the wake of the rapid and thorough industrialization of the nineteenth and twentieth centuries, the whole surface of the earth has to some degree been manipulated by humankind, from tropical rainforests to arctic tundra and polar icecaps, including the oceans and the atmosphere that we breathe. There is little left on our planet that humans have not, at least indirectly, left their anthropogenic fingerprints on. Yet, far from making us earthmasters, modernity has conjured into existence nonhuman forces that the Enlightenment prophets of a disenchanting nature had long since declared to be dead. For not only has nature been infused by human agency on a planetary scale, but it has been so in ways that have produced new forms of more-than-human unpredictability. Anthropogenic climate change is a great example of a radically human-caused but at the same time potentially self-amplifying runaway process, revealing the maternal security of our homely dwelling as uncannily monstrous. Without leaving our earthbound home, we have nevertheless been thrust into an unknown territory strewn with positive feedback loops of cascading effects that would threaten to catapult the planet into a hothouse state, one fundamentally at odds with the continuity of modern civilization as we know it. In the hockey-stick graphs of the “Great Acceleration,”⁵ the modern promise of progress has jarringly morphed into biospheric degradation. Although nature has been seemingly denaturalized, it appears stranger than ever, and the more we shape the earth in our own image, the more foreign it seems to become.

3 Hélène Cixous, “Fiction and Its Phantoms: A Reading of Freud’s *Das Unheimliche* (the ‘Uncanny’),” *New Literary History* 7, no. 3 (1976): 543.

4 Franklin Ginn et al. “Introduction: Unexpected Encounters with Deep Time,” *Environmental Humanities* 10, no. 1 (2018): 213–25.

5 Will Steffen et al. “The Trajectory of the Anthropocene: The Great Acceleration,” *The Anthropocene Review* 2, no. 1 (2015): 81–98.

Although it has an intellectual history of its own, the geophilosophical specificity of this experience is a relatively novel phenomenon. As suggested by the literary theorist Fredric Jameson, its specificity is contingent upon having lived through the apocalypse associated with the “end of nature”⁶ — the recognition that humans are altering the earth’s geospheres to the point that we can perceive our species as a global force of nature, with the consequence that human agency can no longer be approached as though it belongs to a domain apart from its ecological, mineral, chemical, and atmospheric contexts — which, he argues, even the twentieth century’s most perceptive critics of technology failed to properly appreciate:

Even Heidegger continues to entertain a phantasmatic relationship with some organic precapitalist peasant landscape and village society, which is the final form of the image of Nature in our own time. Today, however, it may be possible to think all this in a different way, at the moment of a radical eclipse of Nature itself: Heidegger’s “field path” is, after all, irredeemably and irrevocably destroyed by late capital, by the green revolution, by neocolonialism and the megalopolis, which runs its superhighways over the older fields and vacant lots and turns Heidegger’s “house of being” into condominiums, if not the most miserable unheated, rat-infested tenement buildings. The *other* of our society is in that sense no longer Nature at all, as it was in precapitalist societies, but something else which we must now identify.⁷

During the time that Edmund Burke wrote, for instance, nature was still feared and admired in equal measure because of humanity’s seeming inability to control its forces. Well into the second half of the eighteenth century, the affective registers

6 Bill McKibben, *The End of Nature* (New York: Random House, 1989), 47. See also Paul Wapner, *Living Through the End of Nature: The Future of American Environmentalism* (Cambridge: MIT Press, 2010).

7 Fredric Jameson, *Postmodernism, or, the Cultural Logic of Late Capitalism* (Durham: Duke University Press, 1991), 34–35.

inspired by the nascent science of geology produced simultaneously terror and delight. With the rapid industrialization of the late eighteenth and early nineteenth century, however, nature's preeminent status as a limit to and condition for human flourishing had not only begun to wane but was being completely reimagined. As Immanuel Kant would later insist in a rejoinder to Burke, what begins in pain and humiliation, as the punishment and vulnerability of the human body in nature is exposed, ends in satisfying self-admiration insofar as we, through reason, "may become conscious of our superiority over nature within, and thus also over nature without us."⁸ Conveniently enough, the Enlightenment promise of progress lifted the rational modern subject right out of nature by "regarding [humanity's] vocation as sublimely exalted above it."⁹ It came with guarantees of taming and managing—we could even say intellectually administering—the awesome power, scale, and physical threat of nature, and all the while it asserted human entitlement to rational supremacy over the nonhuman, and over the irrational, wherever it may appear. Admittedly, the vast size and violent force of nature may put the imagination into painful crisis—and this is the moment of terror and overpowering—but reason eventually comes to the spectator's rescue by recognizing itself as a power separate from and ostensibly superior to nature, and thus, reminded of the supersensible destiny of rational moral agency, the spectator may recover its dignity. But if nature *qua* threat was exemplified by the 1755 Lisbon earthquake, a deadly disaster whose sensibilities reverberated across the European continent, then the late twentieth century arguably marks an end to the modern concept of the sublime by implicating us all in the planetary-wide purview of global environmental change. Peculiar about our contemporary condition of global change is that there is no longer any place or position of security from which this spectacle of terror can safely be overseen. In compar-

8 Immanuel Kant, *Critique of Judgement*, trans. James C. Meredith, ed. Nicholas Walker (Oxford: Oxford University Press, 2007), 94.

9 *Ibid.*

ison, violent natural hazards, such as earthquakes or tsunamis, though terrible and overpowering in their immediacy, are local enough that their consequences can be enjoyed from a distance. Although the Lisbon earthquake once shook the human imagination to its core, it was still limited — both geographically and ontologically — in such a way as to sanction a gap between the rational subject and the hazards of nature. Instead, if rational critical reflection reveals anything today, it is that the environmental risks of the twenty-first century are first and foremost manufactured, and thereby fundamentally include us.¹⁰ In an ironic twist of fate, our technological systems of anticipation and preemption are now so sophisticated that “our cognitive powers become self-defeating. The more we know about radiation, global warming, and the other massive objects that show upon our radar, the more enmeshed in them we realize we are. Knowledge is no longer able to achieve escape velocity from Earth.”¹¹ All positions of relative advantage ultimately vanish in the wake of the global impact of human activity.

Burke could conceive of the sublime as a failure of human artifice to ever measure up to the overwhelming power of the natural world, but today nature has all but seemingly been conquered by artifice instead. If anything, it is no longer nature that is sublime, but rather “that enormous properly human and anti-natural power of dead human labor stored up in our machinery — an alienated power [...] which turns back on and against us in unrecognizable forms and seems to constitute the massive dystopian horizon of our collective as well as our individual praxis.”¹² It is our own global technological infrastructures that now exceed our cognitive powers of representation and calculation — and our practical capacities of manipulation and control.

10 Gene Ray, “Terror and the Sublime in the So-Called Anthropocene,” *Liminalities: A Journal of Performance Studies* 16, no. 2 (2020): 3–4.

11 Timothy Morton, *Hyperobjects: Philosophy and Ecology after the End of the World* (Minneapolis: University of Minnesota Press, 2013), 160.

12 Jameson, *Postmodernism*, 35. See also Leo Marx, *The Machine in the Garden: Technology and the Pastoral Ideal in America* (Oxford: Oxford University Press, 2000), 195.

... Is Radiant with Triumphant Calamity

As a response to the unhomey experience of living in the midst of these global environmental changes, such a hysterically sublime perpetuation of existential unease has been a frequent theme within the literary genre of cyberpunk.¹³ Faced with a condition that has made the traditional position of the active and knowing subject, ontologically separated from a passive and objective world, look increasingly untenable, these sci-fi writers have attempted to find new ways to imagine our (immanent) relation to the immense architecture of globalization, and “one of the most popular means of representing this relation has been to figure the human subject as immersed in a vast and inescapably complex, technological space.”¹⁴ It is this figuration that links, for instance, Jameson’s theorizing of the subject’s bewildering absorption in hyperspace to the dense noir visuals in such films as *Blade Runner* or to the fluidity between interior and exterior space in the *Sprawl* trilogy of William Gibson. In both cases, the (dis)organization of space is presented as an “alarming disjunction point between the body and its environment,” a cybernetic ecosystem of decentered networks “in which we find ourselves caught as individual subjects,”¹⁵ what Jameson describes as an ego-shattering experience of disorientation. “This latest mutation in space,” he writes, “has finally succeeded in transcending the capacities of the individual human body to locate itself, to organize its immediate surroundings perceptually, and cognitively to map its position in a mappable external world.”¹⁶ In both cases too, it is viewed as explicitly technological. Not in the sense of a modern aesthetic of industrial machines — which is present only as a pastiche of past styles — but in the postmod-

13 Jameson, *Postmodernism*, 38. See also Scott Bukatman, *Terminal Identity: The Virtual Subject in Postmodern Science Fiction* (Durham: Duke University Press, 1993).

14 R.L. Rutsky, *High Technē: Art and Technology from the Machine Aesthetic to the Posthuman* (Minneapolis: University of Minnesota Press, 1999), 14.

15 Jameson, *Postmodernism*, 44.

16 *Ibid.*

ern sense of a synthetic environment of machinic assemblages: an ontologically flat space of surfaces, images, simulations, and empty signifiers.¹⁷ So, although the title of this book refers to an “artificial earth,” the associations it wishes to evoke are not those of a complete domestication of nature. Quite to the contrary, of central concern is the way in which the radical eclipse of nature “liquidates all internal moments of enjoyment and ends, not in self-admiration, but in shame, shudder, and deeper subjective crisis.”¹⁸ Insofar as it is inspired by cyberpunk, *Artificial Earth* is less interested in its dystopian visuals of a near-future megalopolis — with its endless urban jungle of dilapidated apartment complexes, smoke-spewing factories, and neon-decorated high-rises — than in the persistent dedication of its writer to explore uncanny forms of alienation associated with a world that has been entirely humanized, such as the uncomfortable impression that its inhabitants have correspondingly lost a firm sense of their own humanity.

In Philip K. Dick’s sci-fi juxtaposition of high-tech society and biospheric collapse, such an eclipse has been presaged as a dire expression of Theodor Adorno and Max Horkheimer’s declaration, on the opening page of their *Dialectic of Enlightenment* (1944), that “the wholly enlightened earth is radiant with triumphant calamity.”¹⁹ In both cases, the technological triumph of humankind is starkly contrasted with its spiritual defeat. Following the instructions of Baconian science, humans began replacing their spiritual connection to nature with a physical one, but now, as nature has been successfully subdued, reduced to nothing but the stimulus response of its most basic elements, the last artifacts of nature’s existence, humans too find themselves subjugated to the same instrumental impetus of being treated as a means rather than an end. In order to grasp this contradiction, whereby a completely enlightened earth had led

17 *Ibid.*, 385.

18 Ray, “Terror and the Sublime,” 5.

19 Max Horkheimer and Theodor W. Adorno, *Dialectic of Enlightenment: Philosophical Fragments*, ed. Gunzelin Schmid Noerr, trans. Edmund Jephcott (Stanford: Stanford University Press, 2002), 1.

only to the reification of the human, Horkheimer and Adorno suggested that we must conceive of humanity's instrumental domination of nature in a dialectical fashion. Such an approach mirrors Heidegger's observation that the ordering of modernity's instrumentalizing impetus is essentially disordering, and its orienting essentially disorienting. The translator Samuel Weber has trenchantly pointed out that "although [the English rendition] takes the collecting, assembling function of the *Gestell* into account, it effaces the tension between verb and noun that resounds in the German and that points to the strange, indeed uncanny, mixture of movement and stasis that distinguishes the goings-on of modern technics and upon which Heidegger places considerable emphasis."²⁰ Paradoxically, "the more technics seeks to *place* the subject into safety, the less safe its *places* become. The more it seeks to place its orders, the less orderly are its emplacements."²¹ In Heidegger's diagnosis, then, the conscious exploitation of nature is inextricably interlinked with the unconscious reification of the human: "In the planetary imperialism of technologically organized man, the subjectivism of man attains its acme, from which point it will descend to the level of organized uniformity and there firmly establish itself. This uniformity becomes the surest instrument of total, i.e., technological, rule over the earth."²² It is in enframing—which challenges forth the entire earth as a standing reserve and thereby dispossess the human too of any other place to stand except as a stockpiled bystander, on standby as an abstract numeral qua productivity to be administered, regulated, and managed much like any other resource—that humans are instrumentalized into beings that order without asking questions, that objectify the world around them, and that consequently abandon any real

20 Samuel Weber, "Upsetting the Setup: Remarks on Heidegger's Questioning after Technics," in *Mass Mediauras: Form, Technics, Media*, ed. Alan Cholodenko (Stanford: Stanford University Press, 1996), 71.

21 *Ibid.*, 74.

22 Martin Heidegger, "The Age of the World Picture," in *The Question concerning Technology and Other Essays*, trans. William Lovitt (New York: Harper & Row, 1977), 152.

care for others to be what they are. In the cyberpunk aesthetic of an ecology without nature, where only the self-constructed remains, we find a microcosm of the distinctive dilemma that lies at the heart of dwelling upon a wholly enlightened earth, namely, that although humans seemingly encounter nature produced in their image everywhere they look, always and already enframed as a means in service of an endless perpetuation of the self, such a mode of disclosure conceals the fact that “precisely nowhere does man today any longer encounter himself, i.e., his essence.”²³ Our global environmental predicament is so uncanny because the successful enframing of the earth corresponds with a complete loss of world, and in effect a concomitant alienation from that which is most intimate.

It is in this particular sense that this book shall operationalize Horkheimer and Adorno’s famous thesis that “myth is already enlightenment, and enlightenment reverts to mythology.”²⁴ Despite the prominent status ascribed to instrumental reason in the modern epoch, in whose name the notion of an ensouled nature had to be sacrificed on the altar of progress, modern humans never managed to entirely banish the animistic elements of their primitive past. Hence, if modernity has been premised on the exclusion of such premodern facets, it has, on the other hand, always been haunted by an insistent return of the repressed. From a modern perspective, of course, the repressed would first and foremost appear as an unsettling other — as the irrational forces of that “great enchanted garden,”²⁵ supposed to have been dispelled once and for all. It is no accident that, from Karl Marx to Jacques Ellul, critics of technology have “shivered [...] before the spectacle of the mechanized proletariat who is subject to the absolute domination of a mechanized capitalism

23 Martin Heidegger, “The Question concerning Technology,” in *The Question Concerning Technology and Other Essays*, trans. William Lovitt (New York: Harper & Row, 1977), 27.

24 Horkheimer and Adorno, *Dialectic of Enlightenment*, xviii.

25 Max Weber, *The Sociology of Religion*, trans. Ephraim Fischhoff (London: Methuen, 1965), 270.

and a Kafkaesque bureaucracy.”²⁶ Nor that, from gothic horror to cyberpunk, modern humans have been apprehensive of their own synthetic children. In fact, the modern canon is replete with metaphors for the manufactured risks of modernity and the eerie impression of having engineered beings indifferent to the intentions of its artificers, whereby it is precisely this dedication to convert all life to the artificial registers of an anthropogenically stamped form that brings about the return of what modernity has repressed, namely, the impotence of humans to manage and control that which conditions their own existence, without thereby also losing their exceptionalism in the process. Without listing them here, there are countless other examples (fictional and nonfictional) of this scenario in which technological manipulation, through humankind’s instrumentalization of nature in an effort to subjugate it, inadvertently threatens the presumed mastery that distinguishes the modern human subject from its other.

As opposed to a confirmation of humankind’s narcissistic omnipotence, this is to suggest that the complete artificialization of the earth — insofar as artificial processes of change have now become powerful enough to compete with the global forces of nature — has paradoxically made it “so alien, so complex, so awesome, and so overwhelming that we [...] regress to a degraded state of nondifferentiation from it; this outer reality is psychologically as much a part of us as its poisonous waste products are part of our physical selves.”²⁷ On an unconscious level, “we powerfully identify with what we perceive as omnipotent and immortal technology, as a defense against intolerable feelings of insignificance, of deprivation, of guilt, of fear of death,” while giving ourselves “over to secret fantasies of omnipotent destructiveness, in identification with the forces that threaten to destroy the world.”²⁸ It is for this reason that Crutzen, although

26 Bruno Latour, *We Have Never Been Modern*, trans. Catherine Porter (Cambridge: Harvard University Press, 1993), 115.

27 Harold Searles, “Unconscious Processes in Relation to the Environmental Crisis,” *Psychoanalytic Review* 59, no. 3 (1972): 368.

28 *Ibid.*, 370.

he emphasizes the earth's uncanniness, can nevertheless celebrate that "the long-held barriers between nature and culture are breaking down," and affirm that it is therefore "no longer us against 'Nature,' [but i]nstead, it is we who decide what nature is and what it will be[. . . I]n this new era, nature is us."²⁹ Rather than constituting a way of manipulating forces external to the human subject, there is thus a danger that such a narcissistic injury may instead serve to pave the way for the unrestrained assertion of a will to power precisely by dissolving the boundary between subject and object, leading to "an extension of the power of the will which recalls the 'animistic' conception of the universe that precedes the emergence of the mature ego."³⁰ With the return of animism in machinic form, we are no longer faced with the coercion of the natural world through the intention of an artificer to subject its forces to mastery.³¹ Instead, the continued exploitation of nature may be ontologically sanctioned by locating the will immanently to it. Neither subject nor object, such a force of nature is conceptually converted into unconditional production by and for itself. Importantly, this is not to say that we never really encounter nature in the wake of modernity since our experience is always and already technologically mediated, but, precisely to the contrary, that human artifice is accepted as always and already natural, and that humankind's production is constitutive of nature as such. In other words, nature is taken as in itself nothing but creative production, and so it is precisely by the means of artificially altering its environment that humanity is understood to be acting in accordance with its own nature.

"How antifoundationalism can thus coexist with the passionate ecological revival of a sense of Nature," Jameson writes, "is the essential mystery at the heart of what I take to be a fundamental

29 Paul Crutzen and Christian Schwägerl, quoted in Jeremy Baskin, "Paradigm Dressed as Epoch: The Ideology of the Anthropocene," *Environmental Values* 24 (2015): 10.

30 Bukatman, *Terminal Identity*, 210.

31 Angela Melitopoulos and Maurizio Lazzarato, "Machinic Animism," *Deleuze Studies* 6, no. 2 (2012): 240–49.

antinomy of the postmodern.”³² Taking Jameson’s provocation seriously, it is the guiding conviction of this book that tackling said “mystery” must be the central task of a questioning of technology adequate to the uncanny experience of our current global environmental predicament. Could it be so that rather than sites of resistance against the instrumentalization of the earth into a standing-reserve, “this becoming organic, or becoming ecological, is no more than the mechanistic-technological triumph of modernity over nature[?]”³³ At the very least, such a question is justified by the suspicion that, as the philosopher Yuk Hui has suggested, “it is no longer a dualism which is the source of danger in our epoch, but rather a non-dualistic totalizing power present in modern technology, which ironically resonates with anti-dualist ideology.”³⁴ Although we mourn the end of nature, it is only all the more important that we do not prematurely grasp for an artificial organicism to re-create some prelapsarian utopia of a synthetic Eden. For if the sublime has migrated from the natural into the artificial, then it is only because the immanentization of human artifice into productive nature signifies the latter’s complete technification. As a response to the uncanny affects of dwelling on an artificial earth, the regressive drives of an antihumanist desire to return the human to the natural world — a *regressus ad uterum* on a global level — as a means of escaping alienation, and to form an organic society of symbiotic beings in place of modernity’s collection of self-contained bourgeois individuals, can all too comfortably be enrolled in support of the techno-optimistic sentiments of a bright-green ecological modernization. In the anxiety-ridden social reality we find ourselves today, our technology might very well become a conceptual location for intimating the repressed depth of the modern project’s failed effort to master nature. But — and this is what

32 Fredric Jameson, *The Seeds of Time* (New York: Columbia University Press, 1996), 46–47.

33 Yuk Hui, “Machine and Ecology,” *Angelaki: Journal of the Theoretical Humanities* 25, no. 4 (2020): 59.

34 *Ibid.*, 58.

this book seeks to caution — it can equally well come to serve as the omnipotent object to be fused with and worshipped, a location where sadistic-destructive fantasies of annihilation can run rampant. What we need is thus an engaged questioning of technology — tied to social practice and theory — that seeks to clarify the corruptibility of the synthetic merge between natural geomorphology and human artifice to regress into the latter as opposed to progressively contribute to the former. What follows is a genealogical attempt at making such a clarification.

From Hutton to Lovelock and Back Again

To accomplish the task now set before us, chapter 1, “Toward a Terrestrial Turn?” introduces the concept of planetary technicity by investigating the methodological transformations that set the scene for a heightened awareness of global environmental change in the 1980s, and out of which the now widely debated Anthropocene and the variously associated ontological claims about the hybrid nature of our artificial earth have subsequently taken shape. The study of the history, sociology, and philosophy of global change research — particularly meteorology and atmospheric science — has exploded during the last twenty years, but far less attention has been paid to the hermeneutic question of how transdisciplinary efforts, such as earth system science, have disclosed humanity’s relationship to its planetary abode. Yet, the application of systems theoretical tools to conceive of the planet as an interacting whole has as of late come to play a remarkably influential role — scientifically, culturally, and politically. It has served to prove the capability of treating complex systems with computer simulation — a breakthrough for the earth sciences and beyond — and has been invoked as a source of scientific confidence and authority. Moreover, it has become visible and famous in the public sphere, has helped to spawn a renewed interest in and debate about the growing effect of humankind upon the biosphere, and has led to calls for a novel political paradigm of earth system governance. In 2001, the Amsterdam Declaration on Global Change declared

that “the Earth System behaves as a single, self-regulating system comprised of physical, chemical, biological and human components,” and that, because of its dynamic behavior, “global change cannot be understood in terms of a simple cause-effect paradigm.”³⁵ Cementing the position taken in 2001, a second conference on global change was held in London in March 2012, again emphasizing that “the Earth system is a complex, interconnected system that includes the global economy and society, which are themselves highly interconnected and interdependent.”³⁶ Consequently, biological and technological processes have been conceptualized as integral parts of the earth system rather than mere passive recipients of changes in the geospheres. This includes alterations in and by the nitrogen and carbon cycle, atmospheric composition, and marine food chains, but also technical infrastructures, such as transport, communication, and urbanization. To this extent, it has been argued that “the Earth System includes humans, our societies, and our activities” and that “humans are not an outside force perturbing an otherwise natural system but rather an integral and interacting part of the Earth System itself.”³⁷ Conceptually integrating technology into the larger terrestrial environment has thusly been identified as being decisive for properly addressing environmental challenges on a global scale.

In an effort to excavate certain moments where contemporary ideas about the hybrid nature of our artificial earth find historical resonance, chapters 2 through 4 trace the genealogy of planetary technicity all the way up to the birth of earth system science in the 1980s. Beginning with the scientific formaliza-

35 Jan Pronk, “The Amsterdam Declaration on Global Change,” in *Challenges of a Changing Earth. Global Change — The IGBP Series*, eds. Will Steffen et al. (Berlin: Springer, 2002), 207.

36 Lidia Brito and Mark Stafford Smith, *State of the Planet Declaration — Planet under Pressure: New Knowledge towards Solutions Conference, London, 26–29th of March 2012* (London: Diversitas, 2012), 6.

37 Will Steffen, Paul J. Crutzen, and John R. McNeill, “The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?,” *Ambio* 36, no. 8 (2007): 615.

tion of the discipline of geology out of late eighteenth-century natural philosophy, chapter 2, “Deep Time of the Heat Engine,” focuses on the introduction of the concept of self-organization into geology through the geothory of James Hutton, paying particular attention to his ambiguous depiction of the earth as simultaneously a machine and an organism. By putting Hutton’s geothory in the context of the Romantic portrayal of human artifice as an expression of seemingly natural processes of deterioration and regeneration, chapter 2 examines how metaphors for technology shifted away from the dead mechanism characteristic of clockwork to the kind of living feedback that would later come to be formalized in thermodynamics, but that, in the late eighteenth century, was already familiar to savants such as Hutton in terms of the organic body. In general, organicism has been regarded as inherently at odds with instrumentalism: the latter, by all accounts, reduces the natural world to its use for human purposes, and the former operates on a desire to reconcile nature with the human by stressing a much deeper interconnection between both. But even though they condemned the narrow-minded instrumentalism of industrial modernity, the Romantics did not abandon the commitment to technology *per se*; rather, what they rejected was the insufficiency of the instrumentalist interpretation of that commitment, proposing in its stead a different perspective from which to understand the relationship between nature and artifice. Because of this proposed change in perspective, nature was no longer something that could be judged from a particular point of view. Rather, nature could only be comprehended as a complex whole, which, moreover, meant that human artifice, as part of nature, had to be understood as participating in the universal history of the earth itself. Chapter 2 cautions that along with such a change in perspective, however, any sense of a limit — such as a horizon of understanding belonging to human history — thereby disappears into the abyss of geological time, and the subject suddenly vanishes from the center of the global environmental drama. Ironically so, since the purported novelty of the globalization of technology is precisely the manner in which it highlights the

anthropogenic dimension of global environmental change, and thus the deep time consequences of human action.

But the meeting between Romanticism and the burgeoning geological sciences around the turn of the eighteenth century is far from a lone instance in modern intellectual history when it comes to reconceiving human artifice from that of an external imposition upon the earth to something much more akin to an artful disclosure of its inner potential. In its wake, several other intellectual heavyweights continued the project of further unearthing the significance of the role of technology in planetary evolution. In fact, the human/nature coupling was strongly emphasized and promoted by two scholars at the beginning of the twentieth century, one of them the Russian mineralogist and geochemist Vladimir Vernadsky, who published a series of lectures on the subject, titled *The Biosphere* (1926). In these lectures, Vernadsky developed an integrative and functionalist definition of the planet to comprise both living beings and the nonorganic matter sustaining them — including, he argued, technology, with the help of which humankind had become such a crucial component of the earth that it could no longer be ignored as a geological force.

Proceeding from Hutton's ambivalent oscillation between machine and organism, chapter 3, "Dissolving Technology, Planetary Metamorphosis," examines how the topological function of the sphere as an operational interface between biotic and abiotic matter came to influence the understanding of technology by bringing not only organisms but also artifacts into natural evolution. Along with the study of global biogeochemical cycles and the concomitant recognition of humanity's growing effect on the biosphere, speculations on the nature of technology surfaced in the intellectual circles of Paris during the interwar period — certainly through the work of Vernadsky, but also in the work of the Jesuit paleontologist Pierre Teilhard de Chardin. Focusing on Vernadsky's holistic and integrative approach to the study of process on the level of biosphere, chapter 3 observes how this approach laid the foundation not only for the study of anthropogenic environmental change but also for an under-

standing of human artifice as a functional extension of the singular process of the earth's self-organization. Moreover, Vernadsky's development of a biogeochemical approach to the study of the earth is juxtaposed and analyzed in relation to Teilhard de Chardin's speculative anthropology by tracing their theoretical indebtedness to the Bergsonian philosopher Édouard Le Roy's orthogenetic view of terrestrial evolution. Together, their writings spawned a heady mix of a multiplicity of overlapping perspectives—borrowing from scientific, cultural, and explicitly religious genres—through which the unfolding of this understanding of humankind's being on the earth entailed the transformation of age-old oppositions and a number of boundary breakdowns. However, chapter 3 concludes by cautioning that even though the flattening of the modern philosophical division between nature and artifice portrays itself as an ontological corrective to that insufficiently materialist dualism underlying mechanistic philosophy, it ironically remains an *idealism* in the most fundamental sense of that word. Because to fill the inorganic inwardly with spirit is, as the philosopher Louis Althusser famously warned, to smuggle idealism into materialism, upon which one may then justify class relations, bourgeois politics, and the apparatuses of capital through reification. Only in accordance with such an organicist ontology could instrumentalism be set free from its utilitarian constraints of a mere means to become mythologized into an end in itself.

Still, Vernadsky's teachings remained relatively obscure in the West until G.E. Hutchinson popularized them in the latter part of the twentieth century, at around the same time that Vernadsky was called "the father of modern biogeochemistry" by the British atmospheric chemist James Lovelock, who, in his own right, went on to propose that feedback in the climate system was intricately connected to the homeostasis of basic geophysical processes. From the development of this feedback-based, integrative science, which Lovelock himself, following Hutton's metaphor of the body, called "geophysiology," sprang a number of interesting reflections on the essence of technology. As a product of their collaborative work in the 1970s, the

“Gaia hypothesis” was advanced by Lovelock together with the American microbiologist Lynn Margulis as a means to provide an ontological basis for integrating all components of the earth system, thereby reviving the Huttonian idea of the planet as a self-organizing entity, but now under the auspices of the cybernetic notion of the thermostat. The earliest versions of the Gaia hypothesis contained phrases such as “by and for the biosphere,” thereby implying the sense of a joint purposefulness on the part of life in general to artificially produce the global environment in ways that suited its continued existence, thus facing the controversial question of teleology in nature head on. The genealogical investigation is thereby closed out in chapter 4, “Mythology in the Space Age,” by examining how the figure of technological life reappeared in cybernetic discourse during the Cold War with the associated propagation of systems science for the sake of global military surveillance and control. Reengineering the earth’s future along the lines of positive and negative feedback loops, Lovelock and Margulis shamelessly reintroduced natural teleology at the heart of their twentieth-century resurrection of the geothoretical tradition, in effect reimagining the ontological status of the artifact, away from that of an anthropological instrument and instead toward constituting the primary milieu of the organism. If it has been far too common in contemporary philosophy of technology, especially in its critique of instrumentalism, to frame the concern with the globalization of technology in terms of the dominance of exploitative-egoistic Cartesianism over neopagan Spinozism, chapter 4 argues that the Gaia hypothesis of Lovelock and Margulis constitutes an exceptional case of a boundary object, curiously enrolled by both New Age spiritualists and Promethean ecomodernists. Put differently, there is a surprisingly small step from Gaia as a metaphor for vulnerability and community to one that describes the technological realization of a nature yet to come — to be actualized poetically by the biota, as Lovelock and Margulis imagined it. Indeed, from the Gaian point of view, ontic beings, including humans, exist as but elements in more-than-human configurations of energy transformation, whose goal, in what can best be

described as a kind of Nietzschean ecology of self-overcoming, is nothing but the intensification of the vital impulse to self-organize in increasingly complex patterns.

The book's conclusion, "The Will to Terraformation," brings the insights from the genealogical examination of planetary technicity to bear on a critique of the present. With reference to the preceding chapters, it argues that it is not because global technology is gradually becoming more seamless and more indistinguishable from nature's forces that the barrier between what is considered "natural" vis-à-vis "artificial" has seemingly collapsed, but rather that it is because the collapse of the barrier between what is considered "natural" vis-à-vis "artificial" has a priori come to dictate our horizon of experience that global technology is seemingly becoming more seamless and more indistinguishable from nature's forces. One of the consequences of the genealogy presented in this book is thus to nuance the etiology of the Anthropocene provided by its proponents, who, although they generally agree that it was the industrial revolution and its consequences that inaugurated this new epoch of natural history, nonetheless hold that earth system science is responsible for raising humanity's self-awareness to this "scientific fact." Although the critique presented in the conclusion to this book is not meant to dispute the crucial role played by earth system scientists in making global environmental change into a matter of concern, nor the plethora of risks associated with humankind's ability to alter the conditions for life, it nevertheless makes use of this genealogy to stress that empirically verifiable patterns of anthropogenic environmental change, no matter how detailed and well documented, cannot elucidate the ontological dimension to the Anthropocene condition. Last, it cautions that there is an ever-present corruptibility to the synthetic merge between natural geomorphology and human artifice that consists in the reinstatement of an intrinsic teleology in which technology takes on the central role as a transcendental signified, and that anchors and secures the meaning of being — albeit nihilistically so — in an unrestrained instrumentalism. In place of the transcendent artificer, it is argued, we instead get a self-

developing “will to terraformation” internal to nature itself. This is an intellectual lineage that runs through the work of Hutton, Vernadsky, and Lovelock, a mythos upon which planetary technicity, so central to the earth system paradigm, operates.

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There is a rich lineage of reflections on the essence of technology that runs through the history of earth science, which has revolved around efforts to widen technology beyond its reduction into the supplementary status of an instrument, instead emphasizing its character as a global force on par with the rest of the earth’s geospheres. As we shall see, it was largely thanks to the geothory of Hutton that the groundwork for the reinterpretation of human artifice as a part of the self-organizing capacity of the earth had already been laid in the late eighteenth century. This foundation was then built upon in the early twentieth century when Vernadsky, together with Teilhard de Chardin, worried about the relationship between organic and inorganic processes for the evolution of life on earth and proposed a vision of human artifice not just as an imitation of nature but as an elementary manifestation of the integrative function and evolution of the terrestrial environment. Finally, in the second half of the twentieth century, the coevolution of organic and inorganic processes was further developed upon, this time in cybernetic terminology, and postulated by Lovelock and Margulis as the foundation for planetary homeostasis.

Proceeding from a genealogical point of departure, the ambition of this book is to historically examine how the study of the earth led to reflections on the essence of technology, and how these reflections, in turn, altered beliefs in and caused changes to the accepted explanations of the structure and composition of the planet and humanity’s relationship to it. Accordingly, this book seeks to supply a richly recollected and historically reflective dimension to the consolidation of the global environment into the systems-theoretical paradigm of earth system science, and to the associated Anthropocene discourse on humanity’s

relationship to the earth. It seeks, in other words, to usher it into its phase of critical self-consciousness. Surveying and thematizing the concern of defining, describing, and delineating the role of humankind as both observer and participant in the geological economy, this book delves into the conceptual realm that constitutes the self-reflexive dimension of the discipline of earth science. As a consequence, it has a dual aspect: it seeks not only to reconstruct a catalogue of explicit meditations within the earth sciences upon technology as a global phenomenon, but also to provide an in-depth and long-durational genealogy of the discursive conditions underwriting the synthesis of nature and artifice within geophilosophical registers.

What will be attempted herein is thus a study of what characterizes our present concerns about technology in the face of global environmental change by exploring an intellectual legacy that has largely been neglected in conventional historical and philosophical treatises on technology. Such an interdisciplinary cross-pollination between philosophy and history into the framework-explicating impetus of a critical genealogy concerns itself with lineages of a conceptual nature that then become embedded in discursive practices and vocabularies, such that one can wield them without having a detailed understanding of where they came from. But this book is necessarily interdisciplinary also in an additional sense, because the fact of the topic — the disclosure of technology as a global phenomenon — evidently emerges as a confluence of multiple technical lexicons across various domains. Tracing its provenance from the natural-theological concept of a self-organizing earth that fueled the Huttonian systematization of geology all the way to the global environmental concerns of the twentieth century, and thus across multiform encounters between philosophy and earth science, this book orients itself around the concept of planetary technicity as a guiding thread to rediscover overlooked pathways in modern thought. It suggests that, far from being an abstract concern unrelated to advances in the earth sciences, the question concerning the essence of technology dramatizes fundamental philosophical problems of subjectiv-

ity, freedom, and the transcendental that remain central to the modern attempt to reconcile human experience with the scientific discoveries about the natural history of our planet. If we are caught between a rock and a hard place when trying to make sense of the essence of technology today, then a careful consideration of the history of its ontology could contribute to a thematic outlook of enduring relevance.