

# Fractal Eaarth: Visualizing the Global Environment in the Anthropocene

**Thomas M. Lekan**

*Department of History, University of South Carolina, USA*

**ABSTRACT** This essay offers a postcolonial critique of recent environmentalist literature and exhibitions that frame the Anthropocene using the NASA Apollo mission's *Earthrise* (1968) and *Blue Marble* (1972) photographs from space. Building on the work of Dennis Cosgrove and Donna Haraway, as well as historical evidence from the U.N. Environmental Summit in Stockholm in 1972, the essay explores how the attempt to depict *Anthropos* as a unitary geophysical agent resurrects the appeal to the Whole Earth environmentalism of the 1970s without attending to the U.S. imperialist and racist connotations of the disembodied "god trick" found in these extraterrestrial photographs. As evidenced already in the 1950s at the landmark Man and Nature conference at Princeton and in the wildlife documentaries of Bernhard and Michael Grzimek, moreover, the first decades of the Great Acceleration witnessed the growing use of aerial images to chart the "disappearance of the outside" and to advocate for wilderness areas in the Global South as a "cultural heritage of mankind." The confluence of geophysical tipping points, universalist history, and political struggle over decolonization resulted in eco-images that subsumed all parts of the globe—most especially Africa—into a doomsday narrative of human profligacy that lost sight of a kaleidoscopic patchwork of cultural landscapes. Fractal topographies, by contrast, serve as more effective indices of the recursive layering found in digital representations such as Google Earth and help us to stretch our historical imagination and cultural criticism into scale-dependent and multi-agentic realms that lie beyond the Apollonian visions of the late Holocene.

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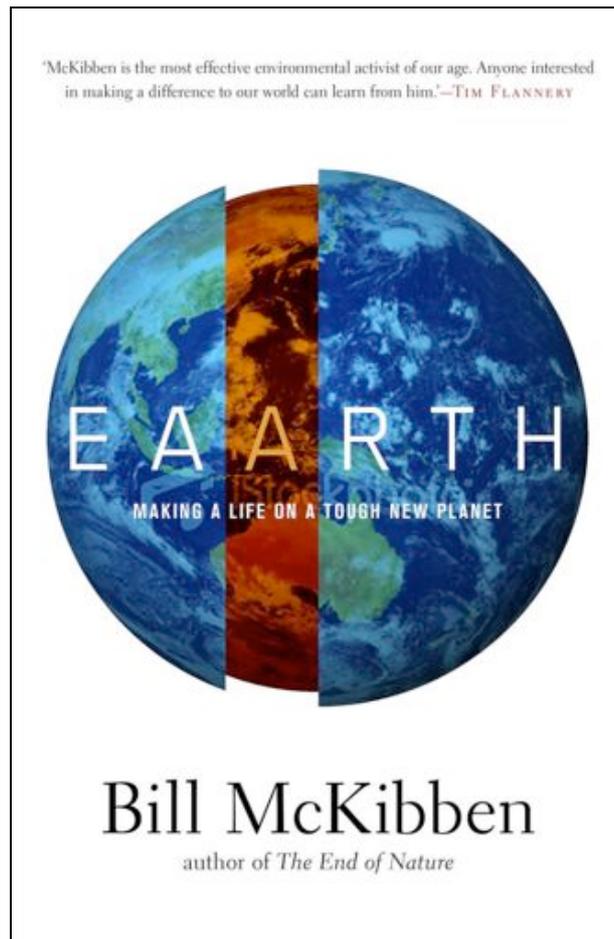
The cover of the Penguin edition of Bill McKibben's 2010 book *Eaarth*, a sobering treatise dedicated to "making life on a tough new planet," portrays the 1972 Apollo 17 photograph 22727—known in popular parlance as *Blue Marble* or *Blue Planet*—with a longitudinal, blood-red gash on its left circumference. The effect of this modification to the original image suggests both a wound in the flesh of the Whole Earth and the birth of its angry, superheated, and inhospitable twin—one in which melting ice caps, rising sea levels, and dying forests will be the new norm.<sup>1</sup>

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<sup>1</sup> Bill McKibben, *Eaarth: Making Life on a Tough New Planet* (Melbourne: Penguin Books Australia, 2010). Quotations in this essay come from the 2011 St. Martin's Griffin version (New York, 2011).

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**Figure 1** The cover of McKibben's 2010 *Eaarth*.  
Image courtesy of Black Inc. Books, Victoria (<http://www.blackincbooks.com/books/eaarth>).



**Figure 2** "The Blue Marble"  
(NASA, photo in the public domain).

“For the ten thousand years that constitute human civilization, we’ve existed in the sweetest of sweet spots,” writes McKibben. “The temperature has barely budged; globally averaged, it’s swung between 58 and 60 degrees Fahrenheit. That’s warm enough that the ice sheets retreated from the centers of our continents so we could grow grain, but cold enough that mountain glaciers provided drinking and irrigation water to those plains and valleys year-round ... We have built our great cities next to seas that have remained tame and level or at altitudes high enough that disease bearing mosquitoes could not overwinter.”<sup>2</sup> We got our first “real” glimpse of that “stable, secure, place,” he notes, in December 1968, when the Apollo 8 mission returned with the equally iconic Earthrise image of our planet as half-cloaked shadow. For astronaut Jim Lovell, the earth appeared as a “grand oasis” of terrestrial life floating in a black, sepulchral universe—an eerie and wonderful manifestation of what Kenneth Boulding had famously termed already in 1966 the “Spaceship Earth.”<sup>3</sup>



**Figure 3** “Earthrise” Note that the original image was tilted in publication to this familiar landscape mode, with a lifeless moon replacing the familiar foreground of earthbound horizons. Image courtesy of NASA.

<sup>2</sup> McKibben, *Eearth*, 1.

<sup>3</sup> Kenneth E. Boulding et al., *Human Values on the Spaceship Earth* (New York: Published by Council Press for Commission on Church & Economic Life, National Council of Churches, 1966).

“But we no longer live on that planet,” warns McKibben. “In the four decades since, that earth has changed in profound ways ... We’re every year less the oasis and more the desert. The world hasn’t ended, but the world as we know it has—even if we don’t quite know it yet. We imagine we still live back on that old planet, that the disturbances we see around us are the old random and freakish kind. But they’re not. It’s a different place. A different planet. It needs a new name. Eearth.”<sup>4</sup>

McKibben’s apocalyptic vision of planet Eearth—one that substitutes a foreboding Frankenstein planet spiraling out of control for the back-to-the-land optimism of Stewart Brand’s *Whole Earth Catalog*—has thus far emerged as a dominant popular mode of representing the Anthropocene.<sup>5</sup> In such illustrations, Earth’s cyborg twin emerges as the monstrous outcome of humankind’s failure to follow the warnings issued in what Benjamin Lazier terms the “Earthrise era”: the period of U.S.-led environmental activism that reached its high point between 1968 and 1972.<sup>6</sup> Concerns found in the 1972 *Limits to Growth* report about DDT or pollution might appear “almost quaint and musty to us now,” writes McKibben, but Barry Commoner, Paul Ehrlich, and the Club of Rome “foresaw Eearth ... and if we’d heeded them we might have prevented its birth.”<sup>7</sup> James Lovelock, the former NASA engineer who propounded the Gaia hypothesis of Earth as a physiological whole in 1979, has similarly resurrected and photo-shopped Blue Planet to resemble a planet awash in flames, while *The Economist* welcomes us to the Anthropocene with a machine-made Blue Planet whose metallic skeleton and bolted exterior plates have begun to fragment and dissolve under the pressure of a super-heated interior.<sup>8</sup> “Humanity, wholly unprepared by its humanist traditions, faces its greatest trial,” thunders Lovelock in *Revenge of Gaia*, “with breathtaking insolence they have taken the stores of carbon that Gaia buried to keep oxygen at its proper level and burnt them.”<sup>9</sup> Gaia will soon pass into a “morbid fever” that may last as long as 100,000 years, notes Lovelock, much like the one that occurred during the Eocene fifty-five million years ago when a geological accident released a terraton of gaseous carbon compounds into the atmosphere. “The great party of the twentieth century is coming to an end, and unless we now start preparing our survival kit we will soon be just another species eking out an existence in the few remaining habitable regions,” or more frighteningly, facing the “ultimate punishment” of extinction.<sup>10</sup>

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<sup>4</sup> McKibben, *Eearth*, 2.

<sup>5</sup> On the history of the *Whole Earth* catalog, see Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2006).

<sup>6</sup> Benjamin Lazier, “Earthrise; Or, The Globalization of the World Picture,” *The American Historical Review* 116, no. 3 (2011): 602–630.

<sup>7</sup> McKibben, *Eearth*, 91.

<sup>8</sup> See the cover of *The Vanishing Face of Gaia* at <http://www.goodreads.com/book/show/5574501-the-vanishing-face-of-gaia>, accessed 15 January 2014 and the 26 May 2011 edition of *The Economist*, “Welcome to the Anthropocene, at <http://www.economist.com/node/18744401>, accessed 19 October 2014.

<sup>9</sup> James Lovelock, *The Revenge of Gaia: Earth’s Climate in Crisis and the Fate of Humanity* (New York: Basic Books, 2006), 146.

<sup>10</sup> *Ibid.*, xiv.

I have no wish in this essay to dispute the rapidity of anthropogenic climate change or the gravity of the political, social, and ecological predicaments that will accompany the planet's transition out of the Holocene. Indeed, I share McKibben's sense of resignation in the wake of the toothless last-minute accords hammered out at the United Nations Climate Change Summit at Copenhagen in 2009 and the subsequent retrenchment of his own organization, 350.org, named for the atmospheric CO<sub>2</sub> concentration level many scientists consider the absolute upper limit for preserving the late Quaternary environment: 350 ppm.<sup>11</sup> And yet, as Yaakov Jerome Garb lamented already in 1985 in the pages of the *Whole Earth Review*, environmentalists displayed a remarkable "insensitivity ... toward this particular image ... and general naiveté regarding the power of imagery to define our relationship with the earth and nature."<sup>12</sup> Anticipating Donna Haraway's critique of the "god trick"—the disembodied, masculinist gaze of a technoscience that purports to be neutral—Garb bemoaned the displacement of the "pulsing, detailed vitality of terrestrial life" with an impoverished, static abstraction, a "rearward view of a distant and abandoned earth" akin to the extraterrestrial fantasies found in science fiction, movies, and video games.<sup>13</sup> Following Garb in the pages below, I argue that the imperialist and Cold War origins of the Earthrise and Blue Planet images make them decidedly anachronistic and unsuitable icons of our current predicament. Indeed, the fixed gaze of the male astronaut from 22,000 nautical miles out seems oddly out of sync with a post-1970s world geared toward postmodern and eco-feminist skepticism toward grand narratives and complexity theories that posit non-linear and fractal topographies at every scale.<sup>14</sup>

Building on the work of Dennis Cosgrove, Sheila Jasanoff, Noël Sturgeon, and Benjamin Lazier, I trace a visual genealogy of the Blue Marble that works backward from the current slate of Frankenstein planets, to the Apollo mission images that resonated so powerfully for environmentalists at the United Nations Conference on the Human Environment at Stockholm in 1972, and finally to the aerial photography and documentary films of 1950's conservationists. Such a critical visual genealogy reveals how the "global environment" emerged as a way of understanding the cascading ecological crises of the post-1945 world, interrogates which groups this universalistic framing authorized to speak for nature, and invites reflection on why "thinking globally, acting locally," a popular slogan of 1970's environmentalism, largely failed to mobilize an international environmental movement capable of stemming environmental degradation over the past fifty years—from Stockholm to Rio to Copenhagen. Cosgrove, who located Blue Marble's origins in America's postwar geopolitical mission, pioneered the use of such a cartographic genealogy in his analysis of how

<sup>11</sup> McKibben, *Eearth*, xv.

<sup>12</sup> Yaakov Jerome Garb, "The Use and Misuse of the Whole Earth Image," *Whole Earth Review* March (1985): 25.

<sup>13</sup> Garb, "Whole Earth Image," 19; 25. On the God's eye view, see Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 Autumn (1988): 583.

<sup>14</sup> On the history of the photographs, see Denis Cosgrove, "Contested Global Visions: One-World, Whole-Earth, and the Apollo Space Photographs," *Annals of the Association of American Geographers* 84, no. 2 (1994): 270–294 and *Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination* (Baltimore: Johns Hopkins University Press, 2001); Robert Poole, *Earthrise: How Man First Saw the Earth* (New Haven: Yale University Press, 2008).

Earthrise and Blue Planet emerged as eco-objects of American environmental diplomacy just as the United States heralded its triumph over the Soviet Union in the space race.<sup>15</sup> Moreover, as both a “dazzling offshoot” of the twentieth century’s most destructive militarist impulses and a consumer icon appropriated by cyber-optimistic hippies and reproduced on countless t-shirts, coffee mugs, tote bags, and corporate logos, Earthrise and Blue Planet force a conversation, as Lazier has remarked, about “whether the visions and vocabularies of the Earthrise era have inadvertently accelerated our planetary emergency as much as they have inspired us to slow it down.”<sup>16</sup>

Most critics of Earthrise images focus less on the particular form of the photographs—which after all were largely incidental to the Apollo missions—and more on the political, social, and ecological import of excluding the “pulsating vitality of terrestrial life” through a disembodied gaze from outer space. Yet rather than retreat to the local as a site of phenomenological resistance to what Martin Heidegger termed (and feared) in 1935 as the “globalization of the world picture,” I am attracted to the multi-scalar entanglements of language and materiality that poet Alice Fulton calls a “fractal poetics,” which she sees as a more idiosyncratic, adaptive, and resilient form of aesthetic engagement than the binaries of nature/culture or global/local allow.<sup>17</sup> As many readers will recall, fractal geometry—which refers to jagged and uneven topological dimensions that fall between two integers—burst into visual culture in the 1990s after the publication of James Gleick’s *Chaos* in 1987 and the belated popular reception of MIT mathematician Benoit Mandelbrot’s essays and philosophical reflections from the late 1960s. Mandelbrot challenged Euclidean geometry’s assumption that a linear, symmetrical form lay behind the broken and non-linear forms we encounter every day—and compares measuring such entities to “wrapping a tinfoil around a sponge.”<sup>18</sup>

Instead, Mandelbrot recognized that properties of spiraling, recursion and infinite self-similarity within a finite space occurred at every scale of resolution—most famously in his thought experiment about the impossibility of measuring the ragged coastline of Britain. Wai Chee Dimock has argued that genres in world literature be studied as fractal systems in which “scalar opposites ... generate a dialectic that makes the global an effect of the grainy.”<sup>19</sup> Since fractals are products of iterative processes in which small changes in the initial parameters produce non-linear, yet bounded, effects—such as the Lorenz attractor familiar from weather modeling or the infinite recursion of a head of broccoli resulting from the unfolding of a DNA sequence—they have opened up deeper questions about complexity, evolutionary emergence,

<sup>15</sup> Stefan Helmreich, “From Spaceship Earth to Google Ocean: Planetary Icons, Indexes, and Infrastructures,” *Social Research* 78, no. 4 (2011): 1214.

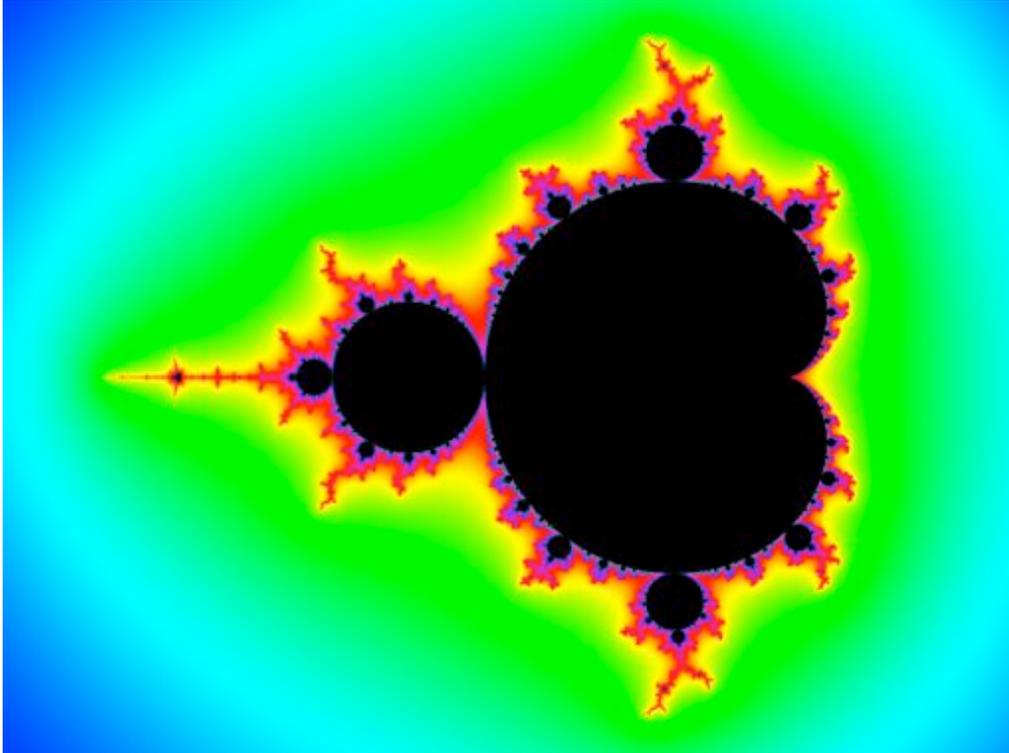
<sup>16</sup> Lazier, “Earthrise,” 608.

<sup>17</sup> See Alice Fulton, “Fractal Poetics: Adaptation and Complexity,” online at <http://alicefulton.com/books/isr2005.html>, accessed 15 October 2014.

<sup>18</sup> James Gleick, *Chaos: Making a New Science* (New York: Viking, 1987); Benoit Mandelbrot, “How Long is the Coast of Britain? Statistical Self-Similarity and Fractal Dimension,” *Science* 156, no. 3775 (1967): 636-638; see also his book *Fractals: Form, Chance, and Dimension* (San Francisco: W.H. Freeman, 1977). On the linkages between chaos and critical theory, see Katherine Hayles, *Chaos and Order: Complex Dynamics in Literature and Science* (Chicago: University of Chicago Press, 1991).

<sup>19</sup> Wai Chee Dimock, “Genre as World System: Epic and Novel on Four Continents,” *Narrative* 14, no. 1 (2006): 89. Many thanks to Tobias Boes for drawing my attention to this source.

and the limits of scientific prediction.<sup>20</sup> In my reading, fractals also serve as indices of the vertiginous spatiality and inescapable viscosity of the hyperobjects we encounter in the Anthropocene, and yet the imagination of the global appears stuck in a Ptolemaic cosmology where we locate ourselves as fixed points on the surface of a spherical orb—and where coastlines like Great Britain's are a deviation from the ideal rather than the norm.<sup>21</sup>



**Figure 4** *Recursive Symmetry in the Mandelbrot Set.* Image from the Wikimedia commons ([http://commons.wikimedia.org/wiki/File:Mandelbrot\\_set\\_rainbow\\_colors.png](http://commons.wikimedia.org/wiki/File:Mandelbrot_set_rainbow_colors.png)).

Such a spatial imagination spills over into narrative constructions of the Anthropocene, where the revenge of Gaia, like the elegies to dying charismatic species or the glimpses of impending catastrophe in travel journalism to the polar ice caps, are beholden to modernization anxieties and colonialist nostalgia for lost Edens that have been a staple of Western culture since the eighteenth century.<sup>22</sup> As Ursula Heise notes in *Nach der Natur*, such narratives, though powerful, foreclose comedic forms of storytelling, ironic visual representation, or non-linear ecologies without Nature that have accompanied our awareness

<sup>20</sup> R. J. Bird, *Chaos and Life: Complexity and Order in Evolution and Thought* (New York: Columbia University Press, 2003).

<sup>21</sup> Timothy Morton, *Hyperobjects: Philosophy and Ecology after the End of the World* (Minneapolis: University of Minnesota Press, 2013).

<sup>22</sup> On nature, narrative, and the sublime, see William Cronon, "A Place for Stories: Nature, History, and Narrative," *The Journal of American History* March (1992): 1347-1376; Elizabeth Kolbert, *Field Notes from a Catastrophe: Man, Nature, and Climate Change* (New York: Bloomsbury, 2006); Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens, and the Origins of Environmentalism, 1600-1860* (Cambridge: Cambridge University Press, 1995).

of human finitude.<sup>23</sup> Fractal topographies also index more effectively than celestial spheres the disjunctive and “contradictory registers” of human agency in the Anthropocene that Dipesh Chakrabarty has explored in recent essays on climate change and postcolonialism: “as a geophysical force and as a political agent, as a bearer of rights and as author of actions; subject to both the stochastic forces of nature (being itself one such force collectively) and open to the contingency of individual human experience; belonging at once to differently-scaled histories of the planet, of life and species, and of human societies.”<sup>24</sup> Fractals thus help us to stretch our historical imagination and cultural criticism into multi-scaled and multi-agentic realms that lie beyond the Apollonian visions of spacewalkers, ones in which, as Carolyn Merchant notes, “the linear slips away into the uncertainty of the indeterminate—into discordant harmonies and disorderly order.”<sup>25</sup>

Most important for this essay is Blue Planet’s historical role in mediating North-South environmental diplomacy. Though McKibben is right to take rich industrial countries to task for their callous disregard at Copenhagen for the poor and vulnerable countries that will bear the brunt of global warming’s worst effects, cultural fascination with Blue Marble’s afterimages re-opens the fault lines between First World and Third World environmentalism already apparent at Stockholm.<sup>26</sup> Most scientists point to the period around 1750, when mineral-based forms of energy replaced organic ones in Great Britain and atmospheric CO<sub>2</sub> concentration levels went from 227 ppm in 1750 to 284 ppm in 1850, as the critical transition period from the Holocene to the Anthropocene. Many also refer to the period between 1950 and 2000 as the *Great Acceleration*, a time when world population doubled, neo-liberal economic systems triumphed, atomic testing scattered radionuclides across the globe, and CO<sub>2</sub> levels shot up by 58 ppm, from 311 ppm in 1950 to 369 ppm in 2000.<sup>27</sup> In Johan Rockström and Paul Crutzen’s accounts of the new epoch, human beings act as a *whole* like massive volcanic eruptions, an

<sup>23</sup> Ursula K. Heise, *Nach der Natur: Das Artensterben und die moderne Kultur* (Berlin: Suhrkamp, 2010), 149 and Timothy Morton, *Ecology without Nature: Rethinking Environmental Aesthetics* (Cambridge, Mass.: Harvard University Press, 2007). For the visioners of synthetic biology, nanotechnology, or geo-engineering, moreover, the end of Nature leaves us free to enhance ourselves technologically or physiologically—to imagine transhuman or parahuman (H+) futures guided by techno-philanthropists, free from viruses and replete with cloned versions of extinct species. See, for example, George M. Church and Edward Regis, *Regenesis: How Synthetic Biology Will Reinvent Nature and Ourselves* (New York: Basic Books, 2012) and Patrick McCray, *The Visioners: How a Group of Elite Scientists Pursued Space Colonies, Nanotechnologies, and a Limitless Future* (Princeton: Princeton University Press, 2012).

<sup>24</sup> Dipesh Chakrabarty, “Postcolonial Studies and the Challenge of Climate Change,” *New Literary History* 43, no. 1 (2012): 14-15. See also his article “The Climate of History: Four Theses,” in *Critical Inquiry* Winter (2009): 197-222.

<sup>25</sup> Carolyn Merchant, “Reinventing Eden: Western Culture as a Recovery Narrative,” in *Uncommon Ground*, ed. William Cronon (New York: W.W. Norton, 1995), 156.

<sup>26</sup> Ramachandra Guha and Juan Martínez Alier, *Varieties of Environmentalism: Essays North and South* (London: Earthscan, 1997).

<sup>27</sup> W. Steffen, J. Grinevald, P. Crutzen P. and J. McNeill, “The Anthropocene: Conceptual and Historical Perspectives,” *Philosophical Transactions. Series A, Mathematical, Physical, and Engineering Sciences* 369, no. 1938 (2011): 850-853.

extraterrestrial asteroid impact, or the cyanobacteria that initiated the Great Oxygenation Event over 55 million years ago—as a driver of planetary change at every scale.<sup>28</sup>

Yet *Anthropos* was hardly a unitary agent over the past two hundred years, since the increase in CO<sub>2</sub> levels stemmed almost entirely from the fossil fuel burning of wealthy OECD countries in Europe, North America, and East Asia.<sup>29</sup> By pushing our visual genealogy back to 1950, we can see how the emergence of the “global environment” at the dawn of the Great Acceleration largely marginalized the most momentous series of political events of that decade: decolonization in Africa and Asia. At landmark conferences such as geographer Carl Sauer’s 1955 Princeton Symposium “Man’s Role in Changing the Face of the Earth,” human geographers deployed aerial snapshots that elided the frictions between global, regional, and local scales and channeled a mosaic of storied Third World landscapes into a linear, universal, and negative environmental history of modernity in which Africa and Asia were doomed to recapitulate the West’s environmental profligacy.<sup>30</sup> The closing of the West’s imaginary frontier in Africa also coincided with the onset of the Great Acceleration and found expression in dozens of bird’s eye wildlife documentaries, the most famous of which were produced by the West German filmmakers Bernhard and Michael Grzimek. In the final sequences of their Academy Award-winning documentary *Serengeti Shall Not Die* (1959), the Grzimeks recast former colonialist game reserves as a “cultural heritage of mankind” over which “no man, black or white,” had sovereignty—a move toward postcolonial reconciliation that nonetheless jeopardized the customary land tenure of rural pastoralists and farmers. By the 1970s, the cybernetic vision of the Earth system had absorbed this de-humanized view of rural ecologies by depicting the world’s tropical ecosystems, whether the rainforests of the Amazon or the savannas of East Africa, as vital organs of a vast, self-regulating, and hierarchically organized physiology—and poor peoples as the main culprits of destruction through careless swidden agriculture and oversized families that stretched the earth’s carrying capacity far more than the industrial societies of the North.<sup>31</sup>

### Who Speaks for Earth?

At a recent Anthropocene exhibit at the Haus der Kulturen der Welt (HKW) in Berlin focused on the *Whole Earth Catalog*, the image of Earthrise graced the cover of the visitor pamphlet: “At the end of the 1960s, this photograph of the blue planet replaced the ‘mushroom cloud’ which had been the global icon of the post-war period and the Cold War,” wrote the organizers. “The view of the planet from outer space was an event of historical importance. It brought about a comprehensive change in consciousness and promoted new notions of a planetary unit and the

<sup>28</sup> On human agency and geological time, see Jan Zalasiewicz, Mark Williams, Alan Haywood, Michael Ellis, “The Anthropocene: A New Epoch of Geological Time?,” *Philosophical Transactions A: Mathematical, Physical and Engineering Sciences* 369, no. 1938 (2011): 835-841; Ben Dibley, “Nature is Us’: The Anthropocene and Species-Being,” *Transformations* no. 21 (2012): available online at [http://www.transformationsjournal.org/journal/issue\\_21/article\\_07.shtml](http://www.transformationsjournal.org/journal/issue_21/article_07.shtml), accessed 15 January 2014.

<sup>29</sup> Steffen et al., “The Anthropocene,” 852. On the disjunctures of different scales, see Anna L. Tsing, *Friction: An Ethnography of Global Connection* (Princeton, N.J.: Princeton University Press, 2005).

<sup>30</sup> W. L. Thomas Jr., ed. *Man’s Role in Changing the Face of the Earth*. In collaboration with Carl Sauer, Marston Bates, and Lewis Mumford (Chicago: University of Chicago Press, 1956). Chakrabarty develops the idea of a “negative universal history” in “The Climate of History,” 222.

<sup>31</sup> James Lovelock, *Gaia, a New Look at Life on Earth* (Oxford: Oxford University Press, 1979), 48-63.

'earth system.'"<sup>32</sup> According to Lazier, Stewart Brand, who famously appeared in a 1966 photograph with a button that read, "Why haven't we seen a photograph of the whole earth yet?" hoped that the view would work as a "hit of cultural acid, a trip he [later] helped abet with the cover of the *Whole Earth Catalog*. And Brand's expectations were vindicated."<sup>33</sup> Appearing at a time when earthbound horizons remained riven by Cold War rivalries, struggles for colonial independence, and fears of nuclear war, Blue Marble revealed a fragile, finite, and harmonious planet veiled by soft clouds and devoid of the familiar demarcation lines of human conquest and legislation.<sup>34</sup> Adding to Blue Planet's Whole Earth symbolism was its disruption of the traditional Western cartographic imagination, for even though the eastern Mediterranean, the "cradle of civilization," appears in the upper left corner, the majority of the image is occupied by regions traditionally rendered small in the Mercator projection: Africa, once regarded as the dark continent but revealed by Louis and Mary Leakey as the "birthplace of humanity" in 1959, the southern oceans, and a part of Antarctica. Freed from such Western distortions and the coordinating systems of the graticule, the earth appeared "at liberty to clothe itself anew in the natural hues of water, earth, and the softest veils of atmosphere."<sup>35</sup> For environmentalists, the image had a dual meaning: a finite spaceship with dwindling resources and expanding pollution, to be sure, but also a Whole Earth mother whose biosphere appeared harmonious and self-regenerating, offering the tantalizing possibility that sociocultural systems might return to a state of symbiosis with these organic coordinates.

The belief that Blue Marble had initiated a shift in human consciousness akin to the Copernican revolution was an important motif at Stockholm in 1972. At that time in the sixteenth century, noted economist Barbara Ward, co-author with René Dubos of *Only One Earth: The Care and Maintenance of a Small Planet*, "people had almost literally to turn their minds upside down ... in their passionate resistance to the idea, we can see a terrible sense of vertigo. It was as though they hardly knew where they were anymore. Cosy flat-earthers had to feel the horror of discovering that the planet is a precarious sphere." Such was the space-time horizon, she continued, in which earthlings found themselves in the 1970s: "We too are in one of those times of vertigo. We too live in an epoch in which the solid ground of our preconceived ideas shakes daily under our feet."<sup>36</sup> Yet destabilizing everyday assumptions

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<sup>32</sup> This text comes from the pamphlet introducing the exhibition "The Whole Earth: Kalifornien und das Verschwinden des Aussen," which ran at the HKW from 26.4 to 1.7. 2013. See also the *The Whole Earth: Kalifornien und das Verschwinden des Außen; Exhibition 26. April bis 1. Juli 2013, Haus der Kulturen der Welt, Berlin* (Berlin: Sternberg-Press, 2013).

<sup>33</sup> Lazier, "Earthrise," 616.

<sup>34</sup> Sheila Jasanoff, "Image and Imagination: The Formation of Global Environmental Consciousness," in *Changing the Atmosphere: Expert Knowledge and Environmental Governance*, ed. Clark A. Miller and Paul N. Edwards (Cambridge, Mass.: MIT Press, 2001), 310-311 and Ursula K. Heise, *Sense of Place and Sense of Planet: The Environmental Imagination of the Global* (Oxford; New York: Oxford University Press, 2008).

<sup>35</sup> Cosgrove, "Contested Global Visions," 278.

<sup>36</sup> Barbara Ward, René J. Dubos, and United Nations Conference on the Human Environment, *Only One Earth: The Care and Maintenance of a Small Planet* (New York: W.W. Norton, 1972). The quotations come from Ward's lecture "Only One Earth," in a series at Stockholm sponsored by the International Institute for Environmental Affairs and published as *Who Speaks for Earth?*, ed. Maurice F. Strong (New

appeared necessary to allow a new conceptual opening that “our poor old planet most desperately needs.”<sup>37</sup> Laurence Tribe, a constitutional scholar at Harvard Law School, remarked that the Blue Marble had ushered us toward a “fourth discontinuity,” as momentous for making the human ego aware of the physical limitations of the place it inhabits as the writings of Copernicus, Darwin, and Freud.<sup>38</sup>

When Earthrise first appeared on Christmas Day in 1968, it had little immediate ecological significance; instead, the Apollo mission symbolized America’s One World, post-nationalist imperium, an ideology that rested upon anti-communism, international free trade, and enlightened civic virtue as opposed to the violence and coercion of both old European and new Soviet empires. As reported in the press shortly after the image’s appearance, the crew had not planned to take such a stunning picture; as commander Frank Borman noted, “I happened to glance out of one of the still-clear windows just at the moment the Earth appeared over the lunar horizon. It was the most beautiful, heart-catching sight of my life, one that sent a torrent of ... sheer homesickness surging through me .... Raging nationalistic interests, famines, wars, pestilences don’t show from that distance,” he commented later, “We are one hunk of ground, water, air, clouds, floating around in space. From out there it really is ‘one world.’”<sup>39</sup> Borman’s comments, along with countless other circulars and press reports issued by NASA, drew on what Dennis Cosgrove describes as a “repertoire of sacred and secular, colonial and imperial meanings [that] have played an especially significant role in the self-representation of the post-war United States and its geo-cultural mission.”<sup>40</sup> The astronauts’ reliance on distance to grasp the totality of the sphere was already implicit in Ptolemaic cartography’s positioning of the observer at sufficient distance to see the spherical earth. The geometric perfection of the sphere, moreover, had rendered it a fitting symbol for Christendom and Empire since the fourth century, when Neoplatonists noted the congruent shapes of the terrestrial globe and the human eye, making gazing upon the globe a distinct form of symbolic mastery over space, as the lavishly decorated globes, atlases, and world maps from European Baroque courts attest.<sup>41</sup>

The Apollo mission was also deeply embedded in discourses of the frontier that were particular to the American experience of continental empire building. Noël Sturgeon has compared the forces driving America’s extraterrestrial expansion of the late 1960s to the “closing of the frontier” in 1893, a time when historian Frederick Jackson Turner postulated that America’s robust individualist democracy had emerged through immigrant Europeans’ confrontation with the harsh wilderness of the frontier. Such environmental determinism led to fears that the frontier’s closing was creating an overly urbanized, feminized, and physically degenerate society; soon thereafter, Theodore Roosevelt and others called for the development of national parks as a social hygienic tonic for the ills of civilization. In the 1960s, Sturgeon argues, spacewalkers folded this wilderness myth, with all of its attendant racist, masculinist, and militarist metaphors, back onto the whole planet as a new Nature to be objectified and

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York: Norton, 1973), 20-21. Ward missed here that Copernicus’s heliocentric revolution came centuries after the flat earth controversies of the ancient world.

<sup>37</sup> Ward, “Only One Earth,” in *Who Speaks for Earth?*, ed. Strong, 21.

<sup>38</sup> Noted in Jasanoff, “Image and Imagination,” 317.

<sup>39</sup> Quoted in Poole, *Earthrise*, 2.

<sup>40</sup> Cosgrove, “Contested Global Visions,” 270.

<sup>41</sup> Cosgrove, *Apollo’s Eye*, 1-15.

controlled. And just as national parks had once displaced indigenous people and poor whites to make way for nature-seeking urban tourists, so too did atomic testing and the space race produce toxic wastelands in Utah, Nevada, and New Mexico in which Native Americans were disproportionately poisoned and dispossessed.<sup>42</sup>

By 1972, when the Blue Marble image appeared, the protracted conflict in Vietnam, stagnating economic growth, and the increasing violence of civil rights and global anti-imperialist struggles led many young people on the New Left to detect the militarism that underlay the U.S. space mission and its One World free-trade imperialism.<sup>43</sup> Apollo 17 would be NASA's last manned lunar spaceflight, and just as crewmembers began winding down the first phase of lunar exploration, many registered a certain fatigue with their own extraterrestrialism. When admonished to take thirty seconds away from his work to look up at the earth, Harrison "Jack" Smith replied "'Aaah! You've seen one Earth, you've seen them all.'"<sup>44</sup> Such a blasé response leads Sheila Jasanoff to the question: did Blue Planet really alter human consciousness, as the Stockholm delegates asserted? Indeed, when the Nixon Administration's newly created Environmental Protection Agency unveiled its *Our Only World* traveling exhibit of photographic eco-images in 1974, just two years after Stockholm, the result would hardly suggest an embrace of Ward and Dubos's call for a serious grappling with limits to growth, a just redistribution of resources, or a critique of the imperialistic separation of the world into so-called developed and developing countries. Instead, the exhibit appealed to Anglo-Saxon individualist altruism—not a radical ecological re-structuring of society—and represented the lowest common denominator of environmental activism by presenting images of sewage treatment plants and air pollution test facilities that mitigated environmental damage, rather than prevented it.<sup>45</sup>

Once the exhibit went on the road, appearing, for example, at the Tokyo World Environmental Exhibition in 1976, it solidified the impression that the United States, the creator of Blue Planet and the first country to set up a comprehensive Environmental Protection Agency, would try to steer environmental diplomacy at the international level in its own interests. Yet American internationalism did little to amend the day-to-day environmental insults suffered by billions of the world's poorest citizens: "dirty air, polluted water, inadequate sanitation, infectious diseases, damaged crops, loss of green spaces, and the decay of built environments."<sup>46</sup> And just a few years later, President Reagan removed the solar panels from the White House, letting fledgling renewable energy programs languish in an orgy of deregulation and militarism that allowed the United States, with only four percent of the world's population, to consume 25 percent of its resources by 2000. The conflation of Whole Earth environmentalism with U.S. hegemony over resources has stalled cross-national

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<sup>42</sup> Noël Sturgeon, *Environmentalism in Popular Culture: Gender, Race, Sexuality, and the Politics of the Natural* (Tucson: University of Arizona Press, 2009), 80-102.

<sup>43</sup> Cosgrove, "Contested Global Visions," 285.

<sup>44</sup> Quoted in Jasanoff, "Image and Imagination," 322.

<sup>45</sup> Gisela Park, "Our Only World—An American Vision," in *Eco-Images: Historical Views and Political Strategies*, ed. Gisela Parak and Rachel Carson Center (Munich: Rachel Carson Center for Environment and Society), 53-60.

<sup>46</sup> Jasanoff, "Image and Imagination," 335.

cooperation again and again since 1972, especially when it comes to biodiversity protection, the law of the seas, and cross-boundary air pollution. As Jasanoff notes in this regard, Blue Planet “promises an imagined community as encompassing as the earth itself, but is this a community in which those without the power to patrol the heavens, to map and perhaps to devastate the earth, can ever meaningfully participate?”<sup>47</sup>

Many of those who attended the discussions and debates at Stockholm were keenly aware of these global divisions and contradictions, but hoped that the UN Summit would provide a forum for a serious discussion about global income inequality. For instance, in her lecture “Only One Earth,” Ward noted that Western nations had achieved success by early exploitation of the earth’s resources, “follow-my-leader” economics that enabled some wealth to “trickle down” to the less fortunate, and “social instruments of transfer” such as taxation, welfare, and insurance that prevented massive social unrest.<sup>48</sup> But such redistribution had failed on a global scale; “no quick bonanza awaits the ex-colonial countries,” she wrote, and countries that had gained nationhood only fifteen years ago would doubtlessly not welcome former colonial masters waltzing in with the message: “too bad, nationalism is out of date.”<sup>49</sup> For Dubos, the solution to this dilemma was “unity through diversity”—often watered down in popular parlance as “think globally, act locally.” But what Dubos really had in mind was a creative unity shaped by the full diversity of sociocultural adaptations to an array of environmental conditions, rather than a top-down assessment of humankind’s “biological” needs. With the earth fully colonized, management would entail differences of opinion based on value judgments, not simply facts.<sup>50</sup>

Unity through diversity presented an alternative framing of earthly connections, yet it offered little in the way of serious grappling with the legacies of imperialism that had created economic inequality and environmental degradation in the first place. Dubos flattened culture across vast power differentials, as if all human societies had equal access to a full range of adaptive strategies and technologies. As Karen Litfin has argued, “in an unequal world, globalism—including global science—is all too likely to mean white, affluent men universalizing their own experiences. Global problems are amenable to large data banks, to Big Science, to grand managerial schemes .... This ‘global view’ cannot adequately depict environmental problems because the impacts of these problems vary with class, gender, age and race.”<sup>51</sup> As was so often the case in the post-Bandung era, it fell to India, self-appointed leader of the non-aligned movement, to question the global view in the name of human difference. With images of the Blue Marble circulating widely on buttons and reports at Stockholm, Prime Minister Indira Gandhi delivered her electrifying speech that called into question One Earth eco-optimism. “I have had the good fortune of growing up with a sense of kinship with nature in all its manifestations,” noted Gandhi:

Birds, plants, stones were companions and, sleeping under the star-strewn sky, I became familiar with the names and movements of the constellations. But my deep interest in this,

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<sup>47</sup> Jasanoff, “Image and Imagination,” 335.

<sup>48</sup> Ward, “Only One Earth,” 23-25.

<sup>49</sup> *Ibid.*, 25.

<sup>50</sup> Dubos, “Unity through Diversity,” 33-42.

<sup>51</sup> Karen Litfin, *The Greening of Sovereignty in World Politics* (Cambridge, Mass.: MIT Press, 1998), 38.

our 'only earth,' was not for itself but as a fit home for man.... Along with the rest of mankind, we in India ... share your concern at the rapid deterioration of flora and fauna ... [But] many of the advanced countries of today have reached their present affluence by their domination over other races and countries, the exploitation of their own natural resources. They got a head start through sheer ruthlessness, undisturbed by feelings of compassion or by abstract theories of freedom, equality or justice ... The riches and the labour of the colonized countries played no small part in the industrialization and prosperity of the West.<sup>52</sup>

Incensed especially at the Club of Rome's call for limits to growth via population control measures in the developing world, Gandhi noted: "It is an over-simplification to blame all the world's problems on increasing population. Countries with but a small fraction of the world population consume the bulk of the world's production of minerals, fossil fuels and so on. Thus we see that when it comes to the depletion of natural resources and environmental pollution, the increase of one inhabitant in an affluent country, at his level of living, is equivalent to an increase of many Asians, Africans or Latin Americans at their current material levels of living."<sup>53</sup> Gandhi thus put her finger on the central contradiction of Blue Planet's cyber-optimism: from 22,000 nautical miles, raging nationalistic interests, famines, wars, and pestilences indeed "don't show." Yet was this lack of attention to the political ecology of alternative scales—whether national, regional, or local—the heart of the problem, the visual stumbling block on the road from Stockholm to Copenhagen?

### **A God's Eye Perspective: The Airman's Epistemology of the 1950s**

The awareness of humankind as the primary ecological and, now, geo-physical agent of the Earth system is not new to the Anthropocene, nor even the 1970s, as a visual genealogy that extends back to the 1950s reveals. At the dawn of the Great Acceleration, aerial photographs and documentary films—media which, like Blue Planet, had their origins in military cartography and imperialist ideology—began to reveal the full extent of anthropogenic shaping of the terrestrial environment. Such aerial images accelerated a trend already underway in human geography from environmental determinism to an analysis of human culture as an independent, and largely destructive, ecological agent. In the 1930s, hot air balloons reaching heights approaching 60,000 feet had achieved unprecedented views of the earth's surface, while in the 1940s, scientists at White Sands New Mexico strapped cameras to Nazi scientist Werner von Braun's captured V-2 rockets and were able to take photographs from about sixty-five miles up, resulting in grainy but stunning views of the earth's curvature from outer space.<sup>54</sup> Indeed, in his popular 1950 work, *The Nature of the Universe*, the astronomer Fred Hoyle had already imagined what a whole earth photograph might mean for a world divided by the Cold War and living in the shadow of nuclear war in the wake of Hiroshima: "once let the sheer

<sup>52</sup> Indira Gandhi, "Man and Environment," Speech delivered at UN Stockholm Conference in 1972. Full text available at: <http://lasulawsenvironmental.blogspot.com/2012/07/indira-gandhis-speech-at-stockholm.html>, accessed 15 January 2014. See also Mahesh Rangarajan, "Ideology, the Environment and Policy: Indira Gandhi," *India International Centre Quarterly* 33, no. 1 Summer (2006): 50-64.

<sup>53</sup> Gandhi, "Man and Environment."

<sup>54</sup> Poole, *Earthrise*, 56-81.

isolation of the Earth become plain to every man whatever his nationality or creed, and a new idea as powerful as any in history will be let loose. And I think this not so distant development may well be good, as it must increasingly have the effect of exposing the futility of nationalistic strife. It is in just such a way that the New Cosmology may come to affect the whole organization of society."<sup>55</sup> Long before Stewart Brand asked about a Whole Earth picture, photography, human geography, and geopolitics had prepared Western societies for an extraterrestrial eco-image, but did so in ways that tended to meld a kaleidoscope of distinctive bio-cultural landscapes into a homogeneous space of environmental impoverishment.

Images from balloons and V-2 rockets could never capture the popular imagination or become eco-images the way that Earthrise and Blue Planet would later do, partly due to the sheer distance the Apollo mission achieved, but also because a human being lay behind—and thus could guarantee the veracity of—the recorded event. As Gisela Parak has recently argued, there has long existed a tension between photographic practices' claims to mimetic truth and the "medium's ongoing tradition of staging events and its selectivity in pictorial reproductions of the world."<sup>56</sup> Yet in the 1950s, the heroic image of the airman—a legacy of the bombing campaigns of World War II—served as the foundation of geopolitical and environmental truth, paving the way for the ecological utopianism that later heralded Earthrise and Blue Planet as portraits of the earth *as it really is*. Airmen such as Charles Lindbergh in America and Italo Balbo in Italy had in the interwar years been heralded as modern Apollos, "youthful gods whose missions took them above and beyond the mundane life of earthbound mortals."<sup>57</sup> In Germany, Ernst Udet's photographs of East Africa as a landscape ripe for development or Leni Riefenstahl's far more menacing depictions of Hitler's plane descending through the clouds in *Triumph of the Will* (1935) all pointed the way toward the allure of the airman's gaze—at once romantic and mastering, sublime and surveilling, holistic and violent.<sup>58</sup>

Surveillance from the air also had a startling and unexpected effect that anticipated the eco-psychological vertigo that Barbara Ward later commented on at Stockholm: the disappearance of the outside through humankind's modification of the globe in every region and at every scale.<sup>59</sup> At the 1955 Princeton Symposium "Man's Role in Changing the Face of the Earth," for example, participants from a variety of disciplines pondered for the first time the significance of humans as the "ecological dominant on the planet" and the sense of finitude generated by the recognition that "the dichotomy of man and nature is ... an intellectual device and as such should not be confused with reality; no longer can man's physical-biological environment be treated, except in theory, as 'natural.'"<sup>60</sup> As John McNeill and others have

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<sup>55</sup> Fred Hoyle, *The Nature of the Universe; a Series of Broadcast Lectures* (Oxford: B. Blackwell, 1950). Cited in Poole, 37-38.

<sup>56</sup> Parak, "Introduction," in *Eco-Images* ed. Parak and RCC, 5.

<sup>57</sup> Cosgrove, "Contested Global Visions," 279.

<sup>58</sup> *Ibid.*, 279. On Udet, see Nina Berman, *Impossible Missions?: German Economic, Military, and Humanitarian Efforts in Africa* (Lincoln: University of Nebraska Press, 2004), 99-138.

<sup>59</sup> HKW, "The Whole Earth: Kalifornien und das Verschwinden des Aussen."

<sup>60</sup> William Thomas, Introductory, *Man's Role in Changing the Face of the Earth*, ed. William Thomas (Chicago: University of Chicago Press, 1956), xxxviii.

noted, the Princeton conference was a watershed in human perception of the Anthropocene, yet it has received strikingly little attention from environmental historians.<sup>61</sup>

The group that assembled in Princeton for a critical re-appraisal of George Perkins Marsh's momentous 1864 book *Man and Nature, or Physical Geography as Modified by Human Action* included a who's who of mid-century environmental thought: economist Kenneth Boulding, historical geographers Clarence Glacken and Karl Wittfogel, ecologist Paul Sears, urban critic Lewis Mumford, philosopher of evolution Pierre Teilhard de Chardin, and, especially, cultural geographer Carl Sauer. These men—and all the participants except for one were male—shared a sense, too, that they stood “at one of the decisive turning points in the history of humanity comparable to the domestication of animals, the invention of the earliest tools, the foundations of the first cities, and the conception of the heliocentric universe.”<sup>62</sup> Recognizing human beings as part of the cyborg earth we now associate with the Great Acceleration, however, required a change in perspective, perhaps not as spectacular as the Apollo rocket, but no less momentous: the airplane. “The conquest of the air enables mankind for the first time in its history to experience this interaction [between man and nature] in all its innumerable ramifications,” noted the German-Jewish modernist architect Erwin Anton Gutkind in his opening essay. “A new scale in time and space has been added to our mental and material equipment. Before this conquest we were winding our way like worms through narrow passages and seeing only more or less unrelated details. Today we can look at the world with a God's eye view, take in at a glance the infinite variety of environmental patterns spread over the earth.”<sup>63</sup> For Gutkind, schooled in the Bauhaus tradition of craftsmanship (*techne*), rather than purely applied technology (*Technik*), the synthesis afforded by the airplane was both technological and aesthetic, a scaling up of the creative faculties and environmental imagination at the same moment as humankind's destructive force was becoming evident.

For Gutkind, this new scale of appreciation was nonetheless of the intermediate kind: it had nothing to do “with the mock-heroic flights into space or the megalomaniac idea of launching artificial satellites which would revolve around the earth.” In a nod to Heidegger's fears about the globalization of the world picture, Gutkind continued: “The solution lies somewhere nearer to home and is less expensive. It lies within ourselves, but it may cost more effort to discover than the brave new world in the outer spaces of the heavens.”<sup>64</sup> Of critical importance for Gutkind was the disappearance of stable and isolated societies evident in the kaleidoscopic jumble of “seemingly incompatible transformations of the earth's surface”—what Ernst Bloch had earlier termed “the non-simultaneity of the simultaneous.”<sup>65</sup> And like Bloch, Gutkind—who had fled Berlin in 1935 for Paris, and later, the United States—feared that the greatest danger of non-simultaneity was not merely epistemological, but political: the potentially reactionary politics of the masses undergoing uneven modernization. Gutkind

<sup>61</sup> W. Steffen, *et al.*, “The Anthropocene,” 844.

<sup>62</sup> E. A. Gutkind, “Our World from the Air: Conflict and Adaptation,” in *Man's Role*, ed. Thomas, 2.

<sup>63</sup> *Ibid.*, 1.

<sup>64</sup> *Ibid.*, 3.

<sup>65</sup> On Bloch, see David C. Durst, “Ernst Bloch's Theory of Nonsimultaneity,” *The Germanic Review* 77, no. 3 (2002): 171-194.

referred to them as “mediocre” people, stuck in outdated nationalism and pressured by conformity to distrust revolutionary new insights.<sup>66</sup> Forging a new role for man in changing the face of the earth beyond his current excessive materialism—a sort of modernity 2.0—would lead to a “different and higher standard of control over the physical environment.” The responsibility for this transformation rested on conceptual bridges—forged by Kant’s understanding of the cognitive *a priori*, elaborated by Alfred North Whitehead’s then contemporary philosophy of integrative scientism, and mediated by the aerial view—between the individual and the universe, the “social microscope and the social telescope,” and science and philosophy. The pressure on those “few” who could recognize the patterns of such relationships was thus “tremendous.”<sup>67</sup> For this reason, the volume of essays that appeared under the title *Man’s Role in Changing the Face of the Earth* in 1956 read more as manifestos than conference proceedings whose dire warnings about resource depletion, species extinction, soil erosion, and overpopulation presaged the 1970s anxieties about the limits to growth.

While cybernetics and systems ecology would later dominate the discussion at Stockholm, *Man’s Role* represented the pinnacle of Carl Sauer’s morphological and historicist approach to evaluating the earth’s surface, one that many scholars call the “Berkeley School of Cultural Geography.”<sup>68</sup> The Berkeley School rejected both the quantitative spatial science of economic geography and early twentieth-century orthodoxies of climatic environmental determinism in favor of a synoptic, visual examination of landscape patterns across varying regions and scales.<sup>69</sup> Sauer was especially interested in the anthropogenic shaping of natural vegetation by activities such as agriculture, fire, livestock grazing, mining, and gathering among indigenous peoples in the Americas before the era of European colonialism. From these interests, he developed the concept of “agricultural diffusionism,” which proposed that agricultural systems in the Americas had emerged in the hilly, riverine terrain of the humid rain forests of Central America, where hunting and gathering societies had developed a degree of leisure to experiment with plant domestication, and then spread to other, less hospitable environments, such as the U.S. Southwest.<sup>70</sup>

In separating agriculture’s origins from its dispersal, Sauer’s approach posited the physical environment as catalyst, rather than a determinant, of human responses and adaptation. As he wrote in his landmark 1925 essay “The Morphology of Landscape,” the cultural landscape was a topography “fashioned from a natural landscape by a culture group. Culture is the agent, the natural area is the medium, the cultural landscape the result.”<sup>71</sup> By the 1930s, Sauer began to worry that such anthropogenic shaping of the earth’s surface had gone

<sup>66</sup> Gutkind, “Our World from the Air,” 3.

<sup>67</sup> *Ibid.*, 3.

<sup>68</sup> On Sauer and the Berkeley School, see William W. Speth, *How It Came to Be: Carl O. Sauer, Franz Boas and the Meanings of Anthropogeography* (Ellensburg, Wash.: Ephemera Press, 1999), 61-80 and Thomas Lekan and Thomas Zeller, “Region, Scenery, and Power: Cultural Landscapes in Environmental History,” in *Oxford Handbook of Environmental History*, ed. Andrew Isenberg (New York: Oxford University Press, 2014), 341-344.

<sup>69</sup> “Morphology: The Agency of Man on Earth,” in *Man’s Role*, ed. W. L. Thomas Jr., 49-69. See also Speth, *How It Came to Be*, 3-30.

<sup>70</sup> Sauer, *Agricultural Origins and Dispersals* (New York: American Geographical Society, 1952).

<sup>71</sup> Sauer, “The Morphology of Landscape,” reprinted in *Land and Life: A Selection from the Writings of Carl Ortwin Sauer*, ed. John Leighley (Berkeley: University of California Press, 1963), 315-350.

awry and, citing Marsh, worried about humankind's destructive exploitation of the earth's resources, particularly the depletion of fresh water, deforestation, chemical pollution, soil exhaustion, desertification, and especially urbanization. This shift in emphasis—from descriptive landscape morphology to an environmentalist critique of ecological degradation—was already evident in his 1938 essay "Theme of Plant and Animal Destruction in Economic History," in which Sauer took social theorists to task for neglecting the "natural history of man," which, he argued, demonstrated "the revenge of an outraged nature" rather than a facile "mastery of man over his environment."<sup>72</sup> Sauer traced the disruption of the "symbiotic balance" between humans and the land all the way back to the Neolithic revolution, but he found his most appalling examples of wanton destruction in the Americas, where European colonialism had left a string of environmental catastrophes in its wake, from the decimation of aboriginal peoples through epidemic diseases to the destruction of the passenger pigeon and the buffalo to the more recent Dust Bowl. "These are a few notes toward a history of the modern age," he wrote. "The modern world has been built on a progressive using up of its real capital."<sup>73</sup>

Gutkind shared Sauer's interest in anthropogenic diffusion across the earth's surface, but of a more modern, industrial, and urban kind. Gutkind envisioned the airplane as the key instrument of a new "social ecology" that applied the principles of animal synecology—the relations of animals to their habitats—to human civilizations, both of which needed to be studied "as a *whole* in their *total* relationship to their physical and social environment."<sup>74</sup> The de-territorialization of the God's eye perspective enabled the viewer to find underlying patterns amidst the chaos of sensory data; citing Goethe's *Die Farbenlehre*, Gutkind noted that "A century which relies only on analysis and seems to be afraid of synthesis is not on the right way; for only both together, like breathing in and breathing out, form the essence of science."<sup>75</sup> As an architect and urban planner with close ties to Mumford, what pained Gutkind most was the "unsystematic growth," "excessive size," and "amorphous structure" of cities that had lost their internal equilibrium as well as their organic ties to the surrounding countryside. By using side-by-side photographs of "organic" and "unsystematic" human settlements across vastly different regions, Gutkind perceived the unfolding drama of social revolution across the globe—from the closely-knit "I-Thou" communities of mutual adaptation between residents and with the environment to the atomized "I-It" estrangement of modern society.<sup>76</sup>

The bird's eye visualization of this shift—from the *Gemeinschaft* (community) of tightly knit "traditional huts" of the village of Bari in Sudan or the small farmsteads of Liminka on the Gulf of Bothnia in Finland to the *Gesellschaft* (society) of copper miners' regimented huts in the Belgian Congo or American suburban tract housing—signified for Gutkind a mid-century homogenization of space akin to the high modernist aesthetic detailed in James Scott's *Seeing*

<sup>72</sup> Sauer, "Theme of Plant and Animal Destruction in Economic History," in *Land and Life*, ed. Leighley, 145.

<sup>73</sup> *Ibid.*, 148.

<sup>74</sup> Gutkind, "Our World from the Air," 7.

<sup>75</sup> *Ibid.*, 2.

<sup>76</sup> *Ibid.*, 12-27. A summary of Mumford's critique of urban modernism is found in his classic *The City in History: Its Origins, Its Transformations, and Its Prospects* (New York: Mariner Books, 1968).

*Like a State*.<sup>77</sup> Yet it also echoed the visual strategies of conservative-turned-National Socialist architect Paul Schultze-Naumburg, whose multi-volume work *Die Gestaltung der Landschaft durch den Menschen* [*Mankind's Shaping of the Landscape*] is mentioned as an inspiration in the book's preface—but without commentary on how Schultze-Naumburg's 1928 work *Kunst und Rasse* [*Art and Race*] used similar techniques to reveal Germany's supposed biological degeneracy and racial decline.<sup>78</sup> In the context of the 1950s, this obscuring of the racist genealogy of eco-images had momentous consequences for mid-century landscape conservation. For Gutkind, Sauer, and Mumford, the airman's epistemology gave access to eco-mimetic truth: humankind's destructive use of its natural capital across the globe. Yet this declensionist narrative of environmental modernity also projected anxieties about spatial homogenization and social-psychological alienation in Berlin and Chicago onto Kinshasa and Nairobi without attending to the awkward and heterogeneous frictions of global encounters at varying scales and perspectives.<sup>79</sup> By subsuming Africa and Asia into a negative history of modernity right at the brink of decolonization, moreover, the essays in *Man's Role* unwittingly re-authorized a green imperial gaze that situated modernization as an inexorable cultural process outside human agency or the asymmetries of global political economy.<sup>80</sup> In such a scenario, decolonized peoples surely could not be trusted to serve as stewards of their wildlife heritage and primeval landscapes, for colonialism had left them just too vulnerable to the seductions of Western modernity and without the Apollonian tools necessary to mimic a God's eye view of their plight.

### **African Nature as Heritage of Mankind**

The heteroglossia of aerial images from Africa also shaped wildlife documentaries, where nostalgia for the imagined last frontier tended to occlude imperialist legacies and ongoing struggles for independence in favor of Edenic narratives structured around neo-Malthusian fears about the threat of indigenous peoples to fragile rain forests and savannas. In Bernhard and Michael Grzimek's 1956 film *Kein Platz für Wilde Tiere* [*No Room for Wild Animals*], for example, the Frankfurt Zoo director and his filmmaker son portray the dangers of human overpopulation with an opening graphic frame that depicts Earth from space as a red, glowing ball.<sup>81</sup> As the camera zooms in on this planet, allegorical figures of Adam and Eve appear, and

<sup>77</sup> James C. Scott, *Seeing like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998).

<sup>78</sup> Paul Schultze-Naumburg, *Die Gestaltung der Landschaft durch den Menschen* (Munich: G. D. W. Callwey, 1922); *Kunst und Rasse* (Munich: Lehmann, 1928).

<sup>79</sup> On the "frictions" of contingent local-regional-global couplings, see Tsing, *Friction*, 1-20; 88-112.

<sup>80</sup> On the use of peripheries in metropolitan environmental mobilization, see Grove, *Green Imperialism*.

<sup>81</sup> Bernhard Grzimek and Michael Grzimek, *Kein Platz für Wilde Tiere*. Original release Okapia Films, GmbH 1956. (DVD version: Berlin: Universal Music Family Entertainment, 2004). There is a growing literature on the Grzimeks' 1950's films and their legacy for twentieth-century conservation, including Franziska Torma, *Eine Naturschutzkampagne in der Ära Adenauer: Bernhard Grzimeks Afrikafilme in den Medien der 50er Jahre* (Munich: Martin Meidenbauer, 2004), 130-132; Johannes Paulmann "Jenseits von Eden: Kolonialismus, Zeitkritik und Wissenschaftlicher Naturschutz in Bernhard Grzimeks Tierfilmen der 1950er-Jahre," *Zeitschrift für Geschichtswissenschaft* 56, no. 6 (2008): 541-560; and Thomas Lekan, "'Serengeti Shall Not Die': Bernhard Grzimek, Wildlife Film, and the Making of a Tourist Landscape in East Africa," *German History* 29, no. 2 June (2011): 224-264.

begin to multiply. Humanity slowly spreads across the earth—reaching only 800 million by 1800—but mushrooms at the dawn of modernity and modern medicine to crowd out the entire planet with expressionist skyscrapers, skeletal figures resembling the terrifying motif in Edvard Munch's *The Scream*, and an atomic bomb explosion. The film then moves onto documentary footage from Léopoldville (today's Kinshasa) and Nairobi, where narrator Victor de Kowa explains that the “children of technical science” have crisscrossed the African continent with roads, railways, and hydroelectric dams, replacing the “abode of gods, snakes, and demons” with the “signal of our age”: the traffic light. Alongside a scene of Congolese begging from a moving truck, de Kowa chastises the West for inviting Africans to share our “progress” and participate in the “culture of the day after tomorrow.” There is no reference here to the Congo's impending independence or the historical legacies of colonialism that might have caused or perpetuated the asymmetries and inequalities depicted in the film. Indeed the book version of *No Room* lauds the notoriously cruel King Leopold II for his efforts to end the slave trade in Central Africa. What matters here is the Malthusian balance of space and resources: where there was increasingly no room for virgin nature, for human children, and “above all, no room for wild animals.”<sup>82</sup>

The middle sequences of the film contrast completely with the diseases of civilization portrayed in the opening. Here, scenes taken in Albert National Park and the Ituri Forest reveal a “forbidden paradise” into which “no one, white or coloured, may step.” In this “animal fairyland” far from the killing fields of the Third Reich, the creatures live “unfettered by strife” among the different species; even when a poisonous viper kills and eats a field mouse in one night sequence, it does so with as little pain as possible, and without any “perverse thoughts of torture,” notes the narrator.<sup>83</sup> The contrast between a terrestrial Eden and the encroachment of Western modernity is mediated by sequences of indigenous peoples treated as endangered species: the Mbuti, “fairy like dwarves” who inhabit the Ituri Forest.<sup>84</sup> Their doom is signified by “Negro” (read: Bantu-speaking) timber workers, who don Western suits, count out a stack of “greasy notes,” and offer a goat in exchange for two pygmy girls. The next scene reveals the result; a throng of mixed-race “beggars” who line the forest roads leading out of Ituri, blissfully unaware that “money must be earned”—underscoring, as in the scenes of urban panhandling, that African penury is a product of land scarcity and overpopulation generated by pathological modernization. But the irony of the Grzimeks' search for wilderness and eugenic purity is that their journey only achieves emotional resonance through an array of technological mediations—a Ford truck, the camera, the dart gun, and particularly, the airplane—that exemplify the very forces of civilization that they abhorred. “Former zoo directors never went to Africa or overseas,” he remarked proudly in his 1973 autobiography, as steamship journeys lasted months, whilst a flight from the new European hub of Frankfurt to Léopoldville took only about fifteen hours.<sup>85</sup> The shifting of scales from an irradiated globe to decadent cities on the

<sup>82</sup> Bernhard Grzimek, *Kein Platz für Wilde Tiere* (Munich: Kindler, 1954), 97-106.

<sup>83</sup> On the Grzimeks' filmic “coming to terms” with the Nazi past, see Torma, *Naturschutzkampagne* and Lekan, “‘Serengeti Shall Not Die,’” 246-252.

<sup>84</sup> On the Mbuti, see Grzimek, *Kein Platz*, 177-196 and the film sequence: 35:54-54:59.

<sup>85</sup> Bernhard Grzimek, *Auf den Mensch gekommen: Erfahrungen mit Leuten* (Munich: Gütersloh, 1974), 250.

ground parallels the topographic homologies of the aerial images in *Man's Role*, suggesting that Africa was doomed to suffer the same fate of the "developed" world without immediate intervention. But intervention here meant saving only innocent and autochthonous animals and their Edenic terrestrial homes; hunter-gatherers like the Mbuti were doomed to extinction, and most other Africans were irrevocably fallen, corrupted by colonialism and the seductions of consumer modernity: dance halls, cars, and modernist architecture.

The visual coupling of the fallen African/innocent animal achieved even more dramatic aerial visualization in the Grzimeks' next film, *Serengeti Darf Nicht Sterben* [*Serengeti Shall Not Die*] (1959), which replaced Technicolor close-ups of orchids and painted Mbuti bodies in the Ituri with wide angle shots of the treeless Serengeti Plains. Like the trip in *No Room*, the Grzimeks' journey to northern Tanganyika began in 1957 under the auspices of science: the pioneering deployment of small aircraft to conduct an aerial census and map the great migration of wildebeest, as well as draw connections between plant geography and animal distribution.<sup>86</sup> The Grzimeks' research was intended to call into question a 1958 British colonial government plan to divide off the Ngorongoro Crater and highlands from the existing borders of the Serengeti National Park in order to establish a permanent homeland for Maasai pastoralists, a concession to colonial subjects prompted by fears of the Mau Mau rebellion in nearby Kenya.<sup>87</sup> For the Grzimeks, the Ngorongoro was a "natural zoo" designed by God to hold Africa's relic animals; their goal was to justify park boundaries that followed the cycles of nature rather than the vagaries of politics. But their research also rested on the Malthusian view that the Maasai and their cattle were growing out of proportion to the Serengeti's delicate carrying capacity. Having used tin from petroleum canisters to reinforce their *bomas* and refusing to hunt with bows and arrows, moreover, the nomadic and pastoral Maasai, unlike the Mbuti, were clearly on the path to Western corruption. "You cannot keep men, even black and brown ones, from multiplying and cannot force them to remain 'primitive,'" Grzimek remarked. "No men, not even native ones, should live inside [a national park's] borders."<sup>88</sup> In the film's final scenes, the narrator makes a plea to movie-goers that frames the "last remaining herds in Africa" as "a cultural heritage of mankind" like the "Acropolis, St. Peter's, or the Louvre in Paris," that "no man—black or white—should ever be allowed to endanger."<sup>89</sup> Michael Grzimek died during the final stages of filming when his small plane collided with a griffon vulture. His gravesite, which stands on the rim of the Ngorongoro Crater, signaled his martyrdom and lent further moral legitimacy to the animal protection cause: "he gave all he possessed, including his life, for the wild animals of Africa."<sup>90</sup>

Tobias Boes has argued that the Grzimeks supported this conservationist view of a human-free wilderness with a visual strategy that included numerous shots of stampeding herds shot from the cockpit, low-flying sequences in which the Grzimeks' plane, D-Ente, seems to

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<sup>86</sup> Bernhard and Michael Grzimek, *Serengeti darf nicht Sterben: 367,000 Suchen einen Staat* (1959; repr. West Berlin: Ullstein, 1961).

<sup>87</sup> Roderick Neumann, "Ways of Seeing Africa: Colonial Recasting of African Society and Landscape in Serengeti National Park," *Ecumene* 2, no. 2 (1995): 149-169.

<sup>88</sup> Bernhard and Michael Grzimek, *Serengeti*, 225.

<sup>89</sup> Bernhard Grzimek, *Serengeti Darf Nicht Sterben* (Okapia Productions, 1959). The film has been redistributed by Family Entertainment (Berlin, 2004).

<sup>90</sup> Torma, *Naturschutzkampagne*, 130-132.

immerse itself in flocks of birds, and soaring sequences in which the plane appears to hang in mid-air.<sup>91</sup> Boes views this latter form of aerial de-territorialization as the most critical to *Serengeti*, for with it “familiar landscapes are transformed into arabesques rather than a measuring, calculating imperial gaze over unclaimed territory”—a subject position that could only be achieved by a “disincarnate” perspective akin to that of an astronaut: the fallen Michael Grzimek.<sup>92</sup> This new form of planetary consciousness, Boes avers, paved the way for the popular resonance of *Blue Marble* and culminated in the 1972 ratification of the world heritage convention.

Yet the concept of the cultural heritage of mankind was not new. It had deep legacies in the bourgeois civilizing project, where prevention of cruelty to animals had long been part of efforts to control the working classes and religious minorities. Wildlife conservationists had also expanded the colonial state’s territorial control over space through game reserves designated for white hunters able to afford the requisite licenses.<sup>93</sup> During the interwar period, the Swiss conservationist Paul Sarasin pressured the League of Nations to extend the concept of world environmental heritage further by restricting the trade in bird feathers, and in the 1960s, Western NGOs argued that young African states could prove their entry into the circle of civilized nations by setting aside land from resource extraction.<sup>94</sup> Yet the displacement of the Maasai from the Serengeti served another purpose: the expansion of tourist habitat facilitated by jet airline service. The popularity of Grzimek’s television series *A Place for Animals* and ever-rising zoo attendance signaled to Grzimek that a new era had begun in which the photo safari, designed for the mass tourist, would replace the hunting safari of early twentieth-century elites. “Comparatively few tourists come to Africa nowadays to *shoot* animals,” Grzimek noted. “There are already tens of thousands who would rather see them in their wild state than in zoos.” With the development of ever-cheaper jet airlines, he continued, “you should be able to get to Nairobi from London in a few hours ... and our children ... will travel to Central Africa more cheaply and quickly than our parents did to France or Italy.”<sup>95</sup> Like most other Western conservationists of the 1950s, Grzimek was counting on these nature tourists to flock to Africa and replace potential earnings from cash crops and mining exports, as well as wean African nations off subsistence pastoralism. But here again, tourism—a key product of the Earthrise era—hastened the transformation of the Serengeti into a dehumanized relic of a formerly robust bio-cultural landscape. Highly managed, highly poached, and highly policed, the Serengeti now stands as a foretaste of the earthly nature we will increasingly encounter in the Anthropocene.

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<sup>91</sup> Tobias Boes, “Political Animals: *Serengeti Shall Not Die* and the Cultural Heritage of Mankind,” *German Studies Review* 36, no. 1 (2013): 41-59.

<sup>92</sup> *Ibid.*, 52.

<sup>93</sup> Bernhard Gissibl, “German Colonialism and the Beginning of International Wildlife Conservation in Africa,” *German Historical Institute Bulletin*, Supplement 3 (Washington, D.C., 2006): 121-144.

<sup>94</sup> Lekan, “‘Serengeti Shall Not Die’, 240-245; 260-261; Anna-Katharina Wöbse, “Oil on Troubled Waters? Environmental Diplomacy in the League of Nations,” *Diplomatic History* 32, no. 4 (September 2008): 519-537.

<sup>95</sup> Grzimek, *Serengeti*, 234.

### Scales of Justice: Toward a Fractal Earth

Does the Grzimek example mean that the airman's perspective is always colonialist and totalizing? Quite the contrary. In the 1990s, as political ecology emerged as an interdisciplinary project to challenge colonialist legacies of nature conservation, environmental historians, anthropologists, ecologists, and geographers actively sought out and reinterpreted archival photographs dating back to colonial times—supplemented by multiple-scaled and long-term series data from satellite images, Geographic Information Systems (GIS), and on-the-ground ethnographies—to frame a situated, postcolonial empiricism.<sup>96</sup> Such long-term series data challenged Grzimek and other mid-century conservationists' Malthusian prognoses, particularly the idea of a stable climax community or fixed carrying capacity for humans and animals on the ever-changing mosaic of the East African savannas. As Robin Mearns and Melissa Leach argued in the introduction to their now classic book *The Lie of the Land: Misreading the African Landscape*, snapshot views of the landscape, taken on fly-by missions and without ethnographic understanding of local land use perspectives, had led researchers to blame rural Africans for long-term periodic changes that had little to do with anthropogenic land use.<sup>97</sup> "One common denominator of the received ideas considered here," they wrote,

is that they rest on neo-Malthusian assumptions concerning the relationship between society and environmental change. The symbolism of neo-Malthusian images is deeply embedded in Western popular culture and religion. With the advent of space travel in the late 60s, the newly projected image of the earth from space gave rise to the icon of spaceship earth, which so emphatically conveyed the impression of a fixed natural resource base and inspired the 1970s environmental movement ... But these were merely after-images of islands and gardens, equally potent global analogues from the European colonial past ... The land, or rather certain representations of it—can indeed lie.<sup>98</sup>

Leach and Mearns call for a "democratization of expertise" in which Africans are recognized as active participants in policy decisions about land use and environmental conservation.

Exposing the "lies" of the aerial view required a sea change in the way ecologists thought about ecosystems themselves: as vibrant, fluctuating, complex patchworks that never reach a point of equilibrium.<sup>99</sup> This so-called ecology of chaos—popularized in James Gleick's 1990 book *Chaos* but known in scientific circles as the study of non-linear or complex systems—was first theorized not so much in the air as on the computer screen, through

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<sup>96</sup> On the revolutions of sight and politics enabled by such technologies, see Laura Kurgan, *Close Up at a Distance: Mapping, Technology, and Politics* (New York: Zone Books, 2013).

<sup>97</sup> Melissa Leach and Robin Mearns, *The Lie of the Land: Challenging Received Wisdom on the African Environment* (London: International African Institute, 1996), 14.

<sup>98</sup> Leach and Mearns, *The Lie of the Land*, 4.

<sup>99</sup> See S. T. A. Pickett and P. S. White, eds., *The Ecology of Natural Disturbance and Patchwork Dynamics* (San Diego: Academic Press, 1985), which challenged Howard Odum's homeostatic systems approach in *An Introduction to Systems Ecology*. Revised Edition. (Boulder: University Press of Colorado, 1994).

information feedback loops known as functional iteration.<sup>100</sup> As population biologist Robert May noted in his 1976 paper “Simple Mathematical Models with Very Complicated Dynamics,” even the most basic equations in ecology—such as those predicting next year’s animal population on the basis of this year’s surveys—produced chaotic behaviors in which there was no correspondence between initial and future values. These infinitely bifurcating graphs did reveal small islands of order and repetition at different levels of scale—a phenomenon known as recursive symmetry—but these did not create the expected periodicity that would allow predictability in any conventional sense.

There is still a tendency on the part of most ecologists to interpret apparently erratic data as either stochastic ‘noise’ or random experimental error. There is, however, a third alternative, namely, that wide classes of deterministic models can give rise to apparently chaotic dynamical behavior ... Our aim is to alert would-be modelers in ecology to the snake-in-the-mathematical-grass called ‘bifurcations’ and to the subtle and disturbing consequences it can have for the relation between ecological theory and experiment.<sup>101</sup>

Indeed in the Lotka-Volterra equation that models predatory-prey relationships (for example, the wolves and moose on Isle Royale in Lake Michigan), population ecologists found that even minute differences in the initial conditions—entering 3.0 versus 2.7—resulted in bifurcations that could result in wide fluctuations from the initial parameters. The result had a startling effect on the way scientists viewed real world animal populations: fluctuations were no longer anomalies or noise that could be filtered out or set aside as statistically insignificant.<sup>102</sup> As Donald Worster wrote in 1988, “Lovelock’s globe looks like a remarkably stable place, with organisms maintaining conditions highly suitable for life over a billion years ... that may be how things look to the cosmic eyeball. Stand on any given acre in North America and contemplate its past thousand years or so, even a single decade, and the conclusion ecologists are coming to these days is change, change, change.”<sup>103</sup> In the decades to come, complexity theory attuned ecologists and land managers to how such population dynamics and patchwork habitats produced far more robust and resilient ecosystems—chaos, in this sense, revealed a deeper magnitude of order.<sup>104</sup>

The fact that mapping these recursive strategies revealed small islands of system-like behavior—in the form of self-similar fractals—has become the subject of much artistic,

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<sup>100</sup> Gleick, *Chaos*, 61-64; Paolo Palladino, “Defining Ecology: Ecological Theories, Mathematical Models, and Applied Biology in the 1960s and 1970s,” *Journal of the History of Biology* 24, no. 2 Summer (1991): 223-243.

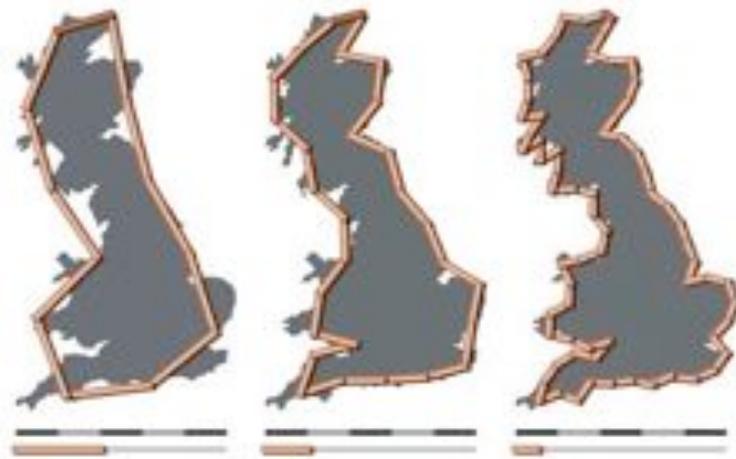
<sup>101</sup> Robert May, “Bifurcations and Dynamic Complexity in Simple Ecological Models,” *The American Naturalist* 110, no. 974 (1976): 573.

<sup>102</sup> Daniel B. Botkin, *Discordant Harmonies: A New Ecology for the Twenty-First Century* (New York: Oxford University Press, 1990), 27-50.

<sup>103</sup> Donald Worster, “Doing Environmental History,” in *The Ends of the Earth: Perspectives on Modern Environmental History*, ed. Donald Worster and Alfred W. Crosby (Cambridge: Cambridge University Press, 1988), 297.

<sup>104</sup> Johan T. du Toit, Harry Biggs, and Kevin H. Rogers, eds., *The Kruger Experience: Ecology and Management of Savanna Heterogeneity* (Washington, D.C.: Island Press, 2003).

philosophical, and scientific contemplation about deeper forms of order in nature and society. Fractals emerge in the mapping of chaotic systems due to topological folding—that is, two points can end up close to one another or far apart because of the stretching, pulling, twisting, or bending of multi-dimensional phase space, akin to a blob of food dye being stretched and refolded into a piece of bread dough until it consists of many layers of blue and white.<sup>105</sup> Discovered by the MIT professor Benoit Mandelbrot in the 1960s, fractal topographies—coming from the Latin *fractus*, or broken or uneven—connote topological dimensions that fall between two integers, producing recursive self-similarity and complexity at every scale. In Mandelbrot’s most famous example, the coastline of Britain, he explores a central paradox: the measured length of a stretch of coastline depends on the scale of measurement.



**Figure 5** “The Coastline Paradox.” This image from Mandelbrot’s 1967 paper models the coastline paradox: the property that the measured length of a stretch of a deeply indented coastline like Great Britain’s depends on the scale of measurement. Smaller scales reveal new details, down to the ever-shifting grains of sand, *ad infinitum*. Image from the Wikimedia commons (<http://upload.wikimedia.org/wikipedia/commons/2/20/Britain-fractal-coastline-combined.jpg>)

For even if we choose the smallest increment of measurement—the slow trail of a snail along the deeply indented bays, rocks, and sand beaches—we could never reconcile that measurement with all the others at different scales into a satisfying result. Quoting a French saying at the end of his 1967 essay, Mandelbrot noted: “what is true on one side of the Pyrenees is false on the other.”<sup>106</sup>

The sciences of the Anthropocene are not so much concerned with earthbound non-linearity, speaking instead of “tipping points”: planetary boundaries beyond which the entire earth system can shift, irreversibly, from one state to another. Yet as we contemplate the ecological and ethical ramifications of the Anthropocene, fractals do challenge any simplistic homogenizing or scalar reconciliation of the local and the global—and point to an inexhaustibly exuberant nature beyond doomsday narratives of finitude, revenge, or atonement. The resurgence of the Blue Planet photographs expresses yearnings for the “physical

<sup>105</sup> Gleick, *Chaos*, 51-53; 252-255. J. P. Crutchfield, J. D. Farmer, and B. A. Huberman, “Fluctuations and Simple Chaotic Dynamics,” *Physics Reports* 92 (1982): 51-53.

<sup>106</sup> Mandelbrot, “How Long is the Coast of Britain?,” 68.

sensuousness of a wet and blue-green Earth"<sup>107</sup> that also seems oddly anachronistic in light of the multitudinous geospatial layers of Google Earth, a digitized platform that has replaced Blue Planet as an index of the globe in our contemporary popular media. As Ursula Heise, Stefan Helmreich, and Jason Farman have recently noted, Google Earth virtualizes the analog image of a floating ball in space, enabling a "zoom-in-zoom-out" aesthetic that invites non-professional "users"—not disembodied voyeurs—to debate and augment representations of the world, thus subverting the authorial software's "master narratives" through participatory geographical constructions.<sup>108</sup> Astronauts, Cold War science, and neoplatonic spheres no longer dominate this global imaginary; moreover, the interaction of users across different scales and locations creates what Helmreich calls "an index for multiple and socially various interpretations and interventions; its thicket of satellite images, text legends, and street-level photographs can all be tagged, commented upon, modified."<sup>109</sup> Media scholars caution that Google Earth relies on a geospatial infrastructure of data compiled from military satellites, aerial photographs, government censuses, and corporate advertisers, and many observers have objected to both the surveillance capacities of roving satellite views and the blockage of politically sensitive installations. None of these data are truly free, either; most derive from historically tax-payer funded sources and the voluntary labor of users, and yet become the intellectual property of Google once formatted and layered for the Google platform.<sup>110</sup> In this sense, writes Helmreich, "Google Earth ... shares with Spaceship Earth something of the quality of a fetish, a shimmering image meant to be consumed, perhaps as an icon of nostalgia for an Earth we may be about to lose."<sup>111</sup> And yet the multitude of scales, street views, and networking possibilities in Google Earth have undeniably hastened the democratization of Nature and fostered grassroots political organizing within a fully networked world, as activists' use of the platform to track radiation hotspots emanating from the Fukushima nuclear accident have revealed.<sup>112</sup>

The zooming in and zooming out on Google Earth instantiates the fractal, as landscapes reveal uneven surfaces and complexity at every scale. While users perceive such recursive patterns on the computer screen, they can also just as easily step outside and view recursive symmetry in snowflakes, heads of broccoli, or nautilus shells.<sup>113</sup> The image of a Fractal Earth

<sup>107</sup> Donna Haraway, "Cyborgs and Symbionts," quoted in Helmreich, "From Spaceship Earth to Google Ocean," 1217.

<sup>108</sup> Heise, *Sense of Place*, 17-67; Helmreich, "From Spaceship Earth to Google Ocean," 1219; Jason Farman, "Mapping the Digital Empire: Google Earth and the Process of Postmodern Cartography," *New Media and Society* 12, no. 6 (2010): 869-888.

<sup>109</sup> Helmreich, "From Spaceship Earth to Google Ocean," 1211.

<sup>110</sup> See Lisa Parks, "Earth Observation and Signal Territories: Studying U.S. Broadcast Infrastructure through Historical Network Maps, Google Earth, and Field Work," *Canadian Journal of Communication* 38, no. 3 (2013): 294-299 and Siva Vaidhyanathan, *The Googlization of Everything* (Berkeley, Calif.: University of California Press, 2011).

<sup>111</sup> Helmreich, "From Spaceship Earth to Google Ocean," 1219.

<sup>112</sup> Jonathan Soble, "Google zooms in on Fukushima ghost town," *Financial Times Online*, 27 May 2013, at <http://www.ft.com/cms/s/0/54f2d386-96c5-11e2-8950-00144feabdc0.html#axzz3GcMqYjDo>. Accessed 19 October 2014.

<sup>113</sup> Users can also choose phenomenological investigations of broadcast infrastructures themselves to ponder media ecologies. See Parks, "Earth Observation," 299-303.

thus prompts a conversation between digital and ocular mediation at a variety of scales and acknowledges, accordingly, that non-human nature can be what Donna Haraway calls an unexpected “trickster”—resisting, reshaping, or producing unexpected outcomes whenever we try to fix topographical features on a map or manage landscapes. Nor does the fractal try to resolve the tensions between scales through a “god trick” that seeks an ever-more disincarnate subject position or by flattening the distinctions between the local and the global along one plane of interaction. As Haraway notes in “Situated Knowledges,” “We ... don’t want to theorize the world, much less act within it, in terms of Global Systems, but we do need an earthwide network of connections, including the ability to partially translate knowledge among very different—and power-differentiated communities.”<sup>114</sup> Blue Planet’s disembodied gaze from space and its association with the Cold War space race, European and U.S. imperialism, and a Malthusian discourse of limits to growth, may prevent such translation work as we move forward in the Anthropocene by impeding our ability to work through what Rob Nixon has termed the “slow violence” of asymmetrical economic developments, neo-liberal land grabs, and the toxification of bodies.<sup>115</sup> In such a world, Anna Tsing has noted, political engagement means awkward and ephemeral alignments of heterogeneous scales of engagement which can nonetheless generate creative mobilizations that reshape the local *and* ripple back upward to reconfigure global universals—whether they appear in the form of capitalism, Nature, technology, or liberal democracy.<sup>116</sup> In my view, the fractal—whether in digital, analog, or ocular form—provides a more effective index of such a post-Holocene critical practice, energizing an earth-wide network of connections amidst a fragmented, unequal, and exuberant world of difference.

A postcolonial critique of the God’s eye view is therefore not a call back to a local “ethics of proximity” as a place of resistance to the Whole Earth, nor does its “hermeneutics of suspicion” toward discourses that naturalize race, class, or gender miss the contradictory registers of human agency in the Anthropocene.<sup>117</sup> Ursula Heise is surely right to seek in Google Earth and other digital media a platform for imagining “world environmental citizenship” beyond local and national allegiances, and Chakrabarty has shown convincingly that human beings’ geophysical agency in the Anthropocene constitutes a new kind of species-being in which postcolonial subjectivity “must stretch to a new ontological reality that is imbricated in the story of globalization, global capitalism, and modern disenchantment, but not reducible to it, a form of collective existence but without real ontology.”<sup>118</sup> Visualizing a global environment has never been more urgent—or more problematic. But does a return to Blue Planet or a call for a shotgun family reunion arranged by an avenging Mother Gaia really advance a discussion of eco-cosmopolitanism or posthuman ethics? A fractal poetics entangles us in the Anthropocene’s collective ontological horizons and emergent political engagements, not through upbraiding “us” for failing to heed the rigid laws of Gaia, but by asking “whose Earth?” was represented at Stockholm, Rio, Johannesburg, and, yes, Copenhagen.

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<sup>114</sup> Haraway, “Situated Knowledges,” 579-580.

<sup>115</sup> *Ibid.*, 580.

<sup>116</sup> Tsing, *Friction*, 27-50; 88-112; 245-268.

<sup>117</sup> Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham: Duke University Press, 2010), xv.

<sup>118</sup> Chakrabarty, “Postcolonial Studies and the Challenge of Climate Change,” 12.

**Thomas M. Lekan** is an associate professor of history and a faculty associate in the Environment and Sustainability Program at the University of South Carolina in Columbia, S.C., U.S.A. His research focuses on European, global, and comparative environmental history. He is the author of *Imagining the Nation in Nature: Landscape Preservation and German Identity* (Harvard, 2004) and is currently completing a manuscript for Oxford University Press tentatively titled *Saving the Serengeti: Tourism, the Cold War, and the Paradox of German Conservation in Postcolonial Africa*.

**ACKNOWLEDGEMENTS** The author would like to thank the Rachel Carson Center for Environment and Society at LMU in Munich, Germany, for a residential fellowship that provided the interdisciplinary space and time to draft the first version of this essay. I am also grateful to Tobias Boes and the members of the Transatlantic Network in the Environmental Humanities for their encouragement and insights on earlier drafts of this paper, as well as to the anonymous reviewers for their helpful critique of the submitted essay.

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