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# The Anthropocene Earth System and Three Human Stories

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People tell stories, and always have. Now that geologists are signaling a new chapter in Earth's story, humanists and social scientists are chiming in with their versions of the Anthropocene narrative.<sup>1</sup> The resulting cacophony can be distilled into three types of narrative, all portraying humanity in relation to Earth in the Anthropocene. The first might be called "Anything Goes" because it makes little reference to the science. The result is an array of imaginative terms and alternative planetary visions. But, because this way of talking about the Anthropocene maintains the traditional separation between Earth's condition as understood by scientists and the stories told by humanists and social scientists for the past two hundred years, it is deeply conservative. The Anthropocene changes little or nothing about the old ways of plotting stories and judging protagonists.

The two other types of narrative take Earth System science (ESS) seriously. Both recognize the new epoch's fundamental challenge to the ways we've thought about human values and destinies. They also acknowledge the non-negotiable limits it puts on our potential plotlines. What I will call the "Singular Story" aims at interdisciplinary synthesis, making geology, poetry, politics, and everything else speak the same language so that humanity can be included in large-scale computational models of the Earth System. From this perspective, the human story—the evolution of our species, animal domestication, the efflorescence of agriculture, complex political societies, economic forms, and values—evolved within the Earth System story until the mid-twentieth century when, as a species, we started overwhelming the great forces of nature. Now our collective activity is calculated alongside ocean dynamics, terrestrial ecosystems, tropospheric chemistry, and a host of other powerful forces.

A third group of stories promotes a "Democracy of Voices." While taking the science seriously, it argues that our best hope is not to insist on a single tale, but to play up the diversity of perspectives that has been the strong suit of our species as well as the ace card of the humanities and social sciences. This multiplicity retains the resilience-building pluralism of diverse cultures, *but only to the extent warranted* by planetary boundaries. Both the "Singular Story" and the "Democracy of Voices" accept that humanity's Anthropocene stories are constrained in ways they never were in the

1 Helmuth Trischler highlights the speed with which the concept of the Anthropocene entered non-scientific fields and the lively debates it has engendered. See Trischler, "Introduction," in "Anthropocene: Exploring the Future of the Age of Humans," ed. Helmuth Trischler, *RCC Perspectives: Transformations in Environment and Society*, no. 3 (2013), doi.org/10.5282/rcc/5603.

Holocene. Back then, the time and space for experimentation appeared limitless. Now, our time is short and our planet feels smaller. As we struggle to bend the Earth System's trajectory toward a stabilized state, we will need both the singular global story and small-scale textured tales of Anthropocene experiences. We need both the global narrative incorporating everything, as well as many diverse, redundant experiments in resilience that might provide ballast as we lurch over thresholds and tipping points. Unlike the "Anything Goes" approach, both these types of story are radical in their commitment to understanding Anthropocene science. In short, they aim to be true both to our new reality and to our old powers of invention. Below I explore these three types of stories, focusing especially on the second and third in relation to the Earth System's trajectory in the Anthropocene.<sup>2</sup>

### Storytelling

The point I want to make about the Anthropocene is, fundamentally, a humanist's point: reality does not dictate the stories we tell ourselves. Even the reality of the Anthropocene, all-encompassing though it is, gives rise to more than just one storyline. I'm not talking about fiction. With the true stories of history, anthropology, economics, and much else, reality has constrained narrative possibilities only loosely, if at all. For instance, it's a fact that we all die, but tales of transcending death and attaining immortality of one sort or another are everywhere. The discipline of history, philosopher Hannah Arendt argued, was founded by the ancient Greeks to ensure that some mere mortals—the heroes among us—might become as gods, living forever through verse.<sup>3</sup> It's also true that water flows downhill, but we dream up pulleys, pumps, and water wheels to move it in desired directions, telling ourselves tales about our conquest of nature.<sup>4</sup>

2 Will Steffen et al., "Trajectories of the Earth System in the Anthropocene," *PNAS* 115, no. 33 (14 August, 2018): 8252–59.

3 Hannah Arendt, "The Concept of History," *Between Past and Present: Eight Exercises in Political Thought* (New York: Penguin Books, 2006).

4 David Blackbourn, *The Conquest of Nature: Water, Landscape, and the Making of Modern Germany* (New York and London: W. W. Norton and Company, 2006) tells a fairly positive story of human interventions in Germany's riverways. Mark Cioc's history is rather grim. Mark Cioc, "The Rhine as World River," in *The Environment and World History*, ed. Edmund Burke III and Kenneth Pomeranz (Berkeley and Los Angeles: University of California Press, 2009).

This talent for stories is both a boon and a danger because stories aren't just glosses on reality: they also mold the real world. Undeniably, the story of modernity with its narrative of individualism, infinite progress, and endless economic and technological growth did much to create the Anthropocene, however unwittingly. For precisely this reason, as humanists and social scientists respond to the new Earth story of Jan Zalasiewicz and his colleagues from the Anthropocene Working Group (AWG), we need to consider our narratives. Better stories will help us understand how human activities came to wreak such havoc and also how we might navigate the perilous conditions ahead. In this way, Anthropocene stories, like all good true stories, connect past, present, and future. But there's something fundamentally different about a good Anthropocene story as opposed to earlier stories in the humanities and social sciences. To be useful, they must contend with a much more restricted future. The dizzying range of stories once thought possible is narrowed by the Anthropocene. Indeed, our previous surfeit of true stories may well be an artifact of the Holocene itself, a form of "epistemological anarchy" only possible in the probabilistic universe of a relatively stable Earth System. Yet even so, even under the constraints of this fearsome new epoch, choices remain. The Anthropocene constricts potential plotlines, but does not dictate them, at least not yet.

For now, the humanist imperative to craft stories that open on future possibilities still rules. At root, the commitment to narrative potential is a commitment to liberty. Stories are about choices. They describe a situation and show us how the protagonist navigated the Genii's offer of three wishes or dealt with a threat to national security. Believing in the human capacity for decency and justice along with our talent for cruelty and destruction means believing in more than just one true story. The tradition of critical thought, as literary critic Ian Baucom rightly observes, "has long understood its vocation as simultaneously descriptive and transformative: a method oriented to mapping the situation in which we find ourselves and to making something emancipatory of that situation."<sup>5</sup> The truest stories of the Anthropocene will map our altered planetary system in accord with the science and, dire though the situation is, still try "to make something emancipatory" of it. These narratives need to emerge from a conversation across disciplines—geologists and Earth System scientists, on the one hand, and humanists and social scientists on the other. Each side has to listen hard for the new rhythms of this dialogue. We could think of this conversation as learning to ride a bicycle built for two where both cyclists need to pedal in the same direction at approximately the same speed, discussing where to go as they ride.

5 Ian Baucom, *History 4<sup>0</sup> Celsius: Search for a Method in the Age of the Anthropocene*, Vol. 2 of *Specters of the Atlantic* (Durham: Duke University Press, 2020), 8.



**Figure 1.** Three seems particularly good for adventures and parables: we tell tales of the three sisters (weird and otherwise<sup>6</sup>), the three wishes, the three ages of man (and woman) from infancy to old age, and the three aspects of the Christian god. Here we have a scroll depicting the three vinegar tasters (the Buddha, Confucius, and Lao-tzu). Each samples the same vinegar—in other words, the same reality—but one finds it bitter, the next sour, and the last sweet. The Anthropocene, being both an epic adventure and a morality tale, has also spawned triplicates: ones I have dubbed “Anything Goes,” the “Singular Story,” and a “Democracy of Voices.” Naturally, this typology is highly artificial (which typology is not?), but if stories are important both for making sense of the world and for world-making, then analyzing our stories is essential. Depicted here is the traditional Asian allegorical image “The Vinegar Tasters (The Three Teachings),” ca. 1802–1816 (Edo period), by Kanō Isen’in, Edo period, c. 1802–1816, Honolulu Museum of Art, accession 6156.1

### Story #1: Anything Goes

The “Anything Goes” group, taking its cue from the eponymous musical, is the most imaginative. With a pell-mell playfulness that often sets ESS and stratigraphy aside, writers have responded inventively to the new word. Some adopt defensive postures, attacking the proposed geological epoch as a threat, even an existential threat, to their understanding of the world. Conversely, a few in this group take “Anthropocene” as inspiration for an Ecomodernist utopia where infinite growth and progress continues, uncoupled from the biogeophysical planet. Of this “Anything Goes” group, it may truly

6 The three weird sisters appear in Shakespeare’s *Macbeth*, and less weird sisters appear in Giambattista Basile “The Three Sisters” (an Italian fairytale) in his 1634 work, *The Pentamerone*.



be said that “the Anthropocene is a concept that has as many definitions as the authors who write about it.”<sup>7</sup> Essentially, the “Anything Goes” stories try to shoehorn our new Earth System reality into old Holocene categories.

The Anthropocene is not the first scientific recasting of human history to spark a hundred disparate tales. A century and a half before Paul Crutzen proposed “Anthropocene” in 2000, Darwin stirred up a hornet’s nest with “evolution.” Humanists and social scientists danced dizzy tangos with the idea that humans were descended from apes. Reformers Herbert Spencer and Beatrice Webb applied natural selection in the form of Social Darwinism to society. Anglo-American triumphalists applied the phrase “survival of the fittest” (one that Darwin had originally borrowed from Spencer) to justify empire and “their sort.” Germans, with a keener grasp of Darwin’s meaning, recognized that the form of “fitness” driving evolution had less to do with mastery of gunboats, finance, and colonies, and more to do with sex. Yet carnal love and the maximization of offspring were hardly suitable for state-sponsorship, so German authorities also banned evolution from school books.<sup>8</sup> Japanese leaders redefined the term in yet another way, arguing that their up-and-coming nation could hop, skip, and jump over evolution’s intermediary stages to join Western Imperial Powers.<sup>9</sup> Some of these Meiji oligarchs eagerly presented their 1890 constitution, the first such instrument of government in modern Asia, to Spencer himself. The great Sage of the Tennis Courts (said to dictate his sprawling books while knocking balls) immediately dismissed the Japanese effort as far too advanced for such a backward people. Ironically, the Japanese document had originally been penned in German and was primarily modeled on the Prussian constitution. The descent of social theory based on misconceptions of the “descent of man” is too well known, and too grim, to bear repeating, as eugenics exemplifies. Darwin’s theory, or at least some its terms, were reimagined by social scientists as grounds for many things including selfish individualism, imperialism, racism, classism, utopianism, sexual passion, and social engineering. In response to evolutionary theory, anything went.

7 Roblyne Mellor, *Review of Economic Development and Environmental History in the Anthropocene: Perspectives on Asia and Africa* edited by Gareth Austin; *The Birth of the Anthropocene* by Jeremy Davies; and, Jedediah Purdy, “After Nature: A Politics for the Anthropocene,” *Journal of World History* 30, no. 3 (September 2019): 441–448, here page 441.

8 Alfred Kelly, *The Descent of Darwin: The Popularization of Darwinism in German, 1860–1914* (Chapel Hill, NC: The University of North Carolina Press, 1981).

9 For Herbert Spencer’s 1892 letter to cabinet minister Kaneko Kentar (1853–1942), see Herbert Spencer, *On Social Evolution*, edited and with an Introduction by J.D.Y. Peel (Chicago: University of Chicago Press, 1972): 253–257. See also, Julia Adeney Thomas, *Reconfiguring Modernity: Concepts of Nature in Japanese Political Ideology* (Berkeley and Los Angeles: University of California Press, 2001).



As with Darwinism, so too with the Anthropocene. It also threatens long-held beliefs about the place of humanity in the world, the production of knowledge, and the possibilities for our future. One response is to deflect attention from the concept by focusing on the word. The giddy multiplication of alternative terms for “Anthropocene” make Humpty Dumpty look like an amateur in the world of wordplay.<sup>10</sup> In 2013 in French and then in English in 2016, the pioneering book *The Shock of the Anthropocene* presented chapters on the Thermocene, Thanatocene, Phagocene, Phronocene, Agnotocene, Capitalocene, and Polemocene.<sup>11</sup> But even so, this compendium looks scant compared with the more recent, encyclopedic list of alternative coinages gathered by Clémence Hallé and Anne-Sophie Milon. These include Manthropocene, Chthulucene, Heterocene, and on and on.<sup>12</sup> Each word initiates a different storyline, featuring different protagonists, causes, and goals.<sup>13</sup>

Foreswearing wordplay but still insisting that “Anything Goes,” some social scientists have repurposed “Anthropocene” to accord with their own discipline’s imperatives. For instance, anthropologist and political scientist James C. Scott refers to a “thin Anthropocene” that dates “from the use of fire by *Homo erectus* roughly half a million years ago and extends up through the clearances for agriculture and grazing and the resulting deforestation and siltation.” However, as he admits, “there is no particular reason to insist on the label ‘Anthropocene.’” His point is “to insist on the global environmental impact of the domestication of fire, plants, and grazing animals,” not

10 Scientifically grounded precursors and additions include the following: In 1992, science journalist Andrew Revkin used the term “Anthrocene” in a book on global warming (Andrew C. Revkin, *Global Warming: Understanding the Forecast* [New York: Abbeville Press, 1992]). In 1999, entomologist Michael Samways coined “Homogenocene” to highlight the unprecedented scale and transglobal nature of species invasions (Michael Samways, “Translocating Fauna to Foreign Lands: Here Comes the Homogenocene,” *Journal of Insect Conservation* 3 [1999]: 65–66). In 2000, Paul Crutzen’s proposal of “Anthropocene” at a conference was unpremeditated, although he subsequently learned that freshwater ecologist Eugene Stoermer had been using the term informally since the 1980s, which led to their joint publication (see Will Steffen, Jacques Grinevald, Paul Crutzen and John McNeill, “The Anthropocene: Conceptual and Historical Perspectives,” *Philosophical Transactions of the Royal Society*, 369 [2011]: 842–67, doi.org/10.1098/rsta.2010.0327). Fisheries biologists Dirk Zeller and Daniel Pauly suggested “Myxocene” in 2005, an age of jellyfish and slime, to reflect human-driven changes to the oceans (Dirk Zeller and Daniel Pauly, “Good News, Bad News: Global Fisheries Discards are Declining, but So Are Total Catches,” *Fish and Fisheries*, no. 6 [2005]: 156–59, doi.org/10.1111/j.1467-2979.2005.00177.x).

11 Christophe Bonneuil and Jean-Baptiste Fressoz, *The Shock of the Anthropocene: The Earth, History and Us*, English translation by David Fernbach (Brooklyn, New York: Verso, 2016). The original French version (2013) did not include chapters on “Agnotocene” and “Capitalocene.”

12 Clémence Hallé and Anne-Sophie Milon, “The Infinity of the Anthropocene: A (Hi)story with a Thousand Names,” in *The Science and Politics of Landing on Earth*, ed. Bruno Latour and Peter Weibel (Cambridge, MA: MIT Press, 2020), 42–43.

13 See Elizabeth M. DeLoughrey, *Allegories of the Anthropocene* (Durham, North Carolina: Duke University Press, 2019).

to reorganize the Geological Time Scale. As scientists point out, having global environmental impact is not the same as producing a new geological epoch or altering the Earth System.<sup>14</sup> In a similar vein, global historian John McNeill observes “the customs of historians” over those of geologists, in arguing that “the Anthropocene began at different times in different places. Some places, for example Venice or Mexico City, were well into their local Anthropocenes by 1750. People transformed swamps into cities in both places. Other places, such as the peaks of Patagonia or the depths of the Marianas Trench, which are (I imagine) very much as they were in recent centuries, may not have entered it yet.” His use of the concept, as he correctly says, “would not suit geologists” whose standards require near-synchronous global impact.<sup>15</sup> These appropriators of “the Anthropocene” part ways with Earth System scientists, happy to leave them to their own devices, while social science continues on its accustomed way.

Others in the “Anything Goes” camp are not so generous to geologists. For them, “the Anthropocene” is a provocative red cape waved by a devilish matador. The AWG and the discipline of geology are denounced as misguided, if not downright malicious, enterprises. Instead of ceding to stratigraphers their own conventions on planetary time and letting Earth System scientists have their say about the Earth System, this group presents them with a catalog of their errors. Among the misdeeds of the AWG is “defining the Anthropocene in order to meet stratigraphy’s requirements.”<sup>16</sup> Another is “the geologists’ slow motion—dare one say glacial—assessment of the Anthropocene’s claims,” a pace said to have “eroded their authority over the outcome.”<sup>17</sup> An environmental historian charges them with ignoring the biosphere: “in the rapid ascendancy of planetary earth science, and the subsequent displacement of ecology as the *sine qua non* of environmental sciences, we risk losing sight of life, in all its diverse forms, human and nonhuman, that have shaped the planet.”<sup>18</sup> But these supposed errors of geologists are nothing compared to their ethical lapses. Anthropocene scientists

14 James C. Scott, *Against the Grain: A Deep History of the Earliest States* (New Haven: Yale University Press, 2017), 19–20.

15 John McNeill, “Energy, Population, and Environmental Change since 1750,” in *The Cambridge World History, Volume 7: Production, Destruction and Connection, 1750–Present*, Part 1: Structures, Spaces, and Boundary Making, ed. John R. McNeill and Kenneth Pomeranz (Cambridge, 2017), 52.

16 Jean-Baptiste Fressoz, “Does Political Ecology Need the Approval of Geologists?,” *IPPR Progressive Review* 24, no. 3 (2017), 172.

17 Rob Nixon, “The Anthropocene: The Promise and Pitfalls of an Epochal Idea,” in *Future Remains: A Cabinet of Curiosities for the Anthropocene*, ed. Gregg Mitman, Marco Armiero, and Robert S. Emmett (Chicago: University of Chicago Press, 2018), 15.

18 Gregg Mitman, “Hubris or Humility? Genealogies of the Anthropocene,” in *Future Remains: A Cabinet of Curiosities for the Anthropocene*, ed. Gregg Mitman, Marco Armiero, and Robert S. Emmett (Chicago: University of Chicago Press, 2018), 61.

stand accused of ascribing moral culpability to everyone equally, promoting a “human species-supremacist planetary politics,” echoing “biblical dominion,” and promulgating a “deeply problematic” and “ignorant” “philosophy of history.”<sup>19</sup> Anthropologist Kathryn Yusoff believes that this science “is a praxis of exploitation, dispossession, subjection, and othering, closely tied to the slave mode of production.”<sup>20</sup> “White Geology” seems a greater enemy than an altered planet.

Responding to these concerns on scientific grounds has availed little. Explanations of stratigraphy’s standards and processes fall on deaf ears. For instance, producing geology’s foundational tool of global comparison—the Geological Time Scale—requires widespread agreement and precise forms of physical evidence, making stratigraphy the very heart of that enterprise, something that necessarily takes time. One might point out that the AWG’s deliberations look almost swift if we remember that the Holocene was first proposed in 1867, formally submitted to the International Geological Congress in Bologna in 1885, and officially ratified by the Committee of the International Union of Geological Sciences (IUGS) only in 2008. The idea that ESS ignores the biosphere has no basis. Most of what we know about Earth’s life forms and their evolution is written in the rocks, so geologists rarely lose sight of life. The power of the biosphere to shape the planet’s chemistry and geology is encapsulated in the very term “biogeophysical.”<sup>21</sup> As Zalasiewicz et al. explained in 2014, five years after the AWG was established:

The significance of the Anthropocene . . . lies not so much in seeing within it the ‘first traces of our species,’ but in the scale, significance, and longevity of change to the Earth System. Humans started to develop an increasing, but generally regional and highly diachronous, influence on the Earth System thousands of years ago. With the onset of the Industrial Revolution, humankind

19 Eileen Crist, “On the Poverty of Our Nomenclature,” *Environmental Humanities* 3 (2013), 129 (See also Eileen Crist, *Abundant Earth, Toward an Ecological Civilization* [University of Chicago Press, 2019]).

David Wallace-Wells, *The Uninhabitable Earth: Life After Global Warming* (New York: Tim Duggan Books, 2019), 20; Daniel Hartley, “Anthropocene, Capitalocene, and the Problem of Culture,” in *Anthropocene or Capitalocene: Nature, History and the Crisis of Capitalism*, ed. Jason W. Moore (Oakland, CA: PM Press, 2016), 154–55.

20 Kathryn Yusoff quoted on H-Environment, Call-for-Papers: Conference on “Inhuman Memory: Race and Ecology across Timescales,” 26 October 2019, <https://networks.h-net.org/node/19397/discussions/5170380/cfp-conference-inhuman-memory-race-and-ecology-across-timescales>. See also Kathryn Yusoff, *A Billion Black Anthropocenes* (Minneapolis: University of Minnesota Press, 2019); Heather Davis and Zoe Todd, “On the Importance of a Date, or, Decolonizing the Anthropocene,” *ACME: An International Journal for Critical Geographies* 16 (December 2017): 761–80.

21 For ways in which ecology is key to the Anthropocene, see Sharon Kingsland, “The Importance of History and Historical Records for Understanding the Anthropocene,” *The Bulletin of the Ecological Society of America* 98 (2017): 64–71, doi.org/10.1002/bes2.1296.

became a more pronounced geological factor, but in our present view it was from the mid-twentieth century that the worldwide impact of the accelerating Industrial Revolution became both global and near-synchronous.”<sup>22</sup>

These explanations of scientific protocols and scientific definitions are brushed aside by adherents to “Anything Goes.”

Ecosocialist Ian Angus has attempted to explain to detractors that “Anthropocene” refers not “to all humans, but to an epoch of global change that would not have occurred in the absence of human activity.”<sup>23</sup> The term does not blame everyone (nor indeed anyone); it does not relish *Old Testament* dominion; it does not propose a theory of human history; and nothing in the AWG’s reports suggests that the proposed new epoch is cause for celebration or self-congratulation. The reason for calling it “Anthropocene” is the accelerating dominance of human activities driving the Earth System. It should also be noted that the names geologists give to intervals of time in Earth’s long history aren’t meant as the be-all and end-all of their analysis. In fact, these names are sometimes whimsical. For instance, the Silures, a fierce tribe who gave Roman invaders a hard time, are the namesakes of the Silurian Period (443 million to 416 million years ago) simply because the nineteenth-century Scottish fossil hunter Sir Roderick Murchison (1792–1871) remembered his Tacitus while digging in Wales. In no way was Murchison suggesting that he had discovered evidence of Welsh triumph in the layer of rock representing deep, trilobite-haunted seas. Naming the most recent strata formed on Earth’s crust “Anthropocene” is certainly not a celebration of human supremacy. While a group called “Ecomodernists” proclaim a “Good Anthropocene” where “resource-efficient technologies” decouple humanity from reliance on planetary systems, the majority of AWG members reject the idea that human beings can go our merry way without need for a rich biosphere, breathable air, and fresh water. They stress that we are irrevocably part of the Earth System, and few are sanguine about our future. In fact, some Earth System scientists are resorting to uncharacteristically emotive words like “emergency” and looking with dread to looming social, political, and economic dislocations.<sup>24</sup> There is nothing triumphalist about their bleak view.

22 Jan Zalasiewicz et al., “When did the Anthropocene Begin? A Mid-Twentieth Century Boundary Level is Stratigraphically Optimal,” *Quaternary International* 383 (2015): 196–203, here 201.

23 Ian Angus, *Facing the Anthropocene: Fossil Capitalism and the Crisis of the Earth System* (New York: Monthly Review Press, 2016), 232.

24 For example, the term “emergency” is used by Timothy Lenton et al. to describe our current situation. T. Lenton et al., “Climate Tipping Points—Too Risky to Bet Against,” *Nature* 575 (2019): 592–96, here 596.

So what are we to make of the frivolity, obtuseness, distress, and even anger of the “Anything Goes” stories? Perhaps there is an understandable reluctance to spend time digesting the complexities of the emerging science. It’s easier to fall back on more familiar terms like “the environment” and “climate change” in the rushed atmosphere of publish-or-perish. It’s also easy, and more readily rewarded within the academic world, to adhere closely to disciplinary protocols and ways of thinking. When humanists and social scientists stray into geology and ESS with their odd forms of citation, multiple-authored articles, and strange ways of telling stories, their colleagues are often bemused. The approach characterized here as “Anything Goes” may also reveal a sublimated fear of the situation illuminated by the AWG. Perhaps the *ad hominem* attacks on geologists confuse the messengers for the message. In any case, these “Anything Goes” narratives, at their heart, are not about science.

What is most striking about “Anything Goes” is its deep conservatism. These stories often feature familiar villains and victims. Scientific hubris is once again denounced.<sup>25</sup> Disciplinary prerogatives are protected from the challenge posed by the Anthropocene which, like evolution, brings the study of humans and of the rest of nature together in deeply uncomfortable ways. “Anything Goes” relies on the siloed forms of knowledge institutionalized in late nineteenth-century universities, and resists reimagining the relationship among them. Many adherents seem to hint that somewhere, somehow, there *must* be a way of retaining the old dream of ever-growing abundance for everyone. The Ecomodernists who denounce environmentalism as putting limits on human desires even insist that we can be headed toward greater opulence.<sup>26</sup> The old concepts of justice and liberty, the old economic forms, the old ways of thinking of our lives and what they mean must not be challenged, or so they imply. Don’t listen to the scientists, don’t take on this unprecedented vision of human impact on the planet, don’t let the band stop playing.

25 Historian of science Naomi Oreskes, a member of the AWG, argues that this distrust of science is often politically generated. The trustworthiness of science arises from the social practices surrounding the vetting of its claims rather than abstract reliance on the “scientific method.” The more inclusive these practices are in terms of the types of evidence and social perspectives of the people involved, the better the science will be. See Naomi Oreskes, *Why Trust Science?* (Princeton: Princeton University Press, 2019).

26 Ted Nordhaus and Michael Shellenberger, *Breakthrough: From the Death of Environmentalism to the Politics of Possibility* (New York: Houghton and Mifflin, 2007). For a critique of ecomodernism, see Clive Hamilton, “The Theodicy of the ‘Good Anthropocene’,” *Environmental Humanities* 7, no. 1 (2016): 233–38. doi.org/10.1215/22011919-3616434.

As AWG secretary Colin Waters notes (and the evidence of “Anything Goes” shows), “Anthropocene” has come to mean different things as it has spread to different groups, a situation that can only end in headaches: “We need a common understanding.”<sup>27</sup> That common understanding needs to come from the science. In the preceding essay in this volume, Jan Zalasiewicz laid out the evidence for the Anthropocene, defining it carefully. That understanding is now widely, though not universally, accepted within the geological community. As Zalasiewicz acknowledges, the proposed new epoch, ultimately, may never be formalized by the IUGS. But even if it doesn’t become a formal term for geology, the evidence of ESS reveals that the planet as a whole is functioning in a dangerous way.<sup>28</sup> ESS is a fairly new science that looks beyond the discrete phenomena of biodiversity loss, human population growth, altered chemical cycles, climate change, land-use patterns, and much else to treat Earth as a single integrated system with emergent properties above and beyond any one of these environmental challenges.<sup>29</sup> As a whole, our planet is at or very near a state shift, moving from one way of functioning to another, never before experienced in the history of our species. ESS, in accord with the geology of the Anthropocene, tells us we’re heading for a rough ride. As stratigraphy’s bureaucratic process plays itself out one way or the other, humanists and social scientists should engage with the AWG and the ESS community to shape a common understanding of the Anthropocene. For my part, I think that crafting stories on the basis of a common understanding of reality is our best hope. If the Anthropocene is truly as dangerous and unprecedented as it seems to be, taking guidance from the scientists on what it is and then forging a concerted way forward is surely the wisest route.<sup>30</sup> Humanists and social scientists can’t critique the science unless they understand it, or analyze its political and moral implications.

27 Quoted in Ian Sample, “Anthropocene: Is This the New Epoch of Humans?,” *The Guardian*, 16 October 2014, <https://www.theguardian.com/science/2014/oct/16/sp-scientists-gather-talks-rename-human-age-anthropocene-holocene>.

28 Anthony D. Barnosky, et al., “Approaching a State Shift in Earth’s Biosphere,” *Nature* 486 (7 June 2012): 52–58. See also Will Steffen, et al. “The Emergence and Evolution of Earth System Science,” *Nature Reviews Earth & Environment* 1, 54–63 (2020), [doi.org/10.1038/s43017-019-0005-6](https://doi.org/10.1038/s43017-019-0005-6). Steffen 2020.

29 See Tim Lenton’s marvelously incisive *Earth System Science: A Very Short Introduction* (Oxford: Oxford University Press, 2016)

30 For an insightful analysis of why political science should take Anthropocene science seriously, see Manuel Arias-Maldonado, “Bedrock or Social Construction? What Anthropocene Science Means for Political Theory,” *The Anthropocene Review* 7, no. 2 (August 2020): 97–112, [doi.org/10.1177/2053019619899536](https://doi.org/10.1177/2053019619899536).

## New Stories for a New Reality

What would happen to our stories if we took Anthropocene science seriously? To explore this question, I'll focus on one paper, "Trajectories of the Earth System in the Anthropocene," which appeared in *PNAS* in 2018.<sup>31</sup> With this matter-of-fact title, Earth System scientist Will Steffen and his co-authors do not ring alarm bells, at least not initially. They begin by laying out the evidence that the planet has left not only the relative warmth of the Holocene's interglacial interlude, but perhaps even the glacial-interglacial cycles of the Quaternary Period beginning 2,588,000 years ago. Our planet, they say, is on a new trajectory toward "Hothouse Earth."<sup>32</sup> If the planet continues along the current business-as-usual pathway, feedbacks, tipping points, and nonlinear dynamics may plunge the Earth System across a dangerous threshold. Crossing this threshold, possibly reached when the globally averaged temperature rises 2 degrees Celsius (3.6 degrees Fahrenheit) above pre-industrial levels (as is expected to occur well before the end of the century), is "likely to produce uncontrollable and dangerous conditions."<sup>33</sup> To cross it "poses severe risks for health, economics, political stability (especially for the most climate-vulnerable) and, ultimately, the habitability of the planet for humans."<sup>34</sup> At that point, all bets are off.

The better hope is to stabilize the Earth System before that threshold is reached. Success wouldn't return us to the Holocene. This *PNAS* paper is not modeled on the trope of the Prodigal Son. There is, alas, no way to "repeal the Anthropocene."<sup>35</sup> Instead, "stabilized Earth will likely be warmer than any other time over the last 800,000 years at least" and probably won't avoid the activation of some triggers that would lead to "abrupt shifts at the level of critical biomes that support humanity."<sup>36</sup> What this means is that in the best-case scenario we should expect green and pleasant lands to become deluged scenes of death and places that once were merely lethargically hot to be scorching and unlivable for ourselves and many other species. Perhaps most frightening of all is that the Earth System does not tend to be stable at approximately 2 degrees Celsius

31 Will Steffen et al., "Trajectories of the Earth System in the Anthropocene" *PNAS* 115, no. 33 (14 August, 2018): 8252–8259.

32 These cycles have waxed and waned throughout the past 2.6 million years known as the Quaternary Period (National Oceanic and Atmospheric Administration [NOAA], <https://www.ncdc.noaa.gov/abrupt-climate-change/Glacial-Interglacial%20Cycles>).

33 Steffen et al., "Trajectories," (2018): 8256.

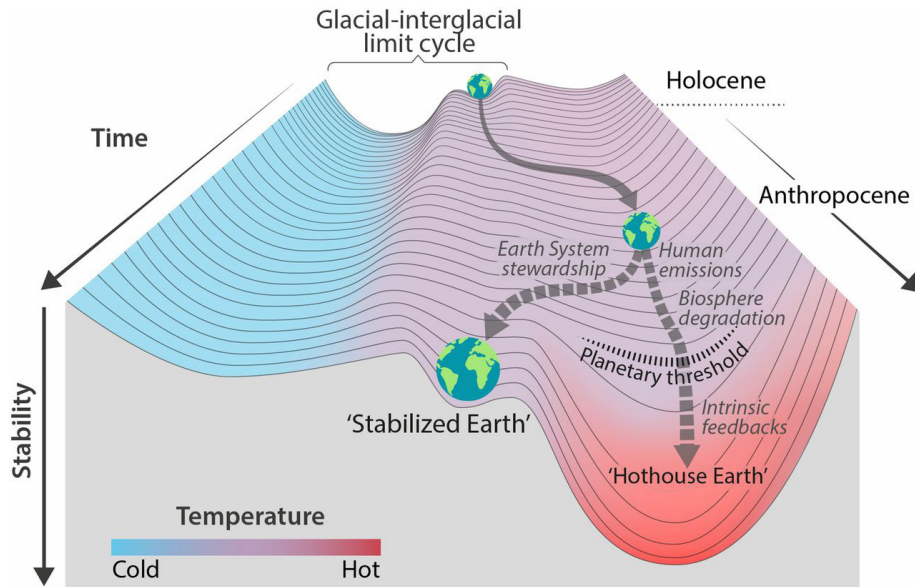
34 Steffen et al., "Trajectories," (2018): 8256.

35 Marcia Björnerud, *Timefulness: How Thinking like a Geologist Can Help Save the World* (Princeton, 2018), 177.

36 Steffen et al., "Trajectories," (2018): 8257.



above preindustrial levels. A stabilized Earth at that temperature would be highly artificial. Constructing and maintaining it would require orchestrating all our social systems to manipulate the Earth System and deflect it from the business-as-usual trajectory. That said, it would be better than the Hothouse alternative.



**Figure 2.** Stability landscape showing the pathway of the Earth System out of the Holocene and thus, out of the glacial–interglacial limit cycle to its present position in the hotter Anthropocene. The fork in the road in Fig. 2 is shown here as the two divergent pathways of the Earth System in the future (broken arrows). Currently, the Earth System is on a Hothouse Earth pathway driven by human emissions of greenhouse gases and biosphere degradation toward a planetary threshold at 2 °C (horizontal broken line in Fig. 2), beyond which the system follows an essentially irreversible pathway driven by intrinsic biogeophysical feedbacks. The other pathway leads to Stabilized Earth, a pathway of Earth System stewardship guided by human-created feedbacks to a quasi-stable, human-maintained basin of attraction. “Stability” (vertical axis) is defined here as the inverse of the potential energy of the system. Systems in a highly stable state (deep valley) have low potential energy, and considerable energy is required to move them out of this stable state. Systems in an unstable state (top of a hill) have high potential energy, and they require only a little additional energy to push them off the hill and down toward a valley of lower potential energy. Image and caption from Steffen et al., “Trajectories,” reproduced here with kind permission.

In storytelling terms, what’s interesting about this study is that it provides only two plotlines. Unlike research based on climate models that project a range of intermediate scenarios, the authors of “Trajectories of the Earth System” argue that nonlinearities in feedback processes reduce potential pathways—or plotlines—to two. Our choice is either a bucking Hothouse Earth marked by abrupt state shifts, “a much higher global average temperature than any interglacial in the past 1.2 million years,” and “sea levels

significantly higher than at any time in the Holocene” with a markedly diminished biosphere, or, on the other hand, a carefully managed Stabilized Earth, uncomfortable, fragile, and different from anything our species has ever known. In other words, the tale ends either horrendously or less horribly. These severely reduced options are about as far from “Anything Goes” as you can get. No kick lines here. No songs by Cole Porter. No jokes from P.G. Wodehouse.<sup>37</sup>

How might we achieve the less horrible Stabilized Earth? The scientists’ answer entails more than science-and-engineering since, they say, “a fundamental reorientation of human values, equity, behavior, institutions, economies, and technologies is required.”<sup>38</sup> This revolution in all human systems is a tall order, made more so because it needs to happen right away: “gradual or incremental change . . . will likely not be adequate.”<sup>39</sup> Given this expansive view of the problem, this paper is an open-handed invitation to collaborate. If we accept this mapping of our situation, the question is how to twist human plotlines to bend the trajectory of the planetary system toward the limited freedom of a harsh but habitable planet. The so-called *positive* feedback loops pushing the Earth System along its dangerous business-as-usual trajectory must be turned, somehow, into *negative* feedback loops producing a stabilized state. (To be clear, “stabilized” in this sense means being relatively constant within certain variables. In no way does it imply stasis or lack of circulation.) The story we need to figure out how to tell will not be a comedy, but it could avoid tragedy. The quest, in other words, is to avoid the tyranny of “Hothouse Earth” and create something emancipatory even of this terrible exigency.

So how do we choose the less bad option? “Trajectories of the Earth System” suggests two ways to avoid tragedy. Primarily, Will Steffen and his co-authors call for the Singular Story: a “deep integration of knowledge from biogeophysical Earth System science with that from social sciences and the humanities.”<sup>40</sup> Although they foresee that unifying diverse fields will be difficult, they hope it will produce “more effective governance at the Earth System level.”<sup>41</sup> To many, this pronouncement will look like support for top-down global governance, a form critiqued by many political scientists. (This is a

37 The musical *Anything Goes* had input from both Porter and Wodehouse and featured a love affair between a wall street broker and a girl named Hope.

38 Steffen et al., “Trajectories,” (2018): 8258.

39 Steffen et al., “Trajectories,” (2018): 8258.

40 Steffen et al., “Trajectories,” (2018): 8258.

41 Steffen et al., “Trajectories,” (2018): 8258.

problem to which I'll return.) But, on close reading, the essay also calls, more quietly, for a second type of story, one that encourages diverse, local efforts directed toward the same shared end, the very reverse of top-down governance.<sup>42</sup> Since the tipping points caused by nonlinear dynamics cannot be forecast with any degree of certainty, no global dictate can ensure survival. More flexible, community-controlled measures with lower built-in costs will help build resilience. These “resilience-building strategies,” the authors say, “include developing insurance, buffers, redundancy, diversity, and other features:” a multiplicity of efforts more nimble in the face of the unforeseeable surprises inherent in a destabilized system. In other words, alongside the recommendation that we commit to the “Singular Story,” this paper also recognizes the value of a “Democracy of Voices.” Both approaches are true to the science, but they suggest very different humanistic narratives, the first founded on the logic that equates the single stabilized Earth System with a single humanity and even a single governing authority; the second encouraging a range of human systems, all resonating with the Anthropocene imperative of redirecting Earth's trajectory but in different ways. In political terms, we might call the first “benevolent totalitarianism” and the second a “multicultural empire” where pluralism *up to a point* is permitted. Neither of these are ideal political forms according to most late Holocene logics, but then no society in the Anthropocene will enjoy the latitude of Holocene conditions.

## Story #2 The Singular Story

Particularly on large scales, the human story is easily integrated into the biogeophysical one. The evidence is everywhere. From this perspective, we are fundamentally beings of rock, water, and air. Like all our fellow creatures, we arise from the Earth System. Our species' story of perhaps 300,000 years fits snugly within the Earth's approximately 4.5-billion-year history.<sup>43</sup> In the very *longue durée*, the mastery of fire in Africa by our ancestral species *Homo erectus*, the domestication of the dog, our handprints

42 Critiques of top-down governance include: Giovanna Di Chiro, “Environmental Justice and the Anthropocene Meme,” in *The Oxford Handbook of Environmental Political Theory*, ed. Teena Gabrielson, Cheryl Hall, John Meyer, and David Schlossberg (Oxford: Oxford University Press, 2016); John S. Dryzak and Jonathan Pickering, *The Politics of the Anthropocene* (Oxford: Oxford University Press, 2019); and, Mark Beeson, *Environmental Populism: The Politics of Survival in the Anthropocene* (Singapore: Palgrave MacMillan, 2019).

43 David Christian has led the way in developing “Big History,” which puts the human story within the larger story of Earth and even the universe. See Christian with William McNeill, *Maps of Time: An Introduction to Big History* (Berkeley and Los Angeles: University of California Press, 2005); with Cynthia Stokes Brown and Craig Benjamin, *Big History: Between Nothing and Everything* (New York: McGraw-Hill Education, 2014) and *Origin Story: A Big History of Everything* (New York: Little, Brown Spark, 2018). For an incisive critique of this form of history, see Ian Hesketh, “The Story of Big History,” *History of the Present* 4, no.2 (Fall 2014): 171–202.

on cave walls from Borneo to Spain; the traps dug to capture and kill mammoths in Mexico some 15,000 years ago, and the invention of pottery and agriculture in many different places, all attest to creativity. Our abilities to bend our environments to meet our desires has conquered oceans, leveled mountains, and rearranged the living world from fungi and microbes to flora and fauna. We have invaded every continent with our companion species, some purposely brought along, some hitch-hikers with their own destinies. As historian Kyle Harper shows, we've both accumulated disease-causing viruses and bacteria in extraordinary numbers compared with our chimpanzee cousins (who have only about two dozen), and also worked, both consciously and unconsciously, to disinfect the planet and build up immunities, allowing our population to soon soar beyond 8 billion.<sup>44</sup>

We struggle. We create. We colonize. We dominate, like all species, to the extent that we can until the environment can no longer support our activities. Our foods taste of the soils in which they are grown, from the *terroir* of French wines to the volcanic sting of true wasabi; our bodies, in the words of the English burial service (and a David Bowie song) go "from ashes to ashes." Few humans eat rocks *per se*, but we are not all that far removed from the newly discovered type of shipworm that munches stone.<sup>45</sup> When we integrate the human story and the Earth System story, we orchestrate vast scales of time and space along with intimate biogeophysical interactions. I don't doubt that the story can be told this way.

This story's giant protagonist is the combination of humanity-and-Earth-System that has been lumbering for millennia toward the Anthropocene, "the sum total of human impacts on the system" which needs "to be taken into account for analyzing future trajectories."<sup>46</sup> To study this Leviathan, proponents of the "Singular Story" argue for the merger of disciplinary perspectives and a unity of knowledge. Sometimes this integration takes the form of collaboration among human and natural scientists with new institutions to support their joint work.<sup>47</sup> Sometimes an even more intense synthesis

44 Kyle Harper, "What Makes Viruses Like COVID-19 Such a Risk for Human Beings? The Answer Goes Back Thousands of Years," *Time*, 11 March 2020, <https://time.com/5800558/coronavirus-human-civilization/>; and Ariane Düx et al., "The History of Measles: From a 1912 Genome to an Antique Origin," (preprint, March 2020) *bioRxiv* 2019.12.29.889667; doi.org/10.1101/2019.12.29.889667.

45 Bob Yirka, "Shipworm that Eats Rock Instead of Wood Found in River in the Philippines," *Phys.Org*, 19 June 2019, <https://phys.org/news/2019-06-shipworm-wood-river-philippines.html>. For more information, see J. Reuben Shipway et al., "A Rock-Boring and Rock-Ingesting Freshwater Bivalve (Shipworm) from the Philippines," *Proceedings of the Royal Society B: Biological Sciences* (2019), doi.org/10.1098/rspb.2019.0434.

46 Steffen et al., "Trajectories," (2018): 8252.

47 E. S. Brondizio et al., "Re-Conceptualizing the Anthropocene: A Call for Collaboration," *Global Environmental Change* 39 (2016): 318–27.

is promoted, one that “fully integrates different approaches and different types of scholarly experience.”<sup>48</sup> This unity of knowledge has been long heralded. In *Economic and Philosophic Manuscripts of 1844*, Karl Marx prophesized, “Natural science will in time incorporate into itself the science of man, just as the science of man will incorporate into itself the natural science: there will be one science.”<sup>49</sup> Recent conferences and policy forums also emphasize “the need for radical interdisciplinary collaboration between the nature and the human sciences.”<sup>50</sup> Along these lines, but from a slightly different perspective, geoscientist Peter Haff adds up all human-Earth interactions, describing the aggregate as the “technosphere.” Borrowing an approach from the physical sciences called “coarse graining,” Haff adopts a level of resolution in his analysis that captures the overall system’s behavior, beyond the operations of its individual components. This technosphere, he claims, has now become autonomous, appropriating mass, energy, and information on its own.<sup>51</sup> Human beings must either serve the technosphere or suffer the consequences. The aim of unifying knowledge is to master the planet more thoroughly—or in Haff’s terms, cope with the technosphere more skilfully—so as to help guide us away from the current Hothouse trajectory. This unified story both *maps* our situation and *makes something emancipatory* of it. The “Singular Story” and “governance at the Earth System level” offer an escape route away from the deterministic business-as-usual road leading us to ruin.

But there are cautions too, from many sides. One warning points to the wondrous complexity of ourselves and our planet, and asks how we can know enough to govern from above. Such coarse-grained analysis of the total Earth System discounts the contingencies of myriad small-scale entanglements, yet it is doubtful that the Earth System functions independently of them. Certainly human existence cannot be understood only in global aggregate. The world, to borrow poet Louis MacNeice’s phrase, is “incorrigibly plural,” socially, but also physically and biologically. E. O. Wilson argues that mathematical models in ecology, as in economics, are of limited use given

48 Michael A. Ellis and Zev Trachtenberg, “Which Anthropocene is it to Be? Beyond Geology to a Moral and Public Discourse,” *AGU Publications, Earth’s Future Commentary* (2013): 124.

49 Quoted in Jürgen Renn, *The Evolution of Knowledge: Rethinking Science for the Anthropocene* (Princeton: Princeton University Press, 2020), 408.

50 Poul Holm and Verena Winiwarter, “Climate Change Studies and the Human Sciences,” *Global and Planetary Change* 156 (2017): 115–22, here 115.

51 Peter Haff, “Technology as a Geological Phenomenon: Implications for Human Well-Being,” in *A Stratigraphical Basis for the Anthropocene Special Publications* 395, ed. Colin Waters, Jan Zalasiewicz, Mark Williams, Mike Willis, and A. N. Snelling (London: Geological Society, 2014): 301–309, here 301. Peter Haff, “Humans and Technology in the Anthropocene: Six Rules,” *The Anthropocene Review* 1, no. 2 (2014): 126–36.

the “ubiquitous nonlinearities that twist and turn like escaping eels when you put together the actions of real players.” “Overall,” he says, “theorists have not been able to grasp the near-bottomless complexity of the real world.”<sup>52</sup> These intricate dynamics will not easily submit to a single master narrative, and even if they might, the costs of a mistake would be high. Committing to the wrong global governance regime or megascale project could very well lead to higher costs and horrific suffering. The dangers of geoengineering have been detailed by Clive Hamilton who warns against “Promethean recklessness.”<sup>53</sup> Megaprojects can produce megadisasters that are harder to correct than smaller-scale, more locally controlled schemes.

Another related caution is the untranslatability of one form of knowledge to another. If translating among human languages poses irresolvable difficulties (just compare English-language versions of the *Tao Te Ching!*), then translating, for instance, the language of rocks into the language of social justice is bound to throw up obstacles. What language, what mode of representation is appropriate for a single narrative combining histories of human endeavors with changes in the Earth System? Policy attempts to combine knowledge from the natural and human sciences have produced mixed results. For instance, the languages of the humanities and the metrics of climate models rarely mesh. The official remit of the United Nations International Panel on Climate Change (IPCC) includes considering “socio-economic” factors, but in practice, as historians Poul Holm and Verena Winiwarter have shown, the IPCC resists “major insights from cultural theory and historical analysis.”<sup>54</sup> Holm and Winiwarter quote a particularly revealing passage from the 2014 IPCC report complaining that research on social change can’t be used because of “the difficulty in representing these processes in models.”<sup>55</sup> This dismissal appears to have deeper roots than the difficulty posed by modeling social change. Some in the IPCC community are ideologically wedded to a narrow range of technical solutions. One editor, responding to an external reviewer’s comment on the need for more social science to understand people’s conduct, declared, “Changes in behavior may play a role; maybe not. . . . it is really tech change that

52 Edward O. Wilson, *Half-Earth: Our Planet’s Fight for Life* (New York and London: Norton, 2016), 102. Wilson, interestingly, confuses the ecomodernist view of the Anthropocene for that of the AWG and therefore argues against the concept of the Anthropocene.

53 Clive Hamilton, *Earthmasters: The Dawn of the Age of Climate Engineering* (New Haven: Yale University Press, 2013).

54 Holm and Winiwarter, “Climate Change Studies,” 115.

55 Holm and Winiwarter, “Climate Change Studies,” 120.

matters.”<sup>56</sup> In short, calls for collaboration, if not outright disingenuous, frequently insist that the humanities and social sciences conform to scientific modes of research and representation. To the extent that humanistic knowledge can be made to conform, an interdisciplinary approach may work at the global level with discrete problems such as eliminating ozone-depleting fluorocarbons. Al Gore’s 2006 film, *An Inconvenient Truth*, created just such a story. Benevolent totalitarianism, or what some call “eco-authoritarianism,” may have its uses in limited arenas. However, for many of the more complex challenges of the Anthropocene, a better way is a “Democracy of Voices.” The fact that the Anthropocene is global, systemic, and near-synchronous is not—and should not be taken as—a prescription for a single global, systemic, and near-synchronous solution. A “reorientation of human values” cannot begin at the Earth System level. Reality, even the singular reality of the Anthropocene, does not dictate only one human story.<sup>57</sup>

### Story #3 A Democracy of Voices

The aim of Anthropocene storytelling is to bend Earth’s trajectory away from the worst of all possible worlds, but we hamper ourselves if we insist only on unified knowledge, a single protagonist, and an integrated narrative synthesizing all disciplinary perspectives. There is only one Earth System, but there are many textured, contingent, and small-scale stories within it, both human and otherwise. Some of these stories are congruent with the global story; others are not. The problem begins, I think, with defining the Anthropocene as “the cumulative history of local and regional social change operating in various and evolving forms of connections to global processes.”<sup>58</sup> While partly right, this cumulative history necessarily ignores all the things that people did that never contributed to the forcings on the Earth System. Many still do these things: a fallen branch becomes a flute played at dawn, a community gathers to deliberate water rights, milkweed is planted to nourish monarch butterflies. These alternative stories point elsewhere. Although these actions are now overwhelmed by the dread teleology of the Anthropocene, which cannot be reversed, they still inscribe

56 Quoted in Holm and Winiwarter, “Climate Change Studies,” 121.

57 Lisa Sideris, “Anthropocene Convergences: A Report from the Field,” *RCC Perspectives: Transformations in Environment and Society*, no. 2 (2016): 89–96, doi.org/10.5282/rcc/7450.

58 Eduardo S. Brondizio et al., “Re-Conceptualizing the Anthropocene: A Call for Collaboration,” *Global Environmental Change* 39 (2016): 318–27, here 323.



other trajectories, ones we might usefully recuperate as practical guides to new negative feedback loops. A final point in their favor is political. A cumulative politics to contend with the outcome of history's cumulative processes pulls power out of local hands and centralizes it, but putting decision-making about how to accord with ecological constraints in local hands allows for a "Democracy of Voices" and a wider range of inventive possibilities.

In showing how the human story could be integrated into the biogeophysical one in the previous section, I gave examples of our species' restless, avaricious, and inventive actions, which have led us to dominate the planet, moving out of Africa and spreading across all continents, even to some extent to Antarctica. From hastening the extinction of megafauna to salinizing the soil in ancient Sumer, from fouling the air with coal fumes to producing computers requiring rare earth metals, this cumulative history can be arraigned against us. But not everything done by everyone everywhere worked against the feedback loops that kept our planet within Holocene boundaries. Take ideas. Not all people want to accumulate ever-greater wealth at the cost of social cohesion and their environment. The Bushman of the Kalahari guarded against community-destroying jealousy by establishing protocols for the distribution of food, especially meat, throughout the group.<sup>59</sup> The First Nations of the Canadian and American Pacific Coast strengthened coastal management regimes and much else by great feasts called potlatches where the powerful gave away or destroyed valuables. The Aboriginal people of Australia went further, not just creating sustainable communities but actively managing the whole continent to produce a bounteous, variegated landscape through the skillful deployment of fire. According to historian Bill Gammage, strategic burning allowed them to encourage desirable plants and preferred animal habitats so that people "travelled to known resources and made them not merely sustainable, but abundant, convenient, and predictable."<sup>60</sup> This coordinated management of an entire continent to foster enhanced biodiversity, moisture-retaining soils, cleaner water, and a range of habitats is an example of what paleogeologist and AWG member Mark Williams terms "mutualism." Going beyond sustainability, mutualism is the active creation of a richer environment.

59 Elizabeth Marshall Thomas, *The Old Way: A Story of the First People* (New York: Picador, 2006), 101–103.

60 Bill Gammage, *The Biggest Estate on Earth: How Aborigines Made Australia* (Crows Nest, Australia: Allen and Unwin, 2012), 3.

More recent examples of the human potential for enforcing negative feedback loops include the highly developed use of night soil as fertilizer in early modern Japan, which resulted in cleaner, healthier cities and better farmland.<sup>61</sup> Early modern Japanese also appear to have taken active measures to ensure population stability in the eighteenth century. Family size was calibrated to the goal of providing for the next generation by limiting births through a range of methods including late marriages or compulsory non-marriage for younger siblings, young people working away from home, abstinence, and infanticide. The cumulative result was a steady population slightly below 30 million for a century.<sup>62</sup> But we need not look back to premodern periods for alternatives to today's "business as usual." In 1950s America, some corporations worked with the concept of "fair profit" rather than Milton Friedman's "maximization of shareholder value" model. Even today, there are examples of alternative story lines discordant with the overall trajectory. While industrial agriculture diminishes soil quality and biodiversity, and creates ocean and river dead zones due to chemical fertilizer runoff, an estimated 50 percent of the world's population still depends on smallholder farms, some of which are now being managed to produce better soils, more nutritious crops, and stronger local communities.<sup>63</sup> This movement has sprung up in developed countries such as Japan, Germany, and the United States as well as less developed countries.<sup>64</sup> Cities can foster wildlife beyond squirrels and rats by new building techniques. Even universities can become green oases as the forty-year-long effort of Tsai Jen-Hui, architect at the National Taipei University of Technology, has shown.<sup>65</sup> These projects exemplify the "slow hope" that Christof Mauch recommends as our best way of putting the skids on business-as-usual.

61 See, for instance, Susan Hanley, *Everyday Things in Premodern Japan* (Berkeley and Los Angeles: University of California Press, 1997); Kayo Tajima, *The Marketing of Urban Human Waste in the Edo/Tokyo Metropolitan Area: 1600–1935* (Tufts University, 2005); and David Howell, "Fecal Matters: Prolegomenon to a History of Shit in Japan," in *Japan at Nature's Edge*, ed. Ian J. Miller, Julia Adeney Thomas, and Brett L. Walker (Honolulu: University of Hawai'i Press, 2017), 137–51. See also Donald Worster, "The Good Muck: Toward an Excremental History of China," *RCC: Perspectives: Transformations in Environment and Society*, no. 5 (2017), doi.org/10.5282/rcc/8135.

62 See Fabian Drixler, *Infanticide and Fertility in Eastern Japan: Discourse and Demography, 1660–1880* (Cambridge MA: Harvard University Press, 2008).

63 Sarah K. Lowder, Jakob Skoet, and Terri Raney, "The Number, Size, and Distribution of Farms, Smallholder Farms, and Family Farms Worldwide," *World Development* 87 (November 2016): 16–29.

64 Examples of these experiments include Fukuoka Masanobu, *The One-Straw Revolution: An Introduction to Natural Farming* (Emmaus, Pennsylvania: Rodale Press, 1978); Barbara Kingsolver, *Animal, Vegetable, Miracle: A Year of Food Life* (New York: Harper Perennial, 2007); Liz Carlisle, *Lentil Underground: Renegade Farmers and the Future of Food in America* (New York: Penguin Random House, 2015); Vandana Shiva, *Soil Not Oil: Environmental Justice in an Age of Climate Crisis* (Brooklyn: South End Press, 2008); Ramachandra Guha, *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya* (Berkeley: University of California Press, 2000).

65 Christof Mauch, "Slow Hope: Rethinking Ecologies of Crisis and Fear," *RCC Perspectives: Transformations in Environment and Society*, no. 1 (2019), 21–23, doi.org/10.5282/rcc/8556.

As we look to the future, harnessing local ingenuity to build multiple, redundant systems of different sorts in different environments at different levels may provide the capacity we need to cope better with tipping points and unexpected events on our destabilized planet. Most especially, if we are to galvanize communities to work toward the goal of ecological reflexivity, drawing on useful patterns in their pasts that accord with their particular ecosystems can help meet the global goal.<sup>66</sup> In this way, bringing together the new reality of our planetary situation with the diversity of human behaviors at local, regional, and national levels allows for greater input and gives us more than just one Anthropocene story. More voices, more stories, more options.

In case this plea for multiple stories seems like advocacy for culturally bound humanistic knowledge as opposed to universal scientific approaches, let me give an example from climate change science which also highlights the importance of the local and particular. Take, for instance, something as superficially uncontroversial as tree-planting on a global scale to reduce carbon dioxide in the atmosphere. The headline-grabbing research of Thomas Crowther's lab promoted an "additional 0.9 billion hectares of canopy cover . . . as one of the most effective solutions at our disposal to mitigate climate change," yet this work sparked dissension due to its global level of analysis.<sup>67</sup> *Science* published six critiques, many pointing to regional and local "environmental or socioeconomic constraints," including different soils and rural communities.<sup>68</sup> The Olympian perspective of a global computer model of forests may help, but it is limited, perhaps severely, by the incorrigible pluralism of interactions between life-forms and inorganic cycles at non-global levels. When we move away from the narrowness of a climate change analysis to the more complex, systemic problem of the Anthropocene, there's an even stronger imperative to tell stories with many protagonists, each with different impulses and aims.<sup>69</sup> What works at one level in some places may not work at all universally.

66 John S. Dryzek and Jonathan Pickering, *The Politics of the Anthropocene* (Oxford: Oxford University Press, 2019)

67 Jean-Francois Bastin et al., "The Global Tree Restoration Potential," *Science* 365 (2019): 76–79, here 78.

68 Eike Luedeling et al., "Forest Restoration: Overlooked Constraints," *Science* 366 (18 October 2019): 315. For a general overview of this controversy, see Gabriel Popkin, "Growing Pains: Ecologist Thomas Crowther is Having a Bumpy Rise to Prominence," *Science* 366 (25 October 2019): 412–15.

69 For the importance of the difference between climate change and the Anthropocene, see Julia Adeney Thomas, "Why the 'Anthropocene' Is Not 'Climate Change' and Why It Matters," *AsiaGlobal Online: Asian Perspectives/Global Issues*, 10 January 2019, <https://www.asiaglobalonline.hku.hk/anthropocene-climate-change>, and Michael Ellis, "Climate-Change and the Anthropocene," *Inhabiting the Anthropocene*, 23 January 2019, <https://inhabitingtheanthropocene.com/2019/01/23/climate-change-and-the-anthropocene/>.

Questions of scale are at the heart of the difference between a “Singular Story” and a “Democracy of Voices.” Defining the Anthropocene as the total accumulation of all human behaviors puts everything on one hierarchical scale and proposes the “Singular Story.” Defining the Anthropocene as the result of some actions, systems, and institutions, but not all, maps a non-hierarchical web of connection that resists scaling in the conventional sense. Elements are only partially connected with one another.<sup>70</sup> The friction and sometimes the incommensurability of these ways of knowing and doing make it impossible to represent them all in a single coherent narrative or model.<sup>71</sup> At the global level, where agreement on the nature of the biogeophysical threat is essential, this diversity poses a problem. But, once agreement as to the overall goal is established, the diversity of means is, I think, all to the good. The more stories we have, the more ways forward we might be able to imagine, and the more resilience and redundancy we’ll build into our ways of doing things as we aim to stabilize the Earth System.

There is no doubt in my mind that the Anthropocene requires a closer relationship between science, on the one hand, and the humanities and social sciences on the other. However, as I have argued here, this imperative does not mean that all forms of understanding must now conform to the questions and methods of biogeophysical science. In *The Evolution of Knowledge*, historian of science Jürgen Renn lays out a similar case. Instead of reducing human knowledge to scientific models, he argues for “realigning science with the challenges of the humanities.” Knowledge, now, must focus “on the limits, the intrinsic complexities, and the historical dynamics of systems, be they ecological, societal, or cognitive. Our main concern is no longer universalizing the local (as it was in the modern period) but of localizing and contextualizing the supposedly universal.”<sup>72</sup> We should heed these words. The Anthropocene tells us that we have a single Earth System, but we still need many voices and many disciplinary tools to tackle it.

70 Marilyn Strathern, *Partial Connections*. Updated edition. (Savage, Maryland: Rowman and Littlefield, 1991).

71 Julia Adeney Thomas, “History and Biology in the Anthropocene: Problems of Scale, Problems of Value,” *American Historical Review* 119 (2014): 1587–1607. See also Anna Tsing, “On Nonscalability: The Living World is not Amenable to Precision-Nested Scales,” *Common Knowledge* 18, no. 3 (2012): 505–24.

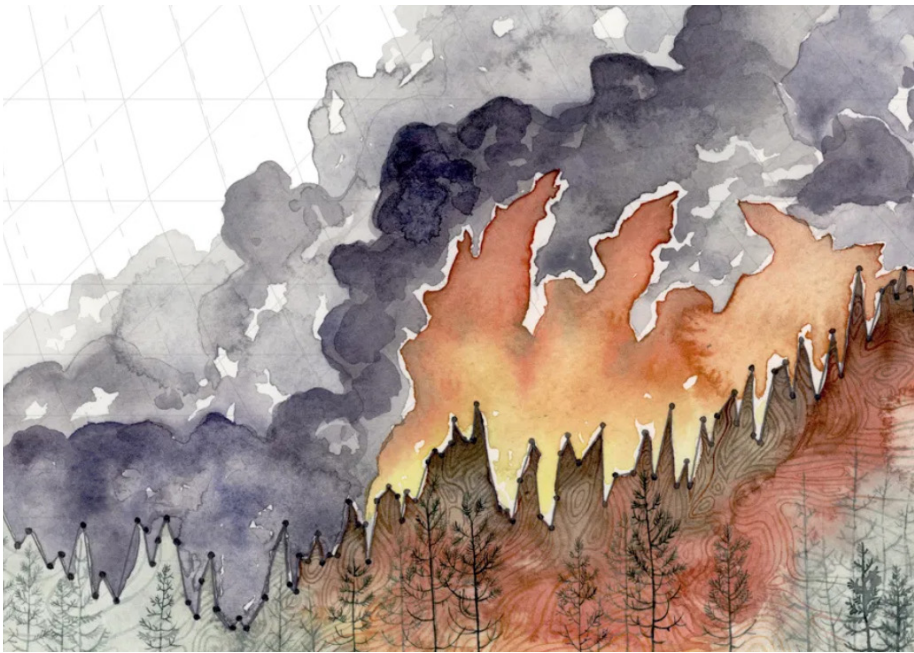
72 Renn, *The Evolution of Knowledge*, 408.

## Conclusion

My essay puts a brave face on things. I have tried to convince you—and myself—that there are stories that do not end in Hothouse Earth. I have tried to make the case that our first step—everyone’s first step—is to grasp the nature of our challenge as described by the AWG and Earth System scientists. Then, and only then, can we begin to craft useful human stories of how to navigate the singular reality of the Anthropocene. That reality, limiting though it is in comparison with the Holocene, is not yet deterministic. There is still more than one possible true story, and even more than one possible *emancipatory* story. Collectively, we must attempt to steer the Earth System by mirroring its totality with a system of global governance and technological initiatives. This story is an epic on the largest scale, unifying all forms of knowledge, peoples, and planet. But, alongside this epic tale, we can—and indeed must—attempt to foster a thousand experimental parables. Each could make changes to local systems, values, and institutions so that they don’t push us ever more rapidly into dangerous territory. I tend to think that the more stories we have, the better our chances. These allegories of local goodness need to be orchestrated toward the same end of stabilizing the Earth System, and that can only be done on the grounds of science. Despite their contrasting protagonists, both the “Singular Story” and “Democracy of Voices” begin and end with a shared understanding of our daunting new reality.

All the while, as we ponder our way forward, the business-as-usual storyline swiftly propels us toward the Niagara Falls of a planetary threshold. If the *PNAS* article by Will Steffen and his co-authors is correct, we have little time and much to do. Once the Earth System cascades over the precipice, there’s no crawling back. Our collective story at that point, on an uninhabitable planet, can offer no emancipatory narrative for human societies. Responding to the Anthropocene with an “Anything Goes” attitude that refuses to take the science seriously is complicit in business-as-usual. If this approach, the “normal one” we’re used to, prevails, tragedy looms. For individuals amid the tumult of Hothouse Earth, I can imagine stories of both courage and failure: A few will face death with the clarity of a Stoic or a Buddhist; many will be kind to fellow sufferers; but most, in the words of W. H. Auden, will “die as men before their bodies die.”<sup>73</sup> After that, all our stories are over.

73 The phrase is from “The Shield of Achilles” but the past tense of the poem is, here, made future.



**Figure 3.** *Increasing Forest Fire Activity*, © Jill Pelto. Scientist and artist Jill Pelto uses data about sea level rise, glacier volume decline, increasing global temperatures, and the use of fossil fuels to create images that depict the planet's rapidly changing environments. See the artist's website for further works and information, <http://www.jillpelto.com>.