CHAPTER 1

# *Earth*

*Laura Dassow Walls*

Early in January 1834, fresh from his first trip to Europe, Ralph Waldo Emerson offered the first fruits of what he had learned to his Boston audience. Today, he told them, we look at the planet itself 'in quite another light from any in which our fathers regarded it'. Far from being a mere farm, battlefield, market or dwelling-place, the Earth 'is itself a monument on whose surface every age of perhaps numberless centuries has somewhere inscribed its history in gigantic letters', letters so huge and far apart 'that only the most diligent observer ... can read them'. And what do they reveal? That Man is no upstart, 'but prophesied in nature for a thousand thousand ages before he appeared; that from times incalculably remote there has been a progressive preparation for him'. Our planet was made to fit us exactly as a father might build his children a house, 'laying out the grounds, curing the chimneys, and stocking the cellar'. And the fit is precise: so perfectly is human power adjusted to the forces of nature, even to the way our wants lead us to develop those powers still further, that we are entitled to claim 'possession of the globe'. But mere possession is not enough. We must press still farther, altering and amending the globe, 'improv[ing] the face of the planet itself' and thrilling ourselves 'with delight by the choral harmony of the whole'. Thus does Emerson establish his New Organon for modernity: a Promethean path by which patient research 'can make the mind a second Nature, a second Universe', mastering the planet itself.[1]

In August 1856, Emerson's friend Henry David Thoreau inclined towards a different form of epiphany. 'I see that all is not garden and cultivated field and crops', he wrote after an afternoon's walk; 'that there are square rods in Middlesex County as purely primitive and wild as they were a thousand years ago ... little oases of wildness in the desert of our civilization, wild as a square rod on the moon'. Where Emerson was moved to conquest, Thoreau was moved to adoration: 'I believe almost in the personality of such planetary matter, feel something akin to reverence for

it, can even worship it as terrene, titanic matter extant in my day.' Why should we reverence only the meteors that fall from another planet? 'Are not the stones in Hodge's wall as good as the aerolite at Mecca? Is not our broad back-door-stone as good as any corner-stone in heaven?'[2] Is not Earth a heavenly body, just as much as the stars above?

Both Emerson and Thoreau are moved by something which had recently emerged as a surprising new object of fascination: the planetary Earth. The natural sciences had been reorienting themselves to this new object for decades, yet even by Emerson's day, this most unsettling of discoveries had still not stabilised. This newest planet, too big to see – and yet, imagined against the vastness of deep space, so absurdly small; this mundane planet underfoot, the ground of our household toils yet composed of incalculable ages receding in unimaginably deep time – did this new object humiliate us in our ancient, Biblical pride? Or, was this God's greatest gift, newly revealed as the yielding substrate for the infinite greatness of Man? Both, and more besides: the literature of the nineteenth century records the eruption of Planet Earth into human consciousness. What they did with this gift gave us in turn our own trauma. In an irony which returns us to Emerson's age, we have named that trauma not after the Earth but after ourselves: the Anthropocene.

That this strange historical loop bonds us tightly with our past is what makes this literature so difficult to read today. In it, we are forced to encounter the history we had buried and ignored as it roars back to life, bearing down upon us with our every measure of rising $CO_2$, every purchase of plastic-packaged lettuce, every turn of the key in the ignition of our automobiles. As ecocritic Timothy Clark has recently observed, we are now part of the history we study. This deranges all our familiar historicist tricks of exclusion: 'the more degraded and dangerous the once-natural environment becomes, the more the future or possible futures will insist on themselves as part of any context to be considered or critical method to be used.'[3] Despite the chains of causality that bind us with our past, we feel our distance from it; as Anahid Nersessian observes, Romantic literature is '*in* the Anthropocene but not *of* it'.[4] Yet Clark's point remains: we *are* of it, inscribed by its gigantic letters, which we can read even if our ancestors could not – even as they inscribed those letters onto the face of the planet.

Our problem, as literary scholars, is how to stay open to this literature on its own terms while registering the fact that they, as much as we, are gathered into this same massive mutation in the conditions of reality. As Dipesh Chakrabarty announced in 'The Climate of History' (2009), the

distinction between human history and natural history has collapsed. Our climate crisis reveals 'the enjambment' of the separate orders 'of recorded and deep histories of the human kind, of species history and the history of the earth systems, revealing the deep connections through which the planet's carbon cycle and life interact with each other'.[5] But the collapse that Chakrabarty locates in recent decades actually began two centuries before. As it intensified, it defined the problem of the nineteenth century. Observers who recognised this emergent crisis responded with great interest and deep anxiety – at least for a time, until this, too, was sealed up and buried, along with so many other unspeakable histories. Given the threat it so evidently posed, planetarity could be honored, even worshipped, in its ancient and terrifying indifference to the humans, it both engenders and reclaims; but couldn't it also be tamed and re-engineered into the mirror of humanity? – into Bacon's crystal ball, the dematerialisation and reassembly of an ancient planet into our globalised modernity of infinite abundance? Yes, and it worked – for a while.

## Discovering Earth

Nature didn't always have a history; it became historical during the eighteenth century, as scientific expeditions returned from around the planet bearing immense collections of specimens that exploded once-tidy taxonomies into ramifying messes. Only trained specialists could categorise and describe the planet's immense biodiversity into a comprehensive order of being. As they did so, natural history itself was forced to reorganise from an ordered grid of related phenomena into a temporal network of causal relationships. The breakthrough was led by the Paris naturalist Georges-Louis Leclerc, the Comte de Buffon, who in *Epochs of Nature* (1778) presented the Earth as 'a single integrated system, of living and non-living components—just as we see it today'.[6] Buffon narrativised the static arrangement of minerals, plants and animals, grouped by shared features, into a dynamic tableau of nature's generative power forming and shaping itself through time, starting with the cooling of the molten Earth and culminating with the plenitude of creation – a sweeping tableau that bound mankind together with the planet in a common destiny. As he wrote, surveying that staggering plenitude, 'all that can exist, does'. This meant that nature could be understood only *historically*; 'To understand the present ... one had to know the past.'[7] And for Buffon, that past was disconcertingly deep – seventy-five thousand years, he calculated, laughably short by today's standards. Yet, it was Buffon who placed 'squarely in the

https://doi.org/10.1017/9781108683111.003 Published online by Cambridge University Press

public consciousness' the notion of an Earth vastly older than Biblical chronology, and with it, the notion of humanity as 'a global force' whose advent marked the most recent epoch of the planet's historical stages: 'the entire face of the Earth today bears the imprint of human power' – which we could, he reasoned, use for our benefit. For instance, by the judicious use of deforestation and the planting of trees, humans could modify the climate of the Earth itself, adjusting its temperature to our preferred setting – a capacity celebrated by Emerson: 'Climate is ameliorated by cultivation and not only the climate softened, but the air purified, and made healthful .... By the study of nature [man] improves nature, and keeps the world in repair.'[8]

By the 1830s, when Emerson began delivering his popular lectures, geology was the leading edge of natural history. Wildly speculative 'theories of the earth' had given way to the meticulous quest to untangle and define the precise chronology of rock and fossil formations, understood as nothing less than the archives of nature's self-development through untold millions of years.[9] What the rocks revealed was not a single smooth narrative but, rather, long eras of continental uplift, erosion and sedimentary deposition, punctuated by wild episodes of volcanic eruption. For Scottish geologist James Hutton, this pattern mitigated Buffon's troubling conclusion that the cooling Earth would finally lapse into heat-death and the extinction of all life. Instead, Hutton read in the rocks 'a story of stone's energy and constant movement, one in which horizontal layers of sedimentation bend, ripple, melt, interpenetrate'.[10] From this energy, Hutton theorised that Earth could regenerate as well as decay – a 'self-renewing world machine' of erosion, deposition and volcanic uplift creating 'a slow choreography that can never end, or even age, so long as higher powers maintain the current order of nature's laws'. The ringing final line of Hutton's 1788 treatise *Theory of the Earth* has become famous in this literature: 'If the succession of worlds is established in the system of nature, it is in vain to look for anything higher in the origin of the earth. The result, therefore, of our present enquiry is, that we find no vestige of a beginning,—no prospect of an end.'[11] The earth-*machine* was in fact more like an earth-*body*, an organism in which decay could be 'naturally repaired, in the exertion of those productive powers by which it had been formed'. Such a living Earth would cycle on forever: it was Hutton who unleashed upon modernity the challenge of deep time.[12]

Such an Earth also defies history. Time might be deep, but an eternally cycling nature has no narrative to inscribe, no relation to human history – it is beyond human time altogether, unfathomable and infinite. Yet, this

was not the direction of mainstream geology, which set about ordering Hutton's physical system of cycling stages into a linear, sequential history, what Stephen Jay Gould calls 'a quirky sequence of intricate, unique, unrepeatable events linked in a unidirectional chain of complex causes (and gobs of randomness)'.[13] This transformation was wrought by Hutton's friend John Playfair, who popularised Hutton's notoriously difficult treatise by casting his ahistorical cycles into a progressive history also in line with Biblical revelation.

Thus when Emerson composed his lecture on the 'Globe', he rifled through his notes on Playfair, perhaps pausing to consider a line that became one of his favourites: 'A method of discovering truths is more valuable than the truths it has discovered.'[14] Emerson's interest in geology led him to Hutton's successor Charles Lyell, whose foundational work was based on a method of inductive reasoning that solidified geology as a true natural philosophy: as Lyell put it in his subtitle, one could explain 'the former changes of the earth's surface, by reference to causes now in operation'. Lyell's *Principles of Geology* (1830–3) was the sort of scientific monument that shifted the public imagination. As Emerson's proverb indicates, it did so not merely by piling on facts but by inculcating a principle of observation. Yet, the effect was paradoxical: even as the evidence of our eyes could make legible the deepest events of Earth's history, the abyss of deep time estranged Earth from human reckoning and experience. The key was time: those twisted strata and horrifying chasms, those 'gigantic letters', told not of some planetary catastrophe or terrible Biblical deluge but merely the slow and steady operation of common causes across an incomprehensible clock – soil eroding from an afternoon's rain, mud settling gently in a streambed, uplift following a distant earthquake. As Emerson put it in his essay 'Nature' (1844): 'All changes pass without violence, by reason of the two cardinal conditions of boundless space and boundless time. Geology has initiated us into the secularity of nature, and taught us to disuse our dame-school measure, and exchange our Mosaic and Ptolemaic schemes for her large style.'[15] Thoreau, reading Lyell in Emerson's library, copied the key idea into his Journal: '[W]e discover the causes of all past change in the present invariable order of the universe.' At the end of his life, on the heels of Darwin's *Origin of Species*, Thoreau reiterated: 'There has not been a sudden re-formation, or, as it were, new creation of the world, but a steady progress according to existing laws.'[16]

All such geological reasoning necessarily ended with the present, a present clearly stamped by human actions on the face of the Earth.

Buffon and Emerson, as noted, both expected that humans would transform their planet for the better; meanwhile, geologists debated what name should be given to denote the obvious impact of recent human activity. In 1854, Welsh geologist Thomas Jenkyn proposed the term '"Anthropozoic," or human life rocks', since the rocks were already recording the influence of humans. In 1873, his term was seconded by the Italian geologist Antonio Stoppani, who regarded humans as already 'a new telluric force that for its strength and universality does not pale in the face of the greatest forces of the globe'.[17] Others, too, proposed variations on the concept, such that the historical puzzle is not how the nineteenth century could have conceived humans as a geological agent but how the twenty-first century could have forgotten this. Taking up this puzzle, Simon Lewis and Mark Maslin trace the parallel rise of a competing term originated by Lyell in 1830: the Holocene, or 'Recent Epoch', naming as one of its distinguishing features the presence of humans. In time, as Lyell's authority became dominant, Western geologists increasingly settled on the term 'Holocene' – yet they shifted its meaning by uncoupling it from Lyell's original association with human impact, thus erasing the concept's troubling associations with human-caused environmental damage. This shift prompted atmospheric chemist Paul Crutzen, in 2000, to name our epoch 'the Anthropocene'. The original, human-centred definition of 'the Holocene' had long since been forgotten and, with it, the nineteenth century's deep engagement with the power of humanity as a force of nature.[18]

The break is registered around the ambivalence of Lyell's method. On the one hand, deep causes for incomprehensible changes in nature could be imagined in familiar terms. Thoreau used Lyell's method to open up the historical meaning of New England's landscapes, seeing in them the agency of common natural causes – wind, rain and floods, erosion and deposition, the dispersion of pollen and seeds, the reciprocity of organism and environment in every moment across scales from intimate to cosmic. On the other hand, the planetary scales of time unfolding across untold millions upon millions of years made nature incomprehensible in human terms. How could any history that unfolded on such scales – whether cyclical or progressive – be imagined or be humanly meaningful? Depending on how one saw it, 'Nature' could be either one's most intimate kin, the neighbouring neighbour for all human life, or an alienating and terrifying force, external, virtually immobile on human timescales, hostile or at best indifferent to the humans who infested it.

## Humboldt's Planet

The entire career of Alexander von Humboldt was dedicated to answering this question. This accounts, in large part, for his enormous popularity and prestige: not only did he introduce the planetary Earth to educated readers around the world, his popular writings suggested what it might mean to live on such a planet – to inhabit it not in fear and alienation, nor by seizing control to wrest from nature a wholly artificial world, but in reciprocity and mutual illumination. Christophe Bonneuil and Jean-Baptiste Fressoz remark that, far from dividing humans from nature, 'the period between 1770 and 1830 was marked on the contrary by a very acute awareness of the interactions between nature and society' – ironically, just as Western Europe was precipitating the world into the 'Anthropocene'.[19] This era shaped Humboldt, and he shaped it in turn.

The face of Humboldt's planet was not flat, but deep – he trained himself to see not horizontally across surfaces, but vertically into chains of causality, which he interlaced into growing networks of connections that looped local and present phenomena with planetary, even cosmic, forces. This method allowed Humboldt to work simultaneously across three axes: deep space, deep time and deep mind. His work along the first axis, deep space, is familiar because of his runaway bestseller *Cosmos* (1845–7). Humboldt opened *Cosmos* by taking his readers on an imaginary journey out to 'the depths of space', whence they 'gradually descend through the starry zone . . . to our own terrestrial spheroid, circled by air and ocean'. In this radical new vision, we no longer *ascend* from Earth, escaping and reaching for the stars, but instead we 'descend to our own planet' in order to see it truly, for the first time, as a living planet. Humboldt asks us to envision a world – more, to inhabit a cosmology – that connects 'the realms of infinity' with the swarms of 'minute microscopic animal and vegetable organisms which exist in standing waters and on the weather-beaten surface of our rocks'. As he said towards the end of his life, while our planet may appear 'only like a handful of conglomerated matter in the immeasurable universe', its 'system of co-operating forces . . . shows the dependence of every part of nature upon other parts', seamlessly intergraded from the most elementary inorganic processes to the organic relations that bring into play forces responsible for 'the production and maintenance of life'.[20] According to cultural theorist Peter Sloterdijk, when scientists in Humboldt's day turned their newly powerful telescopes not to the heavens but, in their imaginations, from the heavens back to Earth, they initiated nothing less than a new phase of modernity: 'the

cosmologically sublime' – an aesthetic emergency signalled by Humboldt's *Cosmos*. In Humboldt's day the Earth itself becomes, as Sloterdijk writes, 'the star to which one returns'.[21]

Humboldt set this vision of Earth in deep space along his second axis, deep time, through his work in the emerging geological sciences. His early training as a mining engineer showed him a deep-layered planet thick with fossilised vegetation and riddled with caves and seams, and he applied the cartographic methods of geology to read below the ground, to see where eyes are blind. He taught the world how to see the structure of Earth by comparing rocky outcroppings in local formations, then in regional series, then inferring the underlying structure by relating the strata one could see to analogous series hundreds or thousands of miles away. The result was a dynamic Earth visualised from its molten depths, cooling through the aeons of lithic and organic history, to its present continents and oceans as stitched and separated by chains of volcanoes by which the interior forces of the planet react upon its external crust and vent gases that shape the structure of the atmosphere. And, everywhere, Humboldt traced how the circulations and settlements of human beings, with their domesticated plants and animals, across Earth's continents, oceans and islands, resulted in radical and profound alterations to the Earth's living systems. Rather than separating human history from natural history, Humboldt showed that only through planetary history does humanity become legible.

Third, what binds deep space and deep time together is the mind that can trace their connections through scientific inference and imaginative vision, using language to realise an Earth that we cannot see. Humboldt's 'Nature' does not precede the writing of his oddly disorienting, immersive essays as that which is separate from the 'Human'; instead, nature emanates from them as all that is complexly bound to the creation of the human. For the 'nature' that emanates from Humboldt's writings does so by reimagining the resources of language: when he argues that Earth's strata present traces of the existence and destruction of prior worlds, he shows how the land tells its own story, and how, by learning to read the land's geography, 'earth-writing', we recognise ourselves as part of it. As Humboldt explains in *Cosmos*, in reading the Earth 'we behold the present and the past reciprocally incorporated, as it were, with one another; for the domain of nature is like that of languages, in which etymological research reveals a successive development'. Just as the study of language shows us linguistic relations that animate our present-day speech, the study of Earth shows us geological relations which 'animate the scenery by the associations of

the past which they awaken, acting upon the imagination of the enlightened observer like traditional records of an earlier world. Their form is their history.'[22] Thus languages and geological forms not only evidence *analogous* historical processes, they are 'reciprocally incorporated', making human languages an aspect (or in his word, '*Ansichten*') of planetary geohistory, a living, co-evolving form.

To forge such connections across nature and culture, Humboldt insists on the value of nature writing for rejuvenating languages that modernity has detached from their environmental origins.[23] And as he shows humans to be, in the deepest way, terrestrial beings – profoundly Earth-bound, as Bruno Latour would say – he considers the consequences for ethics and aesthetics as well as science.[24] Humboldt's goal was not to represent a stable reality, either scientifically or poetically, nor to offer a smoothly integrated view of Nature as a whole, but to deploy the act of writing itself to found a science that seamlessly fuses scientific knowledge and literary imagination with ethical concerns, demonstrating how humans and nature compose, together, the evolving and reciprocal relationship that Humboldt called 'Cosmos'. Land, life and language are co-creations. To kill any of them is literally to kill the Cosmos – his own word, reclaimed from the ancient Greek to name the physical, material universe as it is recognised by the mind it engendered, and expressed in the fullness of its order and beauty. Thus, his popular works instantiate Earth, our home, as a planet *both* estranged from us *and* intimately intertwined with everything it means to be human. In doing this, Humboldt announces himself as our first and still primary theorist of planetarity.

## On (Not) Sounding the Alarm . . .

In Humboldt's day, problems of environmental reflexivity were shaped by notions of the 'economy of nature', which studied the interface between nature and humanity in order to rationalise human social organisation via natural laws. Humboldt defied traditional views by presuming a planet organised neither like a dead machine, nor like a living body, but as a dynamic and self-organising *world*, an emergent concept that mutated 'economy' into what Ernst Haeckel, in 1866, named 'ecology' – not to nominate a new science but, rather, to rename and reorganise the established tradition of thought in which both Humboldt and Thoreau participated, and which Charles Darwin transformed into the central organising concept of the natural sciences. Nor were political systems excluded – not at first: Darwin's *Origin of Species* (1859) was greeted by early American

readers as scientific proof that a global political economy based on slavery was a moral outrage, violating the laws of nature.[25]

Social Darwinism perverted this Humboldtian argument into a racist still-toxic legacy. Yet, that such interlinkages could be quite radical is suggested by Charles Fourier, who, in 1821, concluded from the recent climate disturbance of 1816's 'year without a summer' that the 'health of the globe' was declining owing to the rise of industrial civilisation, which 'overturns everything ... by the struggle of individual interest against collective interest'. Fourier offered to cure this planetary and global sickness by the formation of communal associations, an eco-socialist vision which inspired Utopian communities across France and the United States.[26] Similar warnings lay at the heart of modern liberalism, which sought to balance global markets with the common good. In 1848, fears that industrial capital could not expand infinitely on a bounded planet led John Stuart Mill to propose a 'stationary state', an economy of means towards higher ends.[27] By 1864, George Perkins Marsh was ready to sound the alarm: 'The earth is fast becoming an unfit home for its noblest inhabitant, and another era of equal human crime and human improvidence ... would reduce it to such a condition of impoverished productiveness, of shattered surface, of climatic excess, as to threaten the depravation, barbarism, and perhaps even extinction of the species.'[28] His lesson still terrifies: our war against Nature will render us not master but slave, as she wars against us in return.

Marsh was respected and his book influential – up to a point: while his rational, technocratic solutions to environmental harms were well received, critics scoffed that only 'scientific idiots and crackpots' could believe his ludicrous doomsday warnings.[29] This persistent pattern, of scientists and political theorists sounding ever-more-dire alarms which society mocks or ignores, has, since, become a familiar feature of the Anthropocene. As Bonneuil and Fressoz argue, 'we thus have a history of the marginalization of knowledge and alerts, a story of "modern disinhibition" that should be heeded'. Our ancestors destroyed environments not because they didn't know what they were doing; they knew, and did it anyway. The problem historians face, therefore, is not how to account for the emergence of Anthropocenic discourse, but to understand how it emerged, repeatedly, only to be repeatedly marginalised and subsequently forgotten.[30]

We, of all people, have lost the right to be surprised at ancestors whose practices of denial only dug us in deeper. The shock of planetarity registers in our denial: it upends all our Western cosmologies. The shallow, cyclical time of the Christian Bible becomes the abyssal time of Humboldt's

Cosmos, destabilising the theological plot that has for two millennia organised meaningful human life in the West. The providential promise of infinite territory for capital's infinite expansion and the unregulated externalisation of its excrement has become the finite boundary of a finite planet, destabilising imperial dominance.[31] The wall of separation between human mind and mindless nature becomes the historically emergent mind intuited by Humboldt and theorised by Darwin, a concept so disturbing that the prospect of animal consciousness remains controversial even today. In short, the discovery of Earth destabilised the foundational separation of humans from nature that undergirds the entire Western tradition. The response, however, was not to mitigate but to intensify: ever since the global explorations of the 1400s, modernity has built itself into global dominance by devising ways to restabilise the old binary relationship at any cost. The shock waves define both Romantic and Victorian literature, but the process continues today. Whether humanity, or even a recognisable Earth, can survive its conclusion remains, today, an unsettled question.

One measure of our uncertainty is the anxious search for analogues that might help us understand our current condition. They are not reassuring: four out of five of Earth's previous great extinctions were triggered by rapid rises in $CO_2$, and the rapidity of our current path outstrips them all by at least an order of magnitude. Thus, scientists, despite their desire to draw predictive power from the deep past, have concluded that we are in a 'no-analogue' state.[32] The difference, of course, lies in the wholesale global swerve, in the mid-nineteenth century, to fossil fuels. Ironically, the Anthropocene future that Thoreau warned against relied on renewables – wind, solar, hydropower. Global warming is but one of the Anthropocene's many faces: Thoreau heated his iconic house with stumps left over from the deforestation he witnessed, as New England's woodlands were clear-cut to build, fill and fuel the locomotives whose screams turned his attention to the future the railroad was bringing. Thoreau named that engine *Atropos*, Fate. As for coal? It came to Thoreau's world as the substitute fuel that would save the forests, just as oil came into Melville's world as the alternative fuel that would save the whales. What the broad Earth was not big enough to supply, a deep Earth, it seemed, would supply in infinite abundance.

The links were drawn by Emerson's own circle. Emerson's Harvard friend Louis Agassiz, back when he had been Humboldt's protégé in Europe, had concluded from studies of the Alpine glaciers of his Swiss homeland that Lyell's grand historical cycles were punctuated by global glaciations that periodically swept the Earth clear of life. But what had

caused the Earth to freeze? Another friend, Irish physicist John Tyndall (inspired by his own Alpine mountaineering), traced the cause to atmospheric chemistry. He wrote in 1861: '[A]n almost inappreciable admixture of any of the hydrocarbon vapours would produce great effect on the terrestrial rays and produce corresponding changes of climate.'[33] That is, 'carbonic acid', which we now know as carbon dioxide, trapped heat and warmed the planet. Tyndall's observations confirmed the results of Eunice Foote of Seneca Falls, New York, a scientist and early advocate of women's rights, who, in 1856, had established that carbon dioxide warmed the atmosphere; more, she suggested, would mean a warmer Earth.[34]

Today the link between rising $CO_2$ and burning fossil fuels that release $CO_2$ seems obvious, yet, this was not at all obvious to writers and scientists in the nineteenth century. Even glacial theory, as it came to prevail, argued not for human agency over planetary change but for the reverse: ice ages, in their incomprehensibility, only further removed planetary nature from the warm and vital human world. Not until the mid-twentieth century would the links between climate change and human agency be joined into a single picture. Until then, the notion that a trace gas could produce such cataclysmic effect, and that human actions could produce so much of it as to have that effect, was, literally, incredible. What prevailed instead was the wisdom of Charles Lyell: 'We must command nature by obeying her laws . . . and for this reason we can never materially interfere with any of the great changes which either the aqueous or igneous causes are bringing about on the earth.' Or of Ralph Waldo Emerson, who reassured the world that '[Man's] operations taken together are so insignificant, a little chipping, baking, patching, and washing, that in an impression so grand as that of the world on the human mind, they do not vary the result.'[35] Anxieties were resolved, the tracks of the future laid, on this convenient nineteenth-century fiction. Nevertheless, it is we, who have driven the engine to the very edge. Eighty-five per cent of the $CO_2$ ever released has been released since 1948, when Thoreau's successor Aldo Leopold called for the land ethic; over half has been released since 1988 when the United Nations founded the IPCC.[36] That 'we can never interfere' with the Earth's system has become the rock of faith, or delusion, on which all our lives are built.

## Conclusion: Reading the New Earth

Our own close connection to generations before, who both identified the Anthropocene and led us into it, returns us to the question raised by Clark: How might we read the literature of the nineteenth century without

closing it down, without building ourselves into its inbuilt future? Nersessian warns against 'dynamic nominalism', a paranoid reading by which we project into the past our knowledge of the ruination of our climate.[37] Against the argument of Bonneuil and Fressoz – *they knew, but did nothing! we know, but it's too late!* – she asks how we might sustain a 'nonanticipatory' relation to the texts we read, by *not* projecting our knowledge onto them, by practising instead a 'nescience, or not knowing'. Nescience acknowledges that in 'calamity form', linear cause-and-effect relations are deranged: we cannot know whether our actions today can make a difference to the future. Does nothing we do matter? Does everything we do matter? Yet, at least we can beware of how 'form exerts the contextual pressure that can turn an event into a signal' – that is, be aware that only in hindsight do some events become signals. Humboldt, offering the geologist's hindsight that the form of a landscape encodes its history, creates a formal logic that makes the incomprehensible (vast accumulations of planetary time) into a regime of history that can be apprehended by Victorian audiences. But how, in a deranged world, where past and future no longer align, can *we* apprehend the *future*? The acute anxiety this generates reminds us that literature gives form to doubt, allowing us to speak from a place of uncertainty. Thus, the anxiety of not-knowing should not end our imagination of possible future worlds but provoke it.[38]

And we might extend that courtesy to the past. Emerson, by aligning his own startling discovery of the Earth to his inheritance of natural theology, resolves his terrified uncertainty at nature's vast 'secular' periods by converting the beneficent designs of God into a mindfully designing Man, who carries God's creative Logos into the material creation to make a 'second nature' through modern technology. He helped his and later generations to rationalise a world that opposed natural limitation, 'fate', with the infinitude of human 'freedom'. While Emerson's logic opened a protective wedge separating human history from the planetary temporality of Earth, Thoreau used Lyell as his primer for reading Earth as a book, turning the landscape's most delicate strata and nuanced features into gradual, ongoing historical processes that were legible as poetry. Both wrote in the optative mood, confident that an accurate reading of a signing Earth would tell us how to live lives adequate to its grand design.

By contrast, Edgar Allan Poe, in his only novel, sends Arthur Gordon Pym off on a Humboldtian voyage to the South Pole, fictionalising the actual polar explorations of his friend J. N. Reynolds, who was inspired by John Symmes's crackpot theory of the Earth as a hollow sphere open at the

poles. Poe closed his phantasmagoric voyage with that idea, after mocking Humboldt's vision of racial unity by creating a black polar race of sub-humans, mocking the meaningfulness of non-Western languages with a non-human taunt ('*tekeli-li!*') and, finally, mocking Emerson's notion of Earth writing in 'gigantic letters' by closing with an absurdist play on the gigantic ciphers spelled out by the landforms of Tsalal. Moving, in *Eureka*, from fiction to metaphysics, Poe reveals God's Plot to be the collapse of All into Nothing, a nihilist resolution that, paradoxically, Poe dedicates to Humboldt. Numerous nineteenth-century writers found other ways of engaging with this new planetary sense: one might explore the environmental nihilism of James Fenimore Cooper's late novel *The Crater*, and the answering environmental stewardship of his daughter Susan Fenimore Cooper;[39] one might enquire whether Melville's *Moby-Dick* can be thought of as 'an Anthropocene novel' without violating the pastness of the past, or study, in *Clarel*, the collapse of Humboldt's geological legibility into the abyss of deep time, approaching the limit of human history. As for students of other literatures, Anthropocene historians suggest that the Anthropocene must be understood as an historical process of economic exploitation of Earth coextensive with a longer human lineage that would extend nescience back at least to the early modern era, or, as Marsh suggested, to ancient Greece – or even to the Pleistocene extinctions and the origins of agriculture itself.

My argument here has been that looping back to the nineteenth century is the nearest way to discover the roots of both our insight and our blindness. We join them in wonder, and terror: wonder at the sublime vision of a planetary Earth; terror at the meaning of that vision for humanity, a meaning that even today is still unspooling. This loop has many points of attachment. One is offered by Richard Primack, the botanist whose quest to study the effects of global warming on temperate climates was stymied until he discovered the meticulous daily records of seasonal change kept by Thoreau. Those records, and others kept by Thoreau's followers, yielded the datasets that Primack needed to give reality to the fact of global warming, recruiting, in a Humboldtian way, 'citizen scientists' to register and report changes in local environments. As Primack's team has shown, one-third of the plants that Thoreau knew are locally extinct, and another third are vanishing; warming temperatures alone account for it.[40]

Another loop was drawn in 2000, when the collaborative cluster of sciences known as 'Earth System Science', seeded and inspired by Humboldt's work, emerged into our headlines bearing the name for the geological epoch we

have, so obliviously, brought on ourselves: the Anthropocene. A third is drawn by Walt Whitman, who on the brink of the American Civil War seconded Humboldt's faith that human intelligence would naturally follow the currents of the 'Kosmos' towards ever-greater natural and cultural diversity, and that, even if an endlessly warring humanity drove itself to extinction, new life would sprout from the womb of the Earth.[41] Hence Whitman addresses our shared nescience with the prospect of an answer:

> Who, out of the theory of the earth and of his or her body understands by subtle analogies all other theories,
> The theory of a city, a poem, and of the large politics of these States;
> Who believes not only in our globe with its sun and moon, but in other globes with their suns and moons,
> Who, constructing the house of himself or herself, not for a day but for all time, sees races, eras, dates, generations,
> The past, the future, dwelling there, like space, inseparable together. ('Kosmos', 1860, 1867)

The questions remain the same: How do we live together in a terrestrial world that binds us all to each other? How do we live in reciprocity with an engendering planet that mocks our dreams of destiny? Scientists are not alone in asking such questions, and literature can play a particular role – of imagining futures in which these as yet unanswered questions might find their form in an inhabitable world.

## Notes

1. Ralph Waldo Emerson, 'The Relation of Man to the Globe' in *The Early Lectures of Ralph Waldo Emerson, 1833–1842*, [eds. Stephen Whicher et al.], 3 vols. (Cambridge, MA: Harvard University Press, 1959–72 [1834]), vol. I, pp.28–9, 31–2, 41, 48–9; 'Lord Bacon', ibid. p.327.
2. Henry David Thoreau, *The Journal of Henry D. Thoreau*, [eds. Bradford Torrey and Francis H. Allen], 14 vols. (Boston: Houghton Mifflin, 1906), vol. IX: pp.44–5 (30 August 1856).
3. Timothy Clark, *Ecocriticism on the Edge: The Anthropocene as a Threshold Project* (London: Bloomsbury, 2015), p.66.
4. Anahid Nersessian, 'Two Gardens: An Experiment in Calamity Form', *Modern Language Quarterly* 74(3) (September 2013), 307–28 (p.325).
5. Dipesh Chakrabarty, 'The Climate of History: Four Theses', *Critical Inquiry* 35 (Winter 2009): 197–222; 'Climate and Capital: On Conjoined Histories', *Critical Inquiry* 41 (Autumn 2014), 1–23 (p.15).
6. Simon L. Lewis and Mark A. Maslin, *The Human Planet: How We Created the Anthropocene* (New Haven, CT: Yale University Press, 2018), pp.26–7.

7. Christophe Bonneuil and Jean-Baptiste Fressoz, *The Shock of the Anthropocene* (London: Verso, 2017), pp.27, 177. See also Paul Lawrence Farber, *Finding Order in Nature: The Naturalist Tradition from Linnaeus to E. O. Wilson* (Baltimore: Johns Hopkins University Press, 2000), pp.13–21; Martin J. S. Rudwick, *Bursting the Limits of Time* (Chicago: University of Chicago Press, 2005).
8. Lewis and Maslin, *Human Planet*, p.27; Bonneuil and Fressoz, *Shock of Anthropocene*, p.177; Emerson, 'Relation of Man', p.44.
9. See Laura Dassow Walls, 'Natural History in the Anthropocene' in John Parham and Louise Westling (eds.), *A Global History of the Environment* (Cambridge: Cambridge University Press, 2017), pp.187–200 (p.192).
10. Jeffrey Jerome Cohen, in Jeffrey Jerome Cohen and Linda T. Elkins-Tanton, *Earth* (New York: Bloomsbury, 2017), p.44.
11. Stephen Jay Gould, *Time's Arrow, Time's Cycle: Myth and Metaphor in the Discovery of Geological Time* (Cambridge, MA: Harvard University Press, 1987), p.66; Hutton quoted p.65.
12. Quoted Bonneuil and Fressoz, *Shock of Anthropocene*, p.57; see Cohen and Elkins-Tanton, *Earth*, p.44.
13. Gould, *Time's Arrow*, p.59.
14. See Laura Dassow Walls, *Emerson's Life in Science* (Ithaca, NY: Cornell University Press, 2003), pp.42–3; Playfair quoted p.18.
15. Walls, *Emerson's Life*, pp.156–7; Ralph Waldo Emerson, 'Nature' in *Essays and Lectures* (New York: Library of America, 1983 [1844]), pp.541–55 (p.546).
16. Henry David Thoreau, *Journal I: 1837–1844*, (eds.) Elizabeth Hall Witherell et al. (Princeton, NJ: Princeton University Press, 1981), p.191; Thoreau, *Journal* [1906], XIV: pp.311–13.
17. Quoted and paraphrased from Lewis and Maslin, *Human Planet*, pp.31–4.
18. Ibid., pp.34–9.
19. Bonneuil and Fressoz, *Shock of Anthropocene*, p.76.
20. Alexander von Humboldt, *Cosmos: A Sketch of a Physical Description of the Universe* (Baltimore: Johns Hopkins University Press, 1997 [1845]), vol. I, pp.79–80; *Cosmos: A Sketch of a Physical Description of the Universe* (New York: Harper & Brothers, 1859), vol. V, pp.14–15.
21. Peter Sloterdijk, *In the World Interior of Capital: For a Philosophical Theory of Globalization* (Cambridge: Polity, 2014), pp.24–5, 23.
22. Humboldt, *Cosmos,* vol. I, p.72.
23. In order to immerse us in this sensibility, Humboldt invented a vertiginous, present-tense, immersive nature writing that connects us intimately and viscerally with Earth history. Alexander von Humboldt, *Views of Nature* (Chicago: University of Chicago Press, 2014 [1849]), p.141.
24. Bruno Latour, *An Inquiry into Modes of Existence* (Cambridge, MA: Harvard University Press, 2013), p.247; see also Latour, *Down to Earth: Politics in the New Climatic Regime* (Medford, MA: Polity, 2018).
25. Bonneuil and Fressoz, *Shock of Anthropocene*, pp.182–5; Laura Dassow Walls, *Henry David Thoreau: A Life* (Chicago: University of Chicago Press, 2017), pp.458–9.

26. Fourier quoted in Bonneuil and Fressoz, *Shock of Anthropocene*, p.257.
27. John Stuart Mill, *Principles of Political Economy* (London: J.W. Parker, 1848), vol. 2, pp.310–11.
28. George Perkins Marsh, *Man and Nature, or, Physical Geography as Modified by Human Action* (Cambridge, MA: Harvard University Press, 1965 [1864]), p.43.
29. See David Lowenthal, 'Nature and Morality from George Perkins Marsh to the Millennium', *Journal of Historical Geography* 26(1) (2002), 3–23 (pp.7–8); Lance Newman, *The Literary Heritage of the Environmental Justice Movement: Landscapes of Revolution in Transatlantic Romanticism* (New York: Palgrave McMillan, 2019).
30. Bonneuil and Fressoz, *Shock of Anthropocene*, pp.76, 196–7, 287.
31. Fredrik Albritton Jonsson has detailed the emergence of modernity's 'cornucopian ideology' despite the warnings and cautions of political economists including Adam Smith, Malthus and J. S. Mill. See 'The Origins of Cornucopianism: A Preliminary Genealogy', *Critical Historical Studies* (Spring 2014), 151–68.
32. See Richard E. Zeebe, Andy Ridgwell and James C. Zachos, 'Anthropogenic Carbon Release Rate Unprecedented during the Past 66 Million Years', *Nature Geoscience* 9 (2016), 325–9.
33. John Tyndall, 'On the Absorption and Radiation of Heat by Gases and Vapours', *Philosophical Transactions* (7 February 1861), 1–35 (p.28), royalsocietypublishing.org.
34. Eunice Foote, 'Circumstances Affecting the Heat of the Sun's Rays', *Proceedings of the AAAS*, read on 23 August 1856; cited in Katherine Hayhoe, 'Climate Science: It's a Lot Older than You Think' (2016), blog.ucsusa.org.
35. Charles Lyell, *Principles of Geology*, (ed.) James A. Secord (New York: Penguin, 1997 [1830–3]), pp.312–13; Emerson, *Nature* (1836), *Essays and Lectures*, pp.5–49 (p.8).
36. David Wallace-Wells, *The Uninhabitable Earth: Life after Warming* (New York: Penguin, 2019), pp.4, 235.
37. Nersessian, 'Two Gardens', pp.309, 325.
38. Ibid., pp.311–12, 315, 317.
39. Matthew Wynn Sivils, *American Environmental Fiction, 1782–1847* (Burlington, VT: Ashgate, 2014), pp.154–65; Rochelle Johnson and Daniel Patterson (eds.), *Susan Fenimore Cooper: New Essays on Rural Hours and Other Works* (Athens: University of Georgia, 2001).
40. Richard B. Primack, *Walden Warming: Climate Change Comes to Thoreau's Woods* (Chicago: University of Chicago Press, 2014).
41. Humboldt, *Views of Nature*, p.130.