

PART ONE: WHAT'S IN A WORD?

CHAPTER 1

Welcome to the Anthropocene

In February 2000, a conference of the International Geosphere-Biosphere Programme held in Cuernavaca, Mexico, hosted a heated discussion about the age and intensity of human impacts on the planet. Paul Crutzen, an atmospheric chemist and Nobel Prize winner for his work on the ozone layer, stood up and exclaimed: ‘No! We’re no longer in the Holocene but in the Anthropocene!’ This was the birth of a new word, and above all of a new geological epoch. Two years later, in an article in the scientific periodical *Nature*, Crutzen developed his assertion further: the stratigraphic scale had to be supplemented by a new age, to signal that mankind had become a force of telluric amplitude. After the Pleistocene, which opened the Quaternary 2.5 million years back, and the Holocene, which began 11,500 years ago, ‘It seems appropriate to assign the term “Anthropocene” to the present, in many ways human-dominated, geological epoch.’¹

The Nobel laureate proposed a starting date for this new era of 1784, the year that James Watt patented the steam engine, symbolic of the start of the industrial revolution and the ‘carbonification’ of our atmosphere by the burning of coal extracted from the lithosphere.

From the ancient Greek words *anthropos* meaning ‘human being’ and *kainos* meaning ‘recent, new’, the Anthropocene is then the new epoch of humans. The Anthropocene is characterized by the fact that ‘the human imprint on the global environment has now become so large and active that it rivals some of the great forces of Nature in its impact on the functioning of the Earth system’.² This is not the first time scientists have attested to or foreseen such human power over the fate of the planet, whether to celebrate it or as a cause for concern. As recently as 1778, in his *Epochs of Nature* volume of *Histoire naturelle générale et particulière*, Buffon explained that ‘the entire face of the Earth today bears the imprint of human power’. This imprint would be particularly exerted on climate. By judiciously modifying its environment, humanity would be able to ‘modify the influences of the climate it inhabits, and set the temperature to the level that suits it best’.³ Following him, the Italian

geologist Antonio Stoppani defined humankind in 1873 as a ‘new telluric power’, and in the 1920s Vladimir I. Vernadsky, who introduced the concept of the biosphere, emphasized the growing human effect on the globe’s biogeochemical cycles.⁴

Nor was this the first time that scientists succumbed to anthropocentrism in making humanity a geological marker: the start of the Quaternary, in fact, was fixed to coincide with the appearance of the genus *Homo* 2.5 million years ago in Africa (*Homo habilis*), and the Holocene or ‘recent epoch’ was proposed by the geologist Charles Lyell on the basis of the end of the last glaciation but also on the then-believed coincident emergence of humans. The idea of adding the Holocene to the geologic time clock was put forward by Charles Lyell in 1833, but accepted only in 1885. Geologists, accustomed to working on the scale of the Earth’s 4.5-billion-year history, have no reason to hurry in making our entry into the Anthropocene official. Besides, if the history of our planet is reduced to a day of twenty-four hours, *Homo habilis* appeared only in the final minute, the Holocene began in the last quarter of a second, and the industrial revolution only in the two last thousandths of a second. With the Pleistocene counting in millions of years, and the Holocene in thousands, Crutzen’s boldness in proclaiming a new Anthropocene dating back no more than a couple of centuries is readily understandable. His proposal will very likely continue to be debated for a while to come. At the 34th congress of the International Union of Geological Sciences, held in Brisbane in 2012, it was decided to establish a task group that would submit its report in 2016.

While awaiting official validation by stratigraphers, however, the Anthropocene concept has already become a rallying point for geologists, ecologists, climate and Earth system specialists, historians, philosophers, social scientists, ordinary citizens and ecological movements, as a way of conceiving this age in which humanity has become a major geological force.

What humans are doing to the Earth

What are the arguments put forward? What imprints do humans make on the planet, albeit in a differentiated way that we shall explore below? For atmospheric chemists such as Paul Crutzen, or climatologists such as the Australian Will Steffen and the Frenchman Claude Lorius, the weapon that put an end to the Holocene is to be found in the air: ‘The air trapped in ice is an abrupt indication that the hand of man, by inventing the steam engine, upset the world machine at the same time.’⁵ Fingers point to the greenhouse gases emitted by human activity. In relation to 1750, as a result of these emissions, the atmosphere has been ‘enriched’ in methane (CH₄) to the tune of 150 per cent, nitrous oxide (N₂O) by 63 per cent and carbon dioxide (CO₂) by 43 per cent. As far as the last of these is

concerned, its concentration has risen from 280 parts per million (ppm) on the eve of the industrial revolution to 400 ppm in 2013, a level unmatched for 3 million years. New ingredients have also entered the atmosphere since 1945: fluoride gases such as the CFCs and HCFCs particularly emitted by our refrigerators and air conditioners.

All these are 'greenhouse' gases inasmuch as they retain the heat that the Earth, warmed by the Sun, emits into space. And the accumulation of these gases in the atmosphere has not taken long to raise the planet's temperature. Since the mid nineteenth century, the thermometer has already risen by 0.8°C, and the scenarios of the UN Intergovernmental Panel on Climate Change (IPCC) foresee, depending on the political response they find, a total rise by the end of the present century of between 1.2°C and 6°C. A rise of 2°C in relation to the pre-industrial level, considered by the majority of climatologists as a danger threshold, will be very hard not to breach given the current lack of international political will, and, if the present tendency is not radically modified, climate experts predict a rise of 3.7°C to 4.5°C by 2100, with a whole train of meteorological disturbances and human miseries in its wake. The IPCC's latest report even envisions a rise of 8°C to 12°C by 2300, given a 'business as usual' scenario. The Andean ice cover in Peru has disappeared in twenty-five years, and the polar ice has been melting in the last few years much faster than experts had expected. While the climatologists of the 1980s and '90s conceived the relationship between concentration of greenhouse gases and climate change in a more or less global and linear fashion, systemic approaches and recent advances in modelling show that a small variation in the globe's average temperature can lead to sudden and disorderly changes.

The generalized degradation of Earth's living tissue (the biosphere) is the second element attesting to our swing into the Anthropocene. The collapse of biodiversity is bound up with the general movement of simplification (by anthropization through agriculture and urbanization), fragmentation and destruction of the globe's ecosystems, but it is also accelerated by climate change. An article published in *Nature* in June 2012 indicates that, even in an optimistic scenario, by the end of the twenty-first century, climate conditions on between 12 and 39 per cent of the Earth's surface will be such as present living organisms have never before faced.⁶ On top of those extinctions directly caused by climate change, there is the damage to sea life caused by the acidification of the oceans (up 26 per cent in relation to the pre-industrial period), since these absorb a quarter of our CO₂ emissions.⁷ In the last few decades, the rate of extinction of species has been from 100 to 1,000 times greater than the geological norm: biologists speak of a 'sixth extinction' since the appearance of life on Earth.⁸ Since the Convention on Biological Diversity of 1992, the pace of extinction has in no way slowed down, for lack of action on the main forces of degradation, and it is estimated that the 100,000

currently protected areas in the world will save at best 5 per cent of all species. Three-quarters of the world's fishing zones are at maximum production or over-exploited. The mass of humans (32 per cent), along with that of their domestic animals (65 per cent), now makes up 97 per cent of the total biomass of land vertebrates, leaving only 3 per cent for the remaining 30,000 land-dwelling vertebrate species.⁹ At the current rate, 20 per cent of the planet's species will have disappeared by 2030,¹⁰ but many essential 'services' provided to humanity by the biosphere – pollination, carbon capture, protection from erosion, regulation of water quality and quantity, etc. – have already been greatly reduced.

As well as climate change and the collapse of biodiversity, scientists also note other major transformations that attest to our entry into the Anthropocene. These include in particular the biogeochemical cycles of water, nitrogen and phosphate, each as important as that of carbon, which have also come under human control in the course of the last two centuries. The modification of the continental water cycle is massive, with the draining of half the planet's wetlands and the construction of 45,000 dams with heights of more than fifteen metres, together retaining 6,500 cubic kilometres of water, some 15 per cent of the total flow of the world's rivers.¹¹ These transformations have substantially modified the processes of erosion and sedimentation, without however freeing the greater part of humanity from water insecurity.

The nitrogen cycle has been radically transformed with industrialization (the burning of fossil fuel releasing nitrous oxides) and the Haber-Bosch process (1913) that converts atmospheric nitrogen into nitrogen suitable for fertilizer. These two phenomena represent nitrogen flows twice as great as the 'natural' flow through the biosphere, basically bound up with biological fixing by bacterial symbiosis.¹² The nitric oxide released by fertilizers accentuates the greenhouse effect, and excess urea and nitrates enter water-tables, rivers and estuaries, causing eutrophication and hypoxia.

The global phosphorous cycle also bears the mark of human domination, with an anthropic flow eight times greater than the natural one. Some 20 million tonnes of phosphorous are extracted each year from phosphate mines in the lithosphere, chiefly to be used for fertilizer. It is estimated that 9 million of these 20 million tonnes end up in the oceans.¹³ Scientists have shown that an increase in phosphate level of only 20 per cent in relation to the underlying natural flow was in the geological past one of the causes for the collapse of the oxygen level in the oceans, leading to the massive extinction of aquatic life.

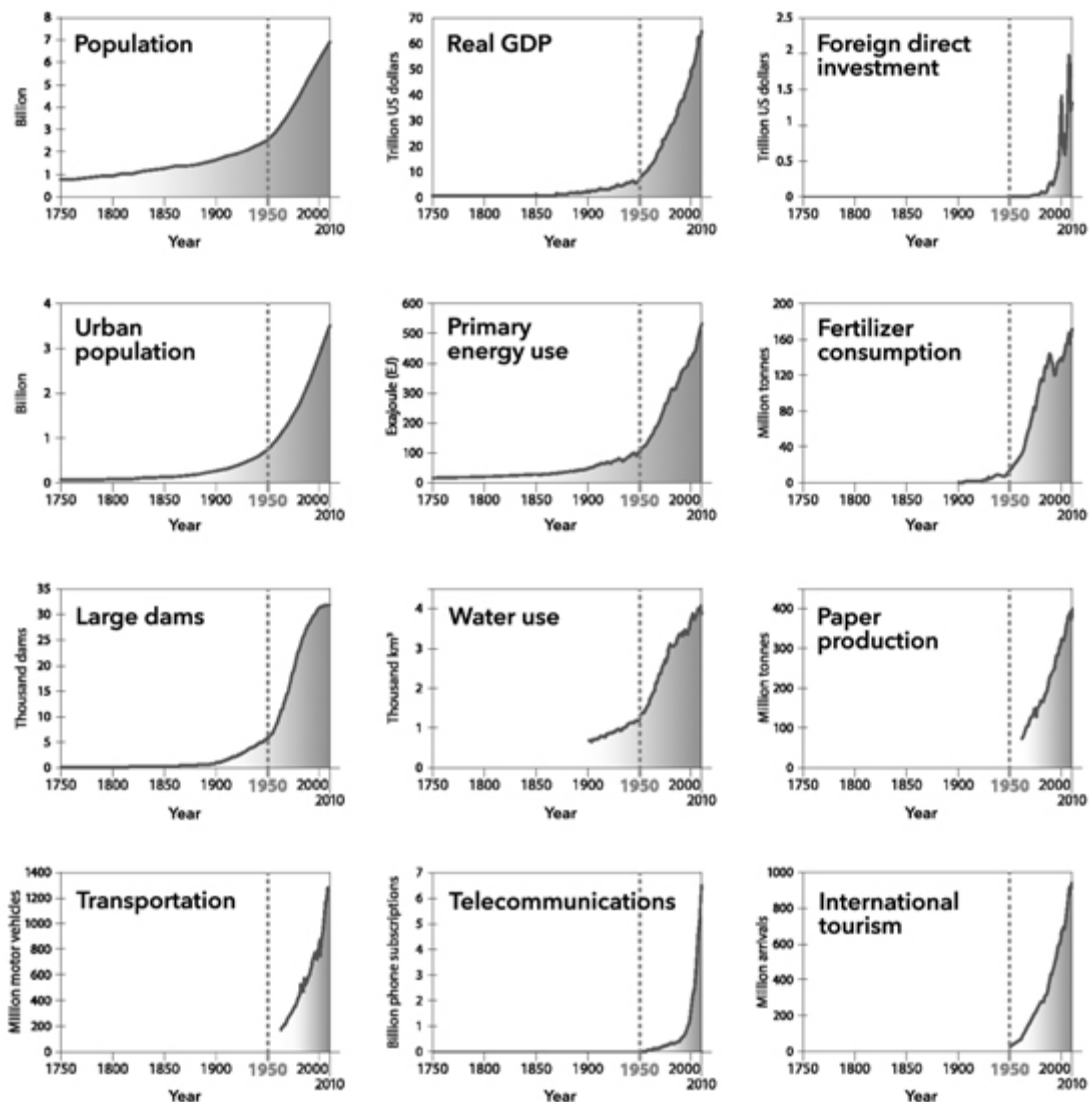
Scientists and geographers have also attempted to estimate the extent to which terrestrial ecosystems have been turned into the artificial ones of pasture, crop-land and cities. It turns out that the human species, having increased from a population of 900 million in 1800 to 7 billion in 2012,

takes nearly a third of the production of continental biomass for its own needs (in terms of food, clothing, housing and many less vital things),¹⁴ and consumes each year one and a half times what the planet can annually produce on a sustainable basis. This means that ‘we’ – meaning above all the 500 million most well-off inhabitants of the globe – are not only consuming the fruits of the tree on which we sit but also sawing through its branches.¹⁵

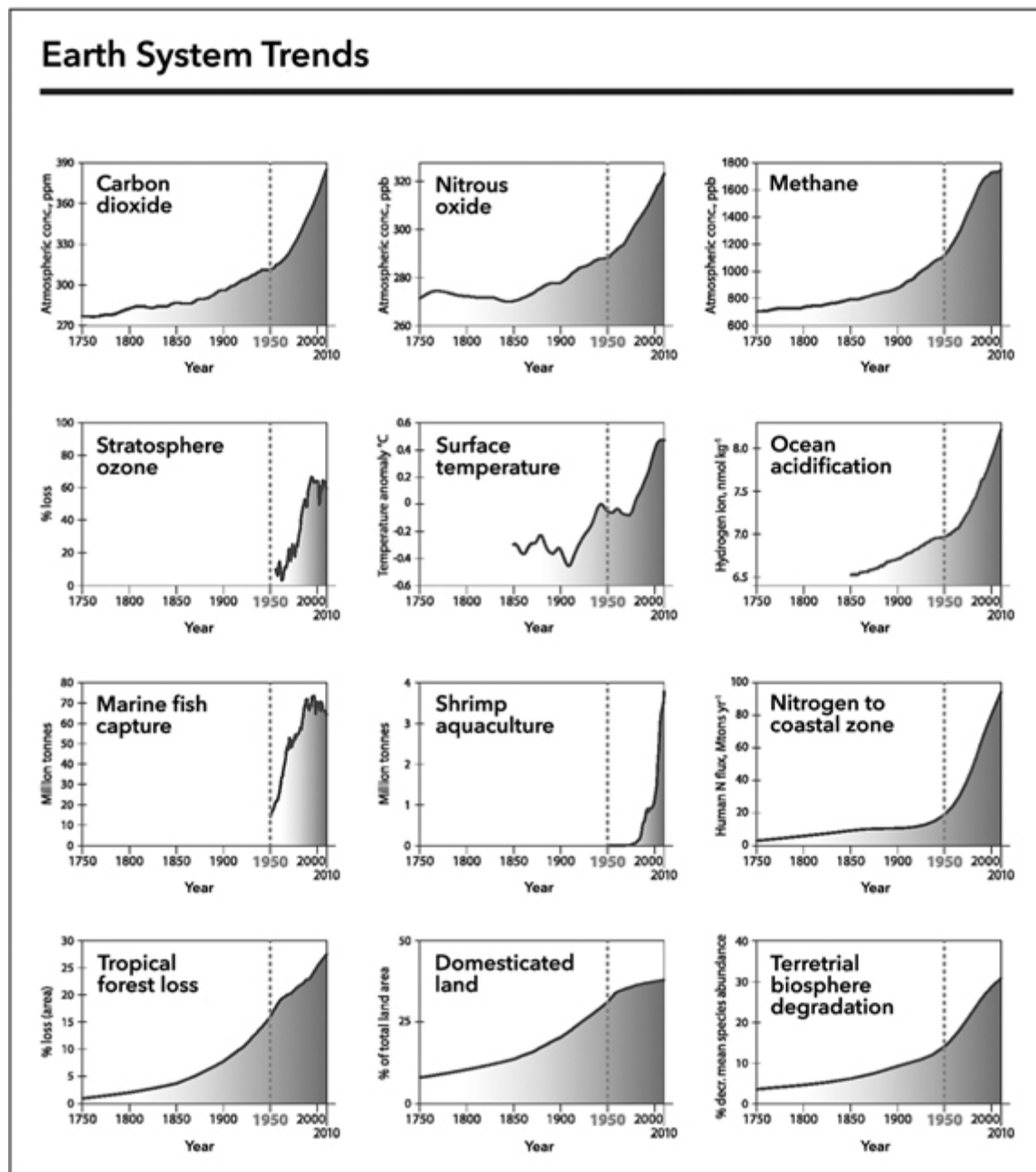
The Anthropocene is characterized by an unprecedented upsurge in energy mobilization: first with coal, then with hydrocarbons and uranium, which increased energy consumption by a factor of forty between 1800 and 2000.¹⁶ This leap in energy has served to transform the planet with multiplied power, to plough up, urbanize and domesticate ecosystems. Pasture, crop-land and cities, which represented 5 per cent of the Earth’s land area in 1750 and 12 per cent in 1900, today cover close to a third. Including partially anthropized biomes, it is estimated today that 84 per cent of the ice-free land surface of the planet is under direct human influence.¹⁷ Ninety per cent of photosynthesis on Earth occurs in ‘anthropogenic biomes’, that is, ecological ensembles modified by human beings. As the geographer Erle Ellis concludes, the new model of the biosphere ‘moves us away from an outdated view of the world as “natural systems with humans disturbing them” and towards “human systems with natural ecosystems embedded within them”’.¹⁸

Figure 1 gives a dashboard display of the Anthropocene, showing the evolution of twenty-four parameters of the Earth system since 1750. For the nine most important of these, a team of scientists from the Resilience Centre in Stockholm studied possible tipping points affecting biodiversity (the risk of collapse of certain ‘services’ that nature performs for us, such as pollination), air and atmosphere pollution, the intensification of biogeochemical cycles and the anthropization of land. They then set for each of these nine parameters a limit not to be crossed. For four of these, however, the limit (danger threshold of a sudden tipping of the Earth system into a catastrophic state) has already been approached (or passed): nitrogen cycle, greenhouse gas emissions, extinction of biodiversity and phosphate cycle.²⁰

Socio-economic Trends



1a



1b

Figure 1 (1a and 1b on facing page): *Dashboard display of the Anthropocene* For these twenty-four parameters of the Earth system, a take-off can be observed around 1800, and a 'Great Acceleration' after 1945.¹⁹

In order to agree to inscribe the Anthropocene in the series of geological epochs, however, stratigraphers are not content with models or predictions. What they need is something solid – sediment, a stratigraphic division that can be seen and measured here and now. Three arguments can be given here in support of the Anthropocene.

First of all, the level of atmospheric carbon dioxide has not been equalled for 4 million years (Pliocene), and future warming will lead the Earth to states unknown for 15 million years. The extinction of biodiversity is taking place with a suddenness matched only by five other episodes in the

entire 4.5 billion years of life on Earth. The last extinction, which did away with the dinosaurs among others, goes back 65 million years and has left stratigraphic markers of the clearest kind. These phenomena, therefore, have the dual property of being caused by humans and being of a scale rarely noted in the geological past.

Secondly, the anthropic changes in the composition of the atmosphere have left traces even in the Antarctic ice cores. Extinctions and modified distributions of species (explosive invasions in the last few centuries, migrations bound up with climate change or the anthropization of biomes) cannot fail to leave fossil traces in the sediments. The transformations of lake-side and coastal fauna and flora caused by the human forcing of nitrogen and phosphorus cycles have also left a specific mark. As for the biomass of the 7 billion humans and their domestic animals, this makes up the predominant share of the overall biomass of terrestrial vertebrates, which will certainly appear remarkable to future palaeontologists.²¹ Finally, the stratigraphic indication left by urbanization, dams, industrial production (the world automobile stock has reached 1,000 billion tonnes)²² and mining and agricultural activity is notable and unique in the history of the Earth. It has even been recently shown that global warming, by modifying the volumes of glaciers, has an effect on volcanic and tectonic activity.²³

Finally, entirely new substances deposited in the planet's ecosystems over the last 150 years (synthetic organic chemistry, hydrocarbons, plastics, some of which form a new type of rock,²⁴ endocrine disruptants, pesticides, radionuclides dispersed by nuclear tests, fluoride gases) constitute a typical signature of the Anthropocene in the sediments and fossils in the course of formation.

In a few million years from now, therefore, it is probable that geologists (if this profession typical of the Anthropocene survives), examining the rock deposits left by our epoch, will detect a transition as sudden as certain past somersaults in the Earth's billion-year history, such as the famous transition between the Cretaceous and the Tertiary 65 million years ago, when a meteor that hit what is now Central America led to the disappearance of three-quarters of the planet's species, including the dinosaurs. Yet today's geologists do not possess the strictly stratigraphic proof carved in the rock that they generally seek. Nonetheless, even if stratigraphers leave until later its validation in the official series of geological epochs, the Anthropocene thesis remains more robust in its wider geological definition, in terms of the sciences of the Earth system, than those of stratigraphy alone. This interdisciplinary field views the Earth as a complex system, from its core up to the high atmosphere, with subsystems (atmosphere, biosphere, hydrosphere, pedosphere, etc.) that are pervaded and connected by constant flows of matter and energy, in immense feedback loops. In this perspective, as Jan Zalasiewicz, head of the Anthropocene Working Group of the International Commission on

Stratigraphy explains, ‘The Anthropocene is not about being able to detect human influence in stratigraphy, but reflects a change in the Earth system.’²⁵

When did the Anthropocene begin?

If it is not the end of the world, it is certainly the end of an epoch: that of the Holocene, in which we have been living for the last 11,500 years. But at what time by the geological clock was the crime committed? Do we have to incriminate *Homo sapiens*, who appeared in Africa 200,000 years ago and went on to colonize Eurasia, the Americas and the Pacific islands? Did this species not bring about the disappearance of the megafauna (reptiles, birds and giant marsupials, the sabre-toothed tiger, the American lion, the European mammoth) by fire and hunting, everywhere that it settled? These transformations have left traces detected by geologists and archaeologists. Or should we locate the beginning of the Anthropocene just a few thousand years after that of the Holocene, as proposed by William Ruddiman, paleoclimatologist at the University of Virginia? Ruddiman argues that some 5,000 years ago humans had already emitted sufficient greenhouse gases – by deforestation, rice cultivation and stock-raising – to modify the Earth’s climatic trajectory. These emissions and the warming they produced delayed the moment of entry into a new glacial episode. So, according to this controversial hypothesis, human action would already have contributed from the Neolithic age (as Buffon boasted in 1778!) to make the Holocene the longest interval of climate stability for 400,000 years (Figure 2). It was even this stabilization of the climate by human action in the Neolithic age that permitted the development of civilizations.

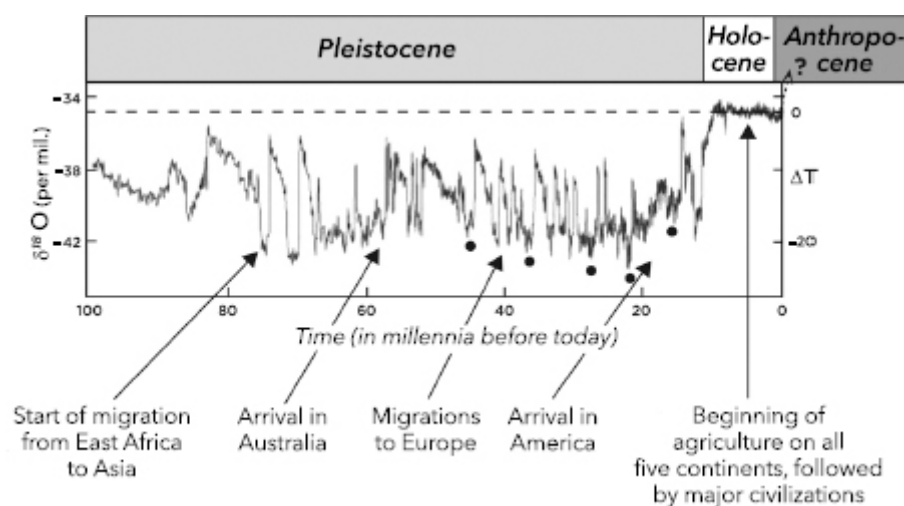


Figure 2: *Temperature and human history over 100,000 years.*

Note the remarkable stability of climate during the Holocene.

The problem with Ruddiman's thesis is that by focusing on the (slow) rise in CO₂ and methane emissions, on the deforestation and agricultural practices of the Neolithic age, it does not take into account the changes of scale brought about by the industrial revolution. For Erle Ellis, who at one time supported this argument before rejecting it, it is only since the nineteenth century that humans have transformed the majority of biomes on the planet.²⁶

At the end of the day, Ruddiman's evidence does not contradict that of an Anthropocene beginning with the industrial revolution. After having stabilized the Holocene climate in the Neolithic age (if this hypothesis is confirmed), since the nineteenth century humanity has started to bring the Earth out of the Holocene, entering an Anthropocene marked by sudden swings.

The British geographers Simon Lewis and Mark Maslin have recently proposed starting the Anthropocene with the European conquest of America. This major historical event, so fateful for the Amerindian people and foundational for a capitalist world-economy, did indeed leave its mark in our planet's geology. The unification of the flora and fauna of the Old and New Worlds caused an upheaval in the agricultural, botanical and zoological map of the globe, newly mingling in a biological globalization forms of life separated 200 million years earlier with the break-up of Pangaea and the opening of the Atlantic Ocean. The demographic collapse of the Amerindian population (from between 54 and 61 million in 1492 to just 6 million in 1650, following the wars of conquest, infectious diseases brought by the Europeans, and forced labour) also had the effect of an urban and agricultural retreat and the reforestation of more than 60 million hectares of the American continent, which, by capturing CO₂, reduced the carbon concentration in the atmosphere from around 279 to 272 ppm between the start of the sixteenth century and 1610.²⁷ But if this low tide of atmospheric carbon is an ominous stratigraphic marker of one of the most terrible events in human history, the variation does not lie outside the general Holocene range of 260 to 284 ppm.

It was around 1809, under the effect of emissions caused by the growing use of coal, that the concentration of CO₂ reached the Holocene maximum (284 ppm), going on to reach 290 ppm by the mid nineteenth century. This time the break was of geological amplitude and not simply historical: the terrestrial atmosphere emerged from the Holocene in the early nineteenth century, and it was with the power of fossil fuels that human activities so profoundly transformed the Earth system's biology and geology (Figure 1), thus supporting Paul Crutzen's proposal of beginning the Anthropocene with the industrial revolution.

Other authors, such as the geologist Jan Zalasiewicz, chair of the Anthropocene Working Group, see unambiguous traces of a change of geological epoch in the mid twentieth century. The new radionuclides emitted into the atmosphere from 16 July 1945, when the first atom bomb was exploded

in the Nevada desert, the novelty of petrochemical products and the sudden expansion in the use of synthetic nitrate fertilisers, all present very clear stratigraphic signals. The exponential acceleration of human impacts since the Second World War reinforces this hypothesis. The advantage of having the Anthropocene start at this time is that the type of proof sought by stratigraphers can be adduced right away (for example, the presence even at the poles of radioactive isotopes non-existent in nature).²⁸

Other members of the community of Earth system scientists, as well as that of the human and social sciences, stand by Paul Crutzen's initial proposal to begin the Anthropocene at the end of the eighteenth century. For if 1945 presents an appropriate stratigraphic signal and indicates a destructive intensification of the Anthropocene, this belated date masks deeper causes and processes, and obscures the major rupture, both environmental and civilizational, of the entry into thermo-industrial society based on fossil fuels. In the present book, while discussing the importance of the conquest of America (Chapter 10) and the 'Great Acceleration' after 1945, our focus will be on the last quarter of a millennium.

Let us sum up. Succeeding the Holocene, a period of 11,500 years marked by a rare climatic stability (apart from the 'little ice ages', significant only on the scale of human history), a period of blossoming agriculture, cities and civilizations, the swing into the Anthropocene represents a new age of the Earth. As Paul Crutzen and Will Steffen have emphasized, under the sway of human action, 'The Earth currently operates in a state without previous analogy.'²⁹

The advances in Earth system sciences presented in this chapter offer a new and fundamental regard on the Earth as a complex and fragile system, non-linear and ultimately highly unpredictable. By demonstrating the telescoping of the short timescale of human action and the long timescale of the Earth, these sciences have also opened a new field of investigation that is absolutely fundamental, at the intersection of the natural sciences and the humanities.

Contrary to the end of the Cretaceous period, or Lars von Trier's film *Melancholia*, the Anthropocene shock is not the result of a foreign body that strikes the Earth from outside and derails its geological trajectory. It is our own model of development, our own industrial modernity, which, having claimed to free itself from the limits of the planet, is striking Earth like a boomerang.

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- 19 Details on the source data for all figures are to be found as part of the Illustration Credits.
- 20 Anthony D. Barnosky, 'Approaching a State Shift in Earth's Biosphere'; Will Steffen et al., 'Planetary Boundaries: Guiding Human Development on a Changing Planet', *Science*, 347:6223, 13 February 2015.
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CHAPTER 2

Thinking with Gaia: Towards Environmental Humanities

The Anthropocene is an event, a point of bifurcation in the history of the Earth, life and humans. It overturns our representations of the world. According to the philosopher Bruno Latour, it is ‘the most decisive philosophical, religious, anthropological and, as we shall see, political concept yet produced as an alternative to the very notions of “Modern” and “modernity”’.¹ Continuing the systemic ecology which forty years ago framed human activities in an analysis of the functioning of ecosystems and the biosphere, the Anthropocene idea abolishes the break between nature and culture, between human history and the history of life and Earth.

From Buffon to Lyell and Darwin, biology and geology extended terrestrial time to hundreds of millions of years, creating a context that was seemingly external, almost immobile and indifferent to human tribulations. In parallel with this, the bourgeois and industrial Enlightenment emphasized the value of ‘man’, the modern subject, as autonomous agent acting consciously on his history and settling social conflicts by dominating nature. We shall see how this break between nature and society was constructed in the nineteenth century, and the part played in it by the emerging human and social sciences. We shall go on to see how this forceful, even violent, return of the history of the Earth into world history creates a new human condition and requires us to reintegrate nature and the Earth system at the heart of our understanding of history, our conception of freedom and our practice of democracy.

Rethinking the environmental crisis: an end to ‘sustainable development’

By offering a reading of the ecological impacts of our model of development over two and a half centuries and on a planetary scale, the concept of the Anthropocene profoundly shifts our understanding of the contemporary ‘ecological crisis’.

A few decades ago, the ‘environment’ was still understood as that which surrounds us, the place where humans went to extract resources, deposit waste, or even that in certain places was to be left

virgin. Economists spoke of environmental degradations as ‘externalities’. In the forms of natural parks, ecosystems and environment, subsequently that of ‘sustainable development’, nature was recognized until relatively recently as essential but separate from us. It hardly seemed to present a serious limit to growth, a watchword intoned in chorus by business leaders, orthodox economists and policy-makers.

The concept of Anthropocene challenges this separation and the promise to perpetuate our economic system by modifying it at the margin. In place of ‘environment’, there is now the Earth system. While triumphant industrial modernity had promised to prise us away from nature, its cycles and its limits, placing us in a world of boundless progress, the Earth and its limits are today making a comeback. We are facing ‘the intrusion of Gaia’, in the words of Isabelle Stengers – Gaia being the Greek goddess of the Earth.² The global and profound biogeochemical processes that we have disturbed are forcing their way into the centre of the political stage and of our everyday lives. Instead of ‘masters and possessors of nature’, we find ourselves each day a bit more entangled in the immense feedback loops of the Earth system. There can be no more talk of a linear and inexorable progress that used to silence those who challenge the market-based, industrial and consumerist order by accusing them of seeking to return us to a bygone age; from now on, the future of the Earth and all its creatures is at stake. And this uncertain becoming, strewn with tipping points, scarcely resembles the radiant future promised by the ideologists’ progress of the last two centuries, whether liberal, social democratic or Marxist.

As for the word ‘crisis’, does it not maintain a deceptive optimism? It leads us to believe, in fact, that we are simply faced with a perilous turning-point of modernity, a brief trial with an imminent outcome, or even an opportunity. The term ‘crisis’ denotes a transitory state, while the Anthropocene is a point of no return. It indicates a geological bifurcation with no foreseeable return to the normality of the Holocene.

The warning given by the Anthropocene concept, and the recent advances in the sciences of the Earth system, thus go much further than an anthropocentric view of the ‘environmental crisis’, no matter how alarming. The problem is not only that our environment is being degraded, nor that ‘resources’ (another category that postulates an external and static character to the Earth and its beings and processes) are being exhausted, increasing social inequalities and thus threatening the planet with major geopolitical disturbances. The double reality that the Anthropocene presents is that, on the one hand, the Earth has seen other epochs in the last 4.5 billion years, and life will continue in one form or another with or without humans. But the new states that we are launching the Earth into will bring with them a disorder, penury and violence that will render it less readily habitable by

humans. Even if the human species manages to reduce its ecological footprint drastically and invent a more sober civilization, we will not have settled accounts with Gaia. The Earth would take at least centuries if not hundreds of thousands of years to get back to the climatic and geobiological regime of the Holocene. The traces of our urban, industrial, consumerist, chemical and nuclear age will remain for thousands or even millions of years in the geological archives of the planet.

The new sciences of the Earth system also give us a non-linear view of the past and future of our planet. We are no longer in a reassuring model in which x hectares of forests converted into fields leads to the disappearance of n per cent of species, causes y per cent extra greenhouse gas and generates $z^{\circ}\text{C}$ increase in global temperature. In both geological history and their own modelling of the future, scientists have detected climatic tipping points and sudden-collapse thresholds of ecosystems. Thus, noting that for the last 400,000 years the Earth has swung between a cold glacial state and a warm interglacial state, they suspect the existence of a tipping point (around $+2^{\circ}\text{C}$ or $+3^{\circ}\text{C}$?) beyond which the Earth system will undergo a change of attractor and tend towards a new stable state that is decidedly warmer (some $+5^{\circ}\text{C}$ or even $+10^{\circ}\text{C}$ or more – no climatologist can predict), such as existed some tens of millions of years ago, long before the appearance of the human species, and lasted for millions of years. Well beyond the linear predictions of the International Panel on Climate Change's first reports, this would be a real leap into the unknown. Living in the Anthropocene, therefore, means inhabiting the non-linear and highly unpredictable world of the Earth system's (or Earth history's) responses to our disturbances. For the Earth is 'perhaps a mother, but an irritable and touchy one', as Isabelle Stengers reminds us in tracing a mythological portrait of Gaia.³

The Anthropocene thus cancels the peaceful and reassuring project of sustainable development. This concept derived from the notion of 'maximal sustainable yield' conceived by (ecological) fishery science in the 1950s, which itself came from the notion of 'sustainable (*nachhaltig*) management' developed by German forestry science in the eighteenth century (see [Chapter 9](#)). Today it fosters illusions that are belied by the advent of the Anthropocene.

First of all, it supports belief in the possibility of perpetuating economic growth by means of a bit more 'conservation' of the environment. Publications from the early 1970s on the impossibility of indefinite growth on a finite planet (the *Limits to Growth* report of the Club of Rome in 1972, Nicholas Georgescu-Roegen's thesis on entropy and degrowth, etc.) were carefully swept under the carpet by the new watchword of 'sustainable development'. While these writings proposed an economy in the service of society and within the biophysical limits of the planet, the discourse of sustainable development that arose in the 1980s claimed that three well-identified poles could be mutually negotiated: the economic, the social and the environmental. Instead of a concentric view in

which the economy is within the social, itself framed by a thousand feedback loops within the biosphere and the Earth system, the environment became a new column in the bookkeeping of big corporations, which gave themselves new sustainable development divisions. The project of the ‘green economy’, born within international institutions in recent years, accentuates this development, with the celebrated ‘ecosystem services’ now being the object of markets: the biosphere, the hydrosphere and the atmosphere appear as mere subsystems of the financial and commodity sphere (see [Chapter 9](#)).

The mechanical theory of maximum sustainable yield was refuted in 1973 by the ecologist Crawford S. Holling, who saw it as a reductionist and linear view that was responsible for the sudden collapse of certain ecosystems such as fishery resources. For him, ‘The well-being of the world is not adequately described by concentrating on equilibria and conditions near them ... [The] effort to provide a maximum sustained yield from a fish population ... may paradoxically increase the chances of extinctions.’⁴ Accordingly, before cofounding the Resilience Alliance in 1999, Holling had proposed already in 1973 the concept of ‘ecological resilience’ as the capacity of an ecosystem to maintain certain of its features despite and through sudden changes of state.

This systemic and complex view of our planet breaks with the posture of control by scientists and engineers imbued with certainty and able to standardize environmental conditions. We enter a world of limits, which is also marked by a greater visibility of the limits of scientific knowledge. Faced with the highly unpredictable character of ecosystems and the Earth, the uncertainties are structural, and it is no longer a matter of believing that a simple compromise can be found between exploitation and conservation. What can help us to inhabit the Anthropocene collectively, therefore, is not, as Holling already said, ‘the presumption of a sufficient knowledge, but the recognition of our ignorance’.⁵ Far from the glorious advent of an ‘age of man’, the Anthropocene thus rather attests to our striking impotence.⁶

A geopolitical event

Besides being a geological event, the Anthropocene is at the same time a political event. In the IPCC’s hypothesis (by no means the most pessimistic) of an increase in average temperature of 3.7°C by 2100, the Earth will be warmer than it has ever been for 15 million years. As for the extinction of biodiversity, this is already proceeding at a speed unmatched for 65 million years. This means that human societies will have to face up in the coming decades to changes of state in the Earth system to which the genus *Homo*, which appeared only two and a half million years ago, has never experienced,

and to which therefore it is neither biologically adapted nor culturally prepared. The Anthropocene thus opens a new situation for humanity, a new human condition.

If the climatic stability of the last 10,000 years of the Holocene made possible the rise of cultures and civilizations on five continents, the end of this epoch and the entry into a new one will not be a smooth and steady process for human societies. Global warming means that people will die and countries disappear. The food situation already faces an uncertain future: the climate change of the last few decades has caused a shortfall of 4 to 5 per cent in world wheat and maize production in relation to 1980.⁷

At the present time, 20 to 30 million people each year migrate in the wake of natural disaster, and the UN envisages 50 million environmental migrants a year by 2030, due in particular to changes linked to climate disturbance. Already today, therefore, there are ‘victims of the Anthropocene’,⁸ and there will be more in the future. As Harald Welzer suggests, with constraints on both resources and climate, the Anthropocene promises to be violent. The geopolitics of the present century may prove more full of conflict, more barbaric, than the twentieth century. The question in the twenty-first century will be how to inhabit the Earth less frightfully.⁹

What levels of climate change and sea-level rise are acceptable? Which Pacific islands are condemned to disappear? How many other species besides our own will we allow to survive? At what point will the acidification of the oceans and the spilling of toxic substances be declared intolerable? If scientists can cast light on these questions, the answers are political decisions. In the time of the Anthropocene, the entire functioning of the Earth becomes a matter of human political choices. For example, knowing that the warming of recent decades has been limited by urban and industrial emissions of sulphur dioxide (an aerosol reflecting solar radiation), particularly in Asia,¹⁰ the international community finds itself facing the dilemma of reducing SO₂ emissions by anti-pollution measures, at the risk of increasing global warming, or instead limiting these measures or even conducting projects of geoengineering that consist in massively spraying SO₂ into the atmosphere so as to limit this warming, at the cost of millions of premature deaths from respiratory diseases caused by this gas.

The slogan of the Rio+20 conference was ‘The future we want’. It thus expresses, not without an ambivalence that concedes to Promethean optimism, the fact that the planet will become what humans make of it, more or less voluntarily and more or less democratically. The Anthropocene is thus a political issue as well as a category in Earth sciences. We cannot be content with invoking demographic growth (the population increase of 2.4 times between 1950 and 2000) or world GDP (which multiplied by seven in the same half century) as explanations of the increasing human sway

over the Earth ([Chapter 4](#)). In the same way, the emission of one kilogram of carbon dioxide or methane does not fulfil the same function for all human beings. For some people it is a question of survival, in the form of the available ration of rice, while for others it is simply increasing a consumption of meat (cattle, like rice fields, are great emitters of methane) that is already excessive from a medical point of view, monopolizing half of the planet's cereal crop-land for cattle feed and generating 18 per cent of greenhouse gas emissions, or more than the entire transport sector.¹¹

We are therefore not in the peaceful and infra-political problematic of a reconciliation of humans with nature: the Anthropocene is political inasmuch as it requires arbitrating between various conflicting human forcings on the planet, between the footprints of different human groups (classes, nations), between different technological and industrial options, or between different ways of life and consumption. The Anthropocene has therefore to be given a political charge in order to overcome the contradictions and limits of a model of modernity that has spread globally over the last two centuries, and to explore the paths of a rapid and equitably divided reduction of the ecological footprint.

The great temporal and ontological divide between nature and society

Whereas the Biblical account, like many other non-Western origin myths, made it possible for a long time to view human history as closely linked to that of the Earth, and Buffon proposed in his *Epochs of Nature* a great fresco tracing the common destiny of Earth and mankind, these two domains became increasingly separated in the course of the nineteenth century, as the prehuman history of the Earth became longer. Two major texts from the early 1830s, by the geologist Charles Lyell and the historian Jules Michelet, attest to this great discordance. In Michelet's universal history of humanity:

Along with the world there began a war that will end together with the world and not before: that of *man against nature*, of spirit against matter, liberty against fatality. History is nothing else than the account of this interminable struggle ... the gradual triumph of freedom ... What is bound to encourage us in this endless struggle is that, by and large, the one side does not change, while the other changes and becomes stronger. Nature remains the same, whereas every day man gains some advantage over her. The Alps have not grown taller, while we have driven a road across the Simplon pass; the waves and winds are no less capricious, but the steamship breaks the waves heedless of the caprice of wind and sea. Follow the migrations of the human race from east to west, along the route of the sun and the magnetic currents of the globe: observe it on this long journey from Asia to Europe, from India to France, and you will see at each point the fatal power of nature diminish, and the influence of race and climate become less tyrannical.¹²

Continuing Michelet's vision, the great historian of the Renaissance, Burckhardt, depicted the modern conception of history as 'the break with nature caused by the awakening of consciousness'.¹³

In symmetry with this 'history against nature', nature dismissed to immobility, at least on the human timescale, Lyell inaugurated with his *Principles of Geology* a view of the Earth's geological history as indifferent to human action. An intelligent observer arriving on our planet and assessing the role of human action, he explained:

would soon perceive that no one of the fixed and constant laws of the animate or inanimate world was subverted by human agency, and that the modifications now introduced for the first time were the accompaniments of new and extraordinary circumstances, and those not of a *physical* but a *moral* nature ... so that, whenever the power of the new agent was withheld, even for a brief period, a relapse would take place to the ancient state of things.¹⁴

The great discrepancy between a long history of the Earth, impassive to human action, and a history of the emancipation of the latter from any natural determinism, was based on a separation of timescales allowed by the gradual extension in the estimated age of the Earth. Buffon proposed a preliminary estimate of 77,000 years, which already broke with the Biblical canon. This was based on the cooling time of an initially very hot planet, extrapolating to the planet the cooling times of metal spheres as measured in his forge. With Lyell, we advance to a timescale of tens of millions of years. The geologist's uniformitarianism allowed very slow phenomena to have great effects. He accordingly opposed other theories, championed in particular by Georges Cuvier, known as 'catastrophist' because they minimized the Earth's timescale and had to explain geological formations by the existence in the past of abrupt phenomena that had ceased to play a role since the appearance of humankind.¹⁵ The history of the Earth that Lyell proposed was one of slow and regular forces on which humans had no hold, in relation to which 'the modifications in the system of which man is the instrument, do not, perhaps, constitute so great a deviation from previous analogy as we usually imagine'.¹⁶ In 1862, the physicist William Thomson (the future Lord Kelvin) gave an age of 400 million years for the Earth (the present estimate is 4.5 billion).¹⁷

The Lamarckian theory of evolution, for its part, and following it that of Darwin, extended the time frame of the history of life, with the appearance of humans from a simian ancestor being only a belated episode in this.

In the nineteenth century, the natural sciences also stripped away the telos from both life and the Earth, while the human and social sciences became teleologically progressive. The former removed from life and Earth their sensitivity to human action, while the latter declared their autonomy by

assiduously detaching the explanation of human and social phenomena from natural causes. History applied to the study of ‘human affairs’ the methods of the natural sciences: the quest for archival traces as evidence, after the model of fossil traces; the accumulation and comparison of ‘series’; and, in the twentieth century, the ‘immobile history’, as Fernand Braudel put it, of structural, economic and social evolutions. But within this common paradigm of process and history, forming the cultural matrix of the industrial nineteenth century, a division of fields of authority occurred: the history of the Earth and life was the province of natural scientists, and the history of ‘progress in human affairs’¹⁸ that of historians and social sciences – a division that still casts a shadow today. As we shall see, this great temporal and ontological divide broke with the conception of connections between climate, environment and society that had prevailed in the late eighteenth century (Chapter 8) and formed a cultural precondition for the swing into the Anthropocene, by constructing a great external nature, slow, immense and undaunted, and thereby making invisible the limits of the planet (Chapter 9) and the unequal socioeconomic relations of nascent fossil capitalism (Chapter 10).

Profiting from this open discordance between the time of nature and the time of humankind, liberal economists such as Jean-Baptiste Say, considering that the exhaustion of natural resources was a matter for a distant future beyond the grasp of economic rationality, broke with Malthus and proclaimed a nature placed outside of economic thought as a free gift: ‘We leave the study of natural wealth to the scholars who deal with natural things.’¹⁹ ‘Natural wealth is inexhaustible ... Unable to be either multiplied or exhausted, it is not the object of economic science.’²⁰

This divide between the natural and the human sciences was further accentuated between 1850 and 1960. Climatology became the science of an external, global climate, conceived as an averaging out of thermometric data over a very large scale, and no longer as the science of places and topographies, the basis for reflection on the human making of climate and the climatic making of societies.²¹ In a related fashion, public health and its revolutionizing by Louis Pasteur and Robert Koch focused medical attention on microorganisms, thus marginalizing the earlier neo-Hippocratic medical paradigm which viewed the body as shaped by a far wider number of elements in the environment such as light, temperature, climate, wind, odour and ‘miasmas’.²² After 1900, the new science of genetics promoted a ‘modern conception of heredity’ centred on the isolated gene, which ruled out the idea (which only recently came back with epigenetics) of a heredity co-determined by the influence of the environment.²³ With the exception of geography, almost all the social sciences defined their object in a way that assiduously removed it from nature: thus social and cultural anthropology separated off from physical anthropology, and Émile Durkheim excluded climatic parameters from the pertinent causes of suicide, the nascent sociology making a watertight division

between society and the natural environment.²⁴ In this respect, Durkheim followed Comte, who with his *Course of Positive Philosophy* had founded sociology as a ‘genuine science of social development’ that obeyed the specific laws of the ‘general progression of humanity’ rather than environmental influences.²⁵ For Comte, in fact, Montesquieu in *The Spirit of the Laws* had exaggerated the influence of ‘local physical causes’ such as climate on the social and political organization:

The true political influence of climate is misconceived, and usually much exaggerated, through the common error of analysing a mere modification before the main action is fully understood ... This error was inevitable under Montesquieu’s necessary ignorance of the great social laws ... Montesquieu did not even perceive ... that local physical causes, very powerful in the early days of civilization, lose their force in proportion as human development admits of their being neutralized.²⁶

Likewise, in the age of empires, an ‘environmental orientalism’ reserved the ‘external’ influences of the environment on human history to discourses on ‘less advanced’ societies, as a counterpoise to an industrial society moved above all by an ‘internal’ logic of progress.²⁷ Soon after, Freud separated the adult individual from the world, decreeing that the cosmic feeling of ‘being in correlation with the surrounding world’ – Romain Rolland’s ‘oceanic feeling’ – was no more than a childish illusion.²⁸ He thus separated out a psychic interiority that the analyst could study in abstraction from its vast ecological context.²⁹

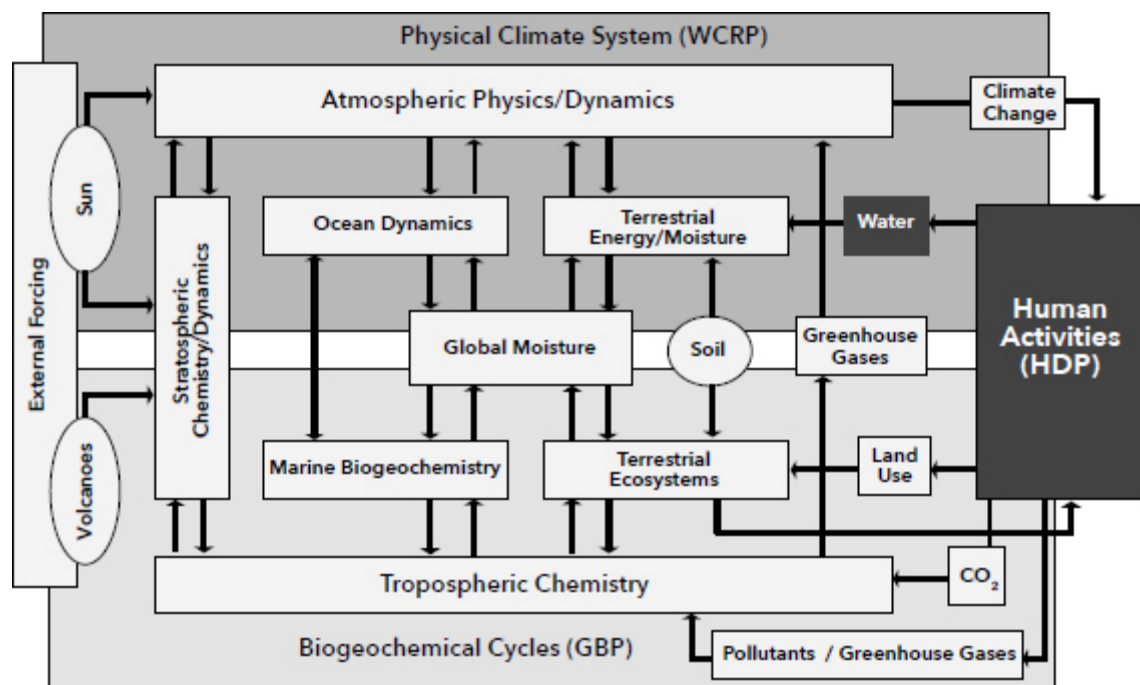
Beyond the great separation

On one side, therefore, were the natural sciences with their non-human objects, their concept of objectivity and their modern certainties; on the other, humanities and social sciences became ‘a-natural’³⁰ by conferring on ‘society’ a self-sufficient totality, free from natural determination (despite the observations of Marx, Sergei Podolinsky, Patrick Geddes and many others on socio-ecological metabolisms; see [Chapter 8](#)). The natural sciences postulated a physical continuity between humans and other entities that obscured the social production and social relations of nature, while the field of human sciences was defined by a metaphysical discontinuity postulated between humans and everything else, hence obscuring the natural production and relations of social order by what Peter Sloterdijk has called a ‘backstage ontology’.

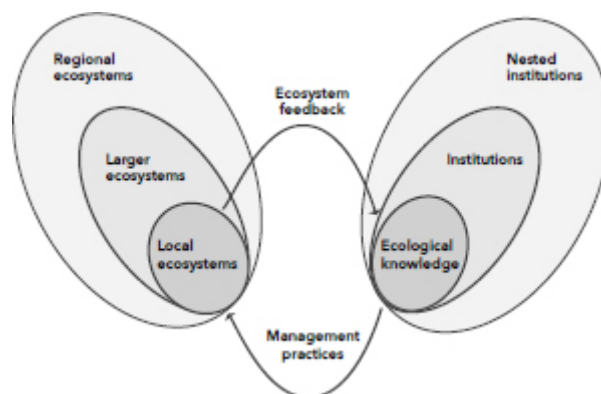
The Anthropocene, as the reunion of human (historical) time and Earth (geological) time, between human agency and non-human agency, gives the lie to this – temporal, ontological, epistemological

and institutional – great divide between nature and society that widened in the nineteenth and twentieth centuries. The new geohistorical epoch signals the irruption of the Earth (its temporality, its limits, its systemic dynamics) into what sought to be a history, an economy and a society emancipating themselves from natural constraints. It signals the return of the *Earth* into a *world* that Western industrial modernity on the whole represented to itself as above the earthly foundation. If our future involves a geological swing of the Earth into a new state, we can no longer believe in a humanity making its own history by itself. This nature that Michelet saw as the static scene of our exploits has clearly entered the game in the most powerful and dynamic manner possible. The Anthropocene thus requires the substitution of the ‘ungrounded’ humanities of industrial modernity by new environmental humanities that adventure beyond the great separation between environment and society.³¹ Environmental history, natural anthropology, environmental law and ethics, human ecology, environmental sociology, political ecology, green political theory, ecological economics, etc., are among the new disciplines that have recently begun to renew the human and social sciences, in a dialogue with the sciences of nature. They sketch new environmental humanities that go beyond the two cultures’ fissure and put an end to the jealous division of territories. In the Anthropocene, it is impossible to hide the fact that ‘social’ relations are full of biophysical processes, and that the various flows of matter and energy that run through the Earth system at different levels are polarized by socially structured human activities.

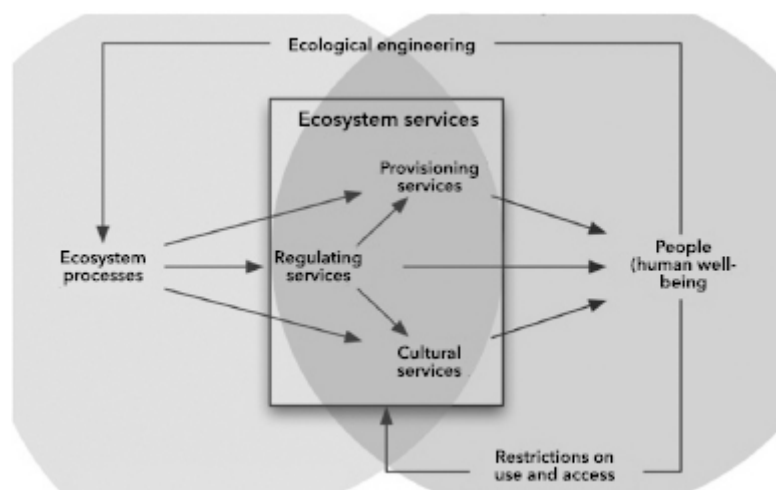
But how are we to conceive conjointly a society structured by nature and a nature structured by the social? In 1998, the ecologists Fikret Berkes and Carl Folke proposed the concept of ‘socioecological systems’.³² A whole field of research (continuing the work of Georgescu-Roegen and Howard T. Odum) has since established itself, to integrate the analysis of flows of matter and energy, and of ‘socioecological metabolisms’, into the social sciences.³³ These approaches conceive society and the compartments of the Earth system as two structures connected by exchanges of matter and energy. The diagrams in [Figure 3](#) illustrate the theoretical frameworks employed by the main interdisciplinary projects that study socioecological systems.



3a



3b



3c

Figure 3: Standard representations of human activities in relation to the Earth system.

In the first diagram (Figure 3a), ‘human activities’ comprise a homogeneous black box, while attention is focused on the ‘natural compartment’ of the Earth system. In the second (Figure 3b), commonly adopted by the ‘socioecological systems’ approach, we have two compartments connected by two paths: the impacts of human management of ecosystems and feedback from the latter. The third diagram (Figure 3c) adds to these two paths an intersection between the two compartments, that of ecosystem services and their use.

This type of representation errs by its excessive simplicity and the functionalism of its description of the social. First of all, the historical, material and cultural dynamics of human societies, their asymmetries and relations of domination, are obscured in a black box. Secondly, in all three diagrams, socio-natural metabolisms are reduced to a play of pressures and responses, whereas what is needed is an understanding of the energy and matter metabolisms operated in and by the social system that is as fine-grained as the analysis of biogeochemical flows in the Earth system. It is hard to grasp what is happening if the Anthropocene is represented by a box of ‘human activities’ that interacts with boxes for the atmosphere, biosphere, etc. We are rather dealing with an intricate network in which social and natural arrangements mutually reinforce each other: European consumer attitudes and the orangutans of Indonesia, markets and rainforests, social inequalities and endocrine disturbance, state powers and the chemical composition of the atmosphere, representations of the world and energy flows. And this ‘socio-bio-geosphere’ in its uncertain becoming can only be understood in a dialogue of disciplines with varying levels of analysis, from the molecular level of environmental effects on our heredity through to the global level of flows of matter and capital organized by the WTO, by way of local scenes at industrial sites or socio-environmental mobilizations.

How then are we to overcome the dualism between nature and society that persists in the approaches supported by the three above diagrams, a relation that remains one of externality even if a connected one? First of all, as proposed by the interdisciplinary field of political ecology, we have to think of ecology and power relations together if we are to understand the formation of social and environmental inequalities.³⁴ We then have to envisage a double relation of internality:³⁵

— *Natures pervaded by the social*, by the thousand and one sociotechnical interventions that are historically situated, and that are only dimly understood when placed in compartments connected by the ever-repeated ‘pressure-response’ pair. The nature of the Anthropocene is above all a ‘second nature’ fostered by powerful institutions (the great networks of capitalism, technological systems, military apparatuses, etc.), which does not rule out the alterity of nature nor the fact that the Earth is not just a social construct.

— *Societies pervaded by nature*, in which social relations and cultural norms are structured and rigidified by mechanisms that organize metabolisms of matter and energy, and that govern the social uses of nature. Far from surrounding the social, the environment traverses it, and the history of societies, cultures and socio-political regimes cannot ignore the flows of matter, energy and information that frame them.

In this perspective of a double-framing internality, each of the two former supposed ‘compartments’ must thus be studied by combining the approaches of the so-called social and so-called natural sciences, rather than by an interdisciplinarity of adjacency in which each would reign over its own compartment. The joint history of the Earth and of human societies then appears as the co-evolution of metabolic (material-energetic) regimes and social orders. In each period, a set of world-views and social relations supports sociotechnical arrangements that organize the metabolisms of a given society and world-system and alter the functioning of the Earth system. And reciprocally, the metabolisms thus constructed have also political agency; they make possible, robust and ‘natural’ a certain social order, a hierarchy between nations, a certain type of lifestyle and vision of the world.

Reintegrating nature into history

From the time of Michelet and Jacob Burckhardt, history has been above all the history of ‘human affairs’, those of men making history. It could scarcely interact with the history of nature, the timescales being quite different. After the Second World War, historians following Fernand Braudel³⁶ distinguished three temporalities: that of nature and climate, almost immobile and not affected by human action; the slow temporality of economic and social facts; and finally, the rapid temporality of events, vibrating to the rhythm of battles, diplomacy and political life. This separation of domains and time frames between nature and society, the legacy of industrial modernity, has had profound consequences for the writing of history. Many historians have related the history of scientific and technological mastery of nature. But until the emergence of environmental history, particularly in the United States in the late 1960s, it was rare indeed for historians to ‘think like a mountain’, in the expression of Aldo Leopold, i.e., to narrate history from the point of view of animals, ecosystems and other non-human entities. And until the 1960s, few historians addressed the alterations of the environment caused by human action and the effects these in turn had on societies.

Rather than an environmental history as had developed in the United States, what we had in France first of all was a ‘history of the environment’, a new object for history as defined by the Annales School. The quest for scientific authenticity, taken over from historical climatology, and the view of nature as an environment external to society, led Emmanuel Le Roy Ladurie to concern

himself with climatic history as a ‘history without men’. This was the basis out of which environmental history painfully emerged in France, its protagonists, unlike their American counterparts, maintaining a *cordon sanitaire* against the ecological mobilizations of the 1970s.³⁷

As an exact opposite of this objectivist history of an environment ‘without men’, other French historians developed a cultural history concerned with environmental representations and sensibilities. Alongside a host of scholarly works on the feeling for nature or the representations of landscapes, Alain Corbin’s *Le Miasme et la jonquille*, published in 1982, is a magisterial text emblematic of this cultural history. But by reading nature in terms of sensibilities and their historical situatedness, Corbin tended to relegate to the back burner the question of the very material effects of industrial activities on the bodies of workers, local residents and ecosystems.

Basically, the polarity between the objectivist perspectives of an environmental history impassive to human action and the constructivist ones of a cultural history of representations of the environment still reproduced the dividing lines between Lyell and Michelet. Taking the Anthropocene seriously as a historian means rejecting a duality that is unsatisfactory and departing from a Braudelien discordance of time frames that is no longer valid.³⁸ Thus it is well established today that the little ice age, the cooling of the climate between 1450 and 1800 with a minimum in the period 1640–1730, was not simply a natural development experienced by human societies, but the product of a reciprocal interaction. If a cyclical reduction in solar activity was one factor involved, human action itself was another: the demographic collapse of the Amerindian population by some 50 million after 1492 led to an extension of forests and a fall in atmospheric CO₂, hence a reduction in the greenhouse effect.³⁹ The work of Earth system scientists on the Anthropocene question has thus challenged the externality of the climate in relation to human action even in the pre-industrial age. After the epoch of separate histories of nature and of human societies, only a shared history can do justice to the reality of the Anthropocene.

Several works of environmental history have sought to combine material readings framed by the ‘hard’ sciences (Alfred Crosby, John McNeill) with political and cultural readings, to integrate socio-natural metabolisms and environmental mutations into a historical account. The notion of a ‘second nature’ shaped by capitalist dynamics, used by William Cronon in his key work *Nature’s Metropolis*, Edmund Russell’s ‘evolutionary history’ perspective of the interactions between human technology and the responses of living organisms, and the history of Western democracies revisited through the energy prism by Timothy Mitchell, are three stimulating examples taken from the field of environmental history that we shall draw on in the third part of this book.⁴⁰

Rediscovering freedom in the age of attachments

The Anthropocene challenges certain distinctions that were formerly deemed fundamental to the modern West: human exceptionalism⁴¹ and the ontological break between the human being as *subject* of entitlement and the *object* of nature. Environmental ethics therefore undertakes a basic rethinking of the foundations of the different moral rules that organize relations between humans and non-humans. A distinction is generally made between three major ethical proposals: anthropocentric (sustainably managing the Earth for humankind), biocentric (respecting the intrinsic right to existence of every being on Earth) and ecocentric ('thinking like Gaia', in the words of J. Baird Callicott, following on from Aldo Leopold). An entire field of philosophy (as well as law and political science) now explores the question of environmental law, or even the rights of nature (already sketched out in the constitution of Ecuador) and the Earth, and relations between nature and sovereignty.⁴²

In the same way, the Anthropocene challenges the modern definition of freedom, long conceived in opposition to nature. John Stuart Mill related the freedom and autonomy of individuals to the achievement of 'a high degree of success in their struggle with Nature'.⁴³ A freedom understood in this way sets human emancipation against nature, against the Earth as a whole. This modern conception of freedom clearly comes up against global limits in a disturbing way. Benjamin Constant, in 'The Liberty of Ancients Compared with That of the Moderns', argued in 1819 that the situation of the citizens of his time, gathered in great national political spaces, could not underpin the same conception of liberty and sovereignty as that of the citizens of the civic democracies of antiquity.

Dominique Bourg and Kerry Whiteside have taken up this argument to maintain that today, in a time of global ecological disruptions of human origin, we need to invent a new ideal of emancipation different from that of the 'moderns'.⁴⁴ For Constant, liberty was synonymous with 'security in private enjoyments', those permitted by a government that limited itself to guaranteeing property and free exchange. For this liberal there was no question of limiting the propensity of individuals to produce, exchange, consume and even waste. If the early socialists opposed to this a different ideal of emancipation, one egalitarian and co-operative, so as to limit the struggle of all against all and the 'material degradation of the planet' as Charles Fourier expressed it (see [Chapter 11](#)), we have to acknowledge that the actual socialism of the twentieth century was not ecological, and that it is Constant's market-based, individualist and consumerist view of liberty that is culturally dominant on the planet as a whole.

As the Anthropocene pursues its course, we find ourselves facing these limits, along with a host of non-human beings and caught in the feedback loops and boomerang effects of Earth history

striking back. What use is it then to conceive liberty, as did Bacon, Descartes, Michelet or Sartre, in terms of a tearing away from nature? What use is it to believe, with Luc Ferry, that ‘man’ is a ‘being of anti-nature’, and profess this view of liberty as a ‘glorification of uprootedness, or innovation’?⁴⁵ As soon as it is no longer possible to abstract from nature, we have to think *with* Gaia. One of the major tasks of contemporary philosophy is undoubtedly to rethink freedom in a different way than this wrenching away from natural determinations, to explore what may be infinitely enriching and emancipatory in those attachments that link us with other beings on a finite Earth. What infinity remains in a finite world?

Rethinking democracy in a finite world

Freedom can only be conceived in the context of social arrangements and institutional constructions. But, as the historian Dipesh Chakrabarty observes, these political constructions are themselves put in question by the disturbances of the Anthropocene: ‘the mansion of modern freedoms stands on an ever-expanding base of fossil-fuel use’,⁴⁶ which today are either growing scarce or disturbing the climate. How can the ideal of democracy be founded anew when the dream of material abundance is evaporating? How should politics be conceived in the age of the Anthropocene?

Faced with the rise of ecological movements, the first approach of political science was to take these as objects and investigate the relative novelty of their ‘offer’ in relation to other political paradigms. Other authors have used this situation to proclaim the ‘end of modernity’, or at least of the ‘simple’, non-reflexive modernity that environmental and health risks are putting in crisis.⁴⁷ Bruno Latour, for example, uses the pertinence of ecology today to argue against those modernizers who sharpen the arrow of time and who manufactured a ‘before’, when nature was supposed to have been less separated from society and society less detached from beliefs and ideologies. He proposes to ‘ecologize’ instead of modernize, and, in the wake of Michel Serres’s *The Natural Contract*, bring nature into politics by a set of institutions (a ‘parliament of things’) so as to assess the place – irremediably uncertain and controversial – in our common world of a multitude of beings, none of which can any longer serve simply as ‘means’ for others.⁴⁸

After this ‘postmodern’ phase, the aggravation of ecological disturbances indicated by scientists and the rise of the concept of Anthropocene have favoured a third wave of more materialist work on the foundations of democracy. Philosophers, political scientists and historians are shedding light on how deeply the political theories of the past were conditioned by particular eco-biogeochemical metabolisms – either explicitly (with Hobbes or Grotius, the state was justified by the scarcity of

resources) or implicitly (in the Fordist compromise based on an unequal exchange with the Third World). Effective democracy is as dependent on material foundations as is liberty, foundations that were unequally assured in the past and seem unsustainable in the future, hence the importance of new political theories that integrate the material and energy metabolisms that are the basis for political representation, the state, security, citizenship, sovereignty, justice, etc. This new field of green political theory (Andrew Dobson, Robyn Eckersley, Luc Semal, etc.) is thus questioning the standard political theory – contractualist, anthropocentric and blind to the limits of the planet.⁴⁹ In this way it will be possible to discern the conditions in which the necessary de-carbonification of our societies, or even an overall energy reduction, could change our democracies. Recent texts have thus explored the rise of a post-growth activism and of territorial policy initiatives of energy sobriety. They show that, far from prefiguring a totalitarian regression, these ‘catastrophist’ initiatives (plans for local energy reduction, transition towns, etc.) can open new spaces for strong democracy, new participatory forecasting and policy-making, and new social inclusiveness.⁵⁰

Questions of environmental justice also open up new and challenging fields for the social sciences. Can we speak of an ecological debt owed by the rich countries? How do environmental regulations in these countries, along with globalization, relocate polluting activities to poor regions? How does this affect social groups in these regions differently? Can exposing another party to environmental nuisance and catastrophe be analysed as a form of violence?⁵¹

To understand what is happening to us with the Anthropocene requires the mobilization of all forms of knowledge. If the natural sciences are essential to understanding the intrinsic dynamics of the Earth and its inhabitants, conceiving the Anthropocene also requires new environmental humanities. For this strange species, the ‘naked ape’ that has plunged the Earth into the uncertain future of the Anthropocene is not simply a biological entity. It is also made up of social and ideological systems, institutions and imaginations, pervaded by power relations that govern an unequal distribution of the benefits and ravages of Gaia, of legitimacy in speaking *of* and *for* the planet, and of the possibilities of influencing technological and economic choices – starting with the ability to tell the Anthropocene and its history.

¹ Bruno Latour, *Facing Gaia: Six Lectures on the Political Theology of Nature*, Gifford Lectures, 2013, 77, bruno-latour.fr (accessed 22 June 2013, link since suppressed).

² Isabelle Stengers, *Au Temps des catastrophes*, Paris: Les Empêcheurs de penser en rond/La Découverte, 2009.

³ Ibid., 53.

- 4 Crawford S. Holling, 'Resilience and Stability of Ecological Systems', *Annual Review of Ecology and Systematics*, 4, 1973: 2.
- 5 Ibid., 21.
- 6 We owe the idea of 'powerful impotence' to Michel Lepasant.
- 7 David B. Lobell et al., 'Climate Trends and Global Crop Production since 1980', *Science*, 333, 2011: 616–20.
- 8 François Gemenne, 'The Anthropocene and Its Victims', in Clive Hamilton, François Gemenne and Christophe Bonneuil (eds), *The Anthropocene and the Global Environmental Crisis: Rethinking Modernity in a New Epoch*, London: Routledge, 2015.
- 9 Harald Welzer, *Les Guerres du climat. Pourquoi on tue au XXIe siècle*, Paris: Gallimard, 2009.
- 10 Robert K. Kaufmann et al., 'Reconciling Anthropogenic Climate Change with Observed Temperature, 1998–2008', *PNAS* 108:29, 19 July 2011: 11,790–3; see also 'Anthropogenic Global Cooling', blog post, *Open Mind*, 23 August 2010, tamino.wordpress.com.
- 11 UN Food and Agriculture Organization, *Livestock's Long Shadow: Environmental Issues and Options*, Rome: 2006, fao.org.
- 12 Jules Michelet, *Introduction à l'histoire universelle*, Paris: Hachette, 1831, 5–7; our emphasis.
- 13 Cited by Dipesh Chakrabarty, 'The Climate of History: Four Theses', *Critical Inquiry*, 35:2, 2009: 197–222. We take up in this section Chakrabarty's key thesis, according to which the Anthropocene shatters the temporal disjunction between human history and natural history.
- 14 Charles Lyell, *Principles of Geology*, vol. 1, London: John Murray, 1830, 164.
- 15 On Lyell and uniformitarianism, see Martin Rudwick, *Worlds before Adam: The Reconstruction of Geohistory in the Age of Reform*, Chicago: University of Chicago Press, 2008, 297–315.
- 16 Lyell, *Principles of Geology*, 161.
- 17 Martin Rudwick, *Bursting the Limits of Time: The Reconstruction of Geohistory in the Age of Revolution*, Chicago: University of Chicago Press, 2005.
- 18 John Dalberg-Acton (Lord Acton) (1896), quoted by E. H. Carr, *What Is History?*, Harmondsworth: Penguin, 1965, 111.
- 19 Jean-Baptiste Say, *Cours d'économie politique*, Paris: Garnier-Flammarion, 1996, 98.
- 20 Jean-Baptiste Say, *Cours complet d'économie politique pratique*, vol. 1, Brussels: Meline, 1832, 83.
- 21 Jean-Baptiste Fressoz and Fabien Locher, 'Modernity's Frail Climate: A Climate History of Environmental Reflexivity', *Critical Inquiry*, 38, Spring 2012: 579–98.
- 22 Jean-Baptiste Fressoz, 'Circonvenir les circumfusa. La chimie, l'hygiénisme et la libéralisation des choses environnantes (1750–1850)', *Revue d'Histoire Moderne et Contemporaine*, 56:4, 2009: 39–76.
- 23 Christophe Bonneuil, 'Pure Lines as Industrial Simulacra: A Cultural History of Genetics from Darwin to Johannsen', in Christina Brandt, Staffan Müller-Wille and Hans-Jörg Rheinberger (eds), *Exploring Heredity*, Cambridge, MA: MIT Press, 2015.
- 24 Émile Durkheim, *Suicide* (1897). See also Chapter 3, 'Suicide and Cosmic Factors'. One of the first analysts of this 'social only' paradigm was Serge Moscovici, *Essai sur l'histoire humaine de la nature*, Paris: Flammarion, 1968.
- 25 *The Positive Philosophy of Auguste Comte*, New York: Calvin Blanchard, 1858, 440ff.
- 26 Ibid., 443.
- 27 Fressoz and Locher, 'Modernity's Frail Climate'.
- 28 Sigmund Freud, *Civilization and Its Discontents*, Standard Edition, vol. 21, London: Hogarth Press, 1961, 64–5.

29 Restoration of this connection is the task of today's 'ecopsychology'. See Andy Fisher, *Radical Ecopsychology*, Albany, NY: SUNY Press, 2013.

30 We gratefully borrow this critique of 'anaturalism' from a book in preparation by Frédéric Neyrat, *Enquête sur la part inconstructible de la Terre*.

31 For the critique of this great separation, see Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy*, Cambridge, MA: Harvard University Press, 1999.

32 Fikret Berkes and Carl Folke (eds), *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*, New York: Cambridge University Press, 1998.

33 Not without a totalizing and demiurgic perspective of optimal planetary management. See Chapter 4 below, and Peter Baccini and Paul H. Brunner, *Metabolism of the Anthroposphere: Analysis, Evaluation, Design*, Cambridge, MA: MIT Press, 2012.

34 Richard Peet, Paul Robbins and Michael Watts (eds), *Global Political Ecology*, London: Routledge, 2010.

35 This perspective is located at the junction of Earth system sciences, the philosophies of Whitehead and Deleuze, Bruno Latour and the 'co-productionist' studies of the sciences, and the ecologized Marxism of Jason Moore, who talks about 'society-in-nature' and 'nature-in-society'. See Jason Moore, *Capitalism in the Web of Life*, London: Verso, 2015.

36 Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II* (2 vols), London: Fontana, 1966.

37 See the very significant issue of *Annales* on the environment, 29:3, May–June 1974. On the 'delay' and specific characteristics of French environmental history, see Geneviève Massard-Guilbaud, 'De la "part du milieu" à l'histoire de l'environnement', *Le Mouvement social*, 200, July–September 2002, 64–72.

38 Chakrabarty, 'The Climate of History'.

39 William F. Ruddiman, *Plows, Plague and Petroleum*, Princeton: Princeton University Press, 2005; Richard J. Nevle et al., 'Neotropical Human-Landscape Interactions, Fire, and Atmospheric CO₂ during European Conquest', *Holocene*, 21, 2011: 853–64; Robert A. Dull et al., 'The Columbian Encounter and the Little Ice Age: Abrupt Land Use Change, Fire, and Greenhouse Forcing', *Annals of the Association of American Geographers*, 100:4, 2010: 755–71; Simon L. Lewis and Mark A. Maslin, 'Defining the Anthropocene', *Nature*, 519, 12 March 2015: 171–80, nature.com.

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41 Riley E. Dunlap and William R. Catton, 'Struggling with Human Exemptionalism: The Rise, Decline and Revitalization of Environmental Sociology', *American Sociologist*, 25, 1994: 5–30.

42 Michel Serres, *The Natural Contract*, Ann Arbor, MI: University of Michigan Press, 1995; Gérard Mairat, *Nature et souveraineté*, Paris: Presses de Sciences Po, 2013.

43 John Stuart Mill, *Considerations on Representative Government* (1861), Rockville, MD: Serenity Publishers, 2008, 40.

44 Dominique Bourg and Kerry Whiteside, *Pour une démocratie écologique*, Paris: Seuil, 2010, 21–5.

45 Luc Ferry, *The New Ecological Order*, Chicago: Chicago University Press, 1995, 92. Jean-Claude Michéa responds that this uprootedness is 'simply the other name for liberal anthropology' and shows how the early socialists of the first half of the nineteenth century opposed this. See Jean-Claude Michéa, *Les Mystères de la gauche*, Paris: Climats, 2013.

46 Chakrabarty, 'The Climate of History', 208.

47 We shall discuss the theses of Ulrich Beck, Bruno Latour and Anthony Giddens in Chapter 4.

48 Latour, *Politics of Nature*, and *An Inquiry into Modes of Existence: An Anthropology of the Moderns*, Cambridge, MA: Harvard University Press, 2013.

49 Andrew Dobson et al., 'Andrew Dobson: Trajectories of Green Political Theory', *Natures Sciences Sociétés*, 22:2, April–June 2014: 132–41; Andrew Dobson, *Green Political Thought*, London: Routledge, 2007; Andrew Dobson and Robyn Eckersley (eds), *Political Theory and the Ecological Challenge*, Cambridge: Cambridge University Press, 2006.

50 Luc Semal, *Politiques catastrophistes. Pour une théorie politique environnementale*, Paris: PUF, 2015; also Agnès Sinäi (ed.), *Penser la décroissance. Politiques de l'Anthropocène*, Paris: Les Presses de Sciences Po, 2013.

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PART TWO: SPEAKING FOR THE
EARTH, GUIDING HUMANITY:
Deconstructing the Geocratic Grand
Narrative of the Anthropocene

CHAPTER 3

Clio, the Earth and the Anthropocenologists

The scientists who invented the term ‘Anthropocene’ did not simply produce fundamental data on the state of our planet or advance a systemic and fruitful perspective on its uncertain future. They also proposed a history, a story seeking to respond to the question ‘How did we get here?’ In this way, they developed an authorized narrative of the Earth, its past and its future shared with the human species, a narrative that makes the management of the Earth system a new object of knowledge and government.

The concept of the Anthropocene continues a number of previous narratives, produced in the course of history, of the global environment, the Earth and its proper usage. The world’s centres of government have long been the places where what balances or unbalances the planet has been spoken and demonstrated. They construct spheres in which the proper ways of handling it, tempering it or acclimatizing it are presented: from the greenhouses of the Jardin du Roi where Buffon wrote his *Epochs of Nature* to the projects of geoengineering promoted by Paul Crutzen, by way of the Crystal Palace of London’s Great Exhibition of 1851, symbol of the commercial organization of the world,¹ or again the geodesic dome conceived by Buckminster Fuller – of the ‘Spaceship Earth’ metaphor – for the United States pavilion at the Montreal Universal Exhibition of 1967, presenting the first image of an ‘Earthrise’ seen from the Moon.²

The elites of the French colonial empire in the eighteenth century, such as Pierre Poivre and Georges-Louis Leclerc de Buffon, those of the British empire in the nineteenth century, such as the economist William Stanley Jevons and the forester Dietrich Brandis, those of the conquest of the American West, such as Gifford Pinchot, or of US hegemony in the 1950s, such as Henry Fairfield Osborn, all developed in their time knowledge and global environmental warnings that dovetailed into systems of world domination – while attempting to inflect these a little (see [chapters 8](#) and [11](#)). Far from being the hallmark of our present era, knowledge of the global environment has thus for a very long time been part of imperial cosmographies.

There is some reason to suspect, therefore, that the knowledge and discourse of the Anthropocene may itself form part, perhaps unknowingly, of a hegemonic system for representing the world as a totality to be governed. To analyse this new cosmography, we shall study those texts most often cited by the scientists, historians and philosophers who have introduced and discussed the notion of Anthropocene on the international stage.³ For simplicity's sake, we shall refer to this phalanx of renowned scholars who made the bold gesture of naming our epoch as 'anthropocenologists'.

Submitting these narratives to criticism does not mean denying the value of the investigations of these anthropocenologists. It is rather a matter of opening up the official narrative of the Anthropocene to discussion, so as to enable closer reflection on the particularities of our representations of the world. So that other voices *from* and *for* the Earth can be heard, coming from other cultures and other social groups; so that other explanations of 'how we got to this point' and other proposals for 'what is to be done' may also have their say. Otherwise the seductive Anthropocene concept may well become the official philosophy of a new technocratic and market-oriented geopower.

In order to make fruitful use of the advances in the Earth system sciences, we have to learn to distrust the grand narratives that come with the Anthropocene concept, to pass them through the sieve of criticism. This is the way in science, history and democracy.

A history of 'stages'

Anthropocenologists seem attracted to historical narration. What is more natural than to explain the human dynamic that has tipped the Earth into a new state? Since the Anthropocene is a new epoch, the question of knowing how we arrived here arises quite immediately, and science presents an account of 'the evolution of humans and our societies from hunter-gatherers to a global geophysical force'.⁴ To tell the Odyssey of humans, still in the nineteenth century 'frail bent reeds ... with their feet plunged unto death into the immemorial soil',⁵ but who have today become beings 'equipotent to the Earth',⁶ as Michel Serres puts it, anthropocenologists have constructed a narrative, searched for founding events and causal chains, and marked out periods.

In 2000, Crutzen and Eugene Stoermer posited the invention of the steam engine in 1784 as the start of the Anthropocene.⁷ They also mentioned scientific precursors of the Anthropocene concept, from Antonio Stoppani and George Perkins March in the nineteenth century to Vladimir Vernadsky.⁸ Since then, articles proposing a historical narrative of the Anthropocene have proliferated, as well as interdisciplinary projects that bring together scientists and historians (such as the IHOPE project:

Integrated History and Future of People on Earth).⁹ Specialists in environmental history such as John McNeill and Libby Robin have likewise joined with scientists in elaborating a historical account of the interactions between the human species and the Earth system since the end of the eighteenth century.¹⁰

The narratives of the anthropocenologists propose three ‘stages’. The first, from the beginnings of the industrial revolution to the Second World War, corresponds to the turn into the Anthropocene, with the thermo-industrial revolution raising the concentration of atmospheric carbon dioxide from 277 to 280 parts per million (ppm) in the eighteenth century to 311 by the mid twentieth century (as against between 260 and 285 ppm for the 11,500 years of the Holocene). The mobilization of coal formed hundreds of millions of years ago started in China and in Europe in the eleventh century but only acquired a massive scale from 1750 on, with the increase from some 500 steam engines in the whole world to hundreds of thousands by 1900. This fossil energy supplanted renewable energies, making possible the development of rail transport and global trade, facilitating access to water, and from the early twentieth century the chemical synthesis of nitrogen fertilizers that considerably increased agricultural yields. The availability of this ‘ready’ energy leads anthropocenologists to conclude that a rise in energy consumption by a factor of forty between 1800 and 2000 made possible economic growth by a factor of fifty, demographic growth by a factor of six, and an anthropic artificialization of land that increased by a factor of between 2.5 and 3 in this same period.¹¹

A second stage in the Anthropocene opened after the Second World War. Anthropocenologists have called this the ‘Great Acceleration’,¹² succinctly adducing a number of causal factors: the collapse of European pre-industrial institutions, a new international economic system of free trade, the technologies that were developed in the Second World War and now applied to civilian economic growth, and the establishment of markets and growth as ‘central societal values’.¹³ But the new historical stage is demonstrated above all by statistics. [Figure 1](#) in [Chapter 1](#) gives a dashboard display of twenty-four charts, measuring a spectrum of ‘human activity indicators’ characteristic of the Great Acceleration, from the concentration of atmospheric carbon and methane through to the number of large dams, by way of nitrogen and phosphorous cycles and the measure of biodiversity. All these graphs attest to an exponential upsurge in human impacts since 1950.

The third stage in the Anthropocene is seen as beginning around the year 2000, marked by a number of turning-points. As with the beginnings of the first stage, it is again carbon that governs this periodization, since the anthropocenologists note that ‘environmental problems aroused little attention during the Great Acceleration ... the major emerging environmental problems were largely ignored’,¹⁴ and it was not until 2001 that the international scientific community, in the third report of the

Intergovernmental Panel on Climate Change (IPCC), asserted for the first time with certainty the chiefly human origin of the climate change under way. The third stage in the Anthropocene was thus that of a new ‘growing awareness of human impact on the global environment’, as expressed by the IPCC or the Earth Summit of 1992 in Rio de Janeiro, as well as the ‘first attempts to construct systems of global governance to manage the relations of humanity with the Earth system’.¹⁵

It was also the development of environmental accounting on a planetary scale that spurred these authors to discern a third phase: the perspective of the exhaustion of hydrocarbons (with a peak in conventional oil reached in 2006, according to the International Energy Agency), a phosphorous peak equally close and threatening agricultural production, and the accelerating reduction in biodiversity. As well as the volume of human impacts, it is also their distribution structure that is changing in this third stage. In the first decade of the new century, China overtook the United States as the world’s largest emitter of carbon dioxide, while India took third place from Russia, South Korea caught up with the United Kingdom, and both Indonesia and Brazil overtook Germany. The countries of the OECD, which in 1971 emitted 67 per cent of carbon dioxide, made up only 42 per cent of the total in 2009.¹⁶ The globalization of the development model born in the West is now making the upper social strata of the countries of the South into major contributors to human telluric action.

The story that anthropocenologists tell in these three phases presents a co-evolution of human species and the Earth system over the last centuries. Environmental history, which has long been mainly focused on particular territories or objects (fire, urban pollution, forests, pesticides),¹⁷ thus advances to a global outlook, at the crossroads of recent advances in world history and the sciences of the Earth system.

After acknowledging the merits of this global perspective of socio-ecological metabolisms in the last quarter of a millennium, we can now question the particular forms of historical explanation as a function of the numbers and curves that this mobilizes.

A history in curves

The anthropocenologists’ modalities of argument were imported into history from the environmental sciences, just as, in the mid twentieth century, history sought to become a science by way of quantitative series borrowed from the science of economics. Under the influence of economists such as Walt W. Rostow, whose classic *The Stages of Economic Growth* was published in 1960, the writing of history in terms of stages on a linear and universal path was standard practice: ‘the traditional society, [then] the preconditions for take-off, [then] take-off, [then] the drive to

maturity and [finally] the age of high mass-consumption'.¹⁸ These stages were accessible to historical knowledge thanks to methods of the triumphant economic and social history that made quantity the key to historical narrative.

Let us look again at this second stage, the Great Acceleration. Some writers even propose having the Anthropocene start from this point in time, arguing from the vertiginous rise of the curves shown above. They point to a 'post-1950 acceleration' of different exponential curves with human impact on the planet.¹⁹ By definition, an exponential curve is characterized by an increasingly steep slope (velocity) but a constant growth rate: there is no sudden jump in the growth rate at the end of the curve. Let us take for example the (almost exponential) curve of CO₂ emissions from fossil fuels – coal, gas and oil – as shown in [Figure 4](#).

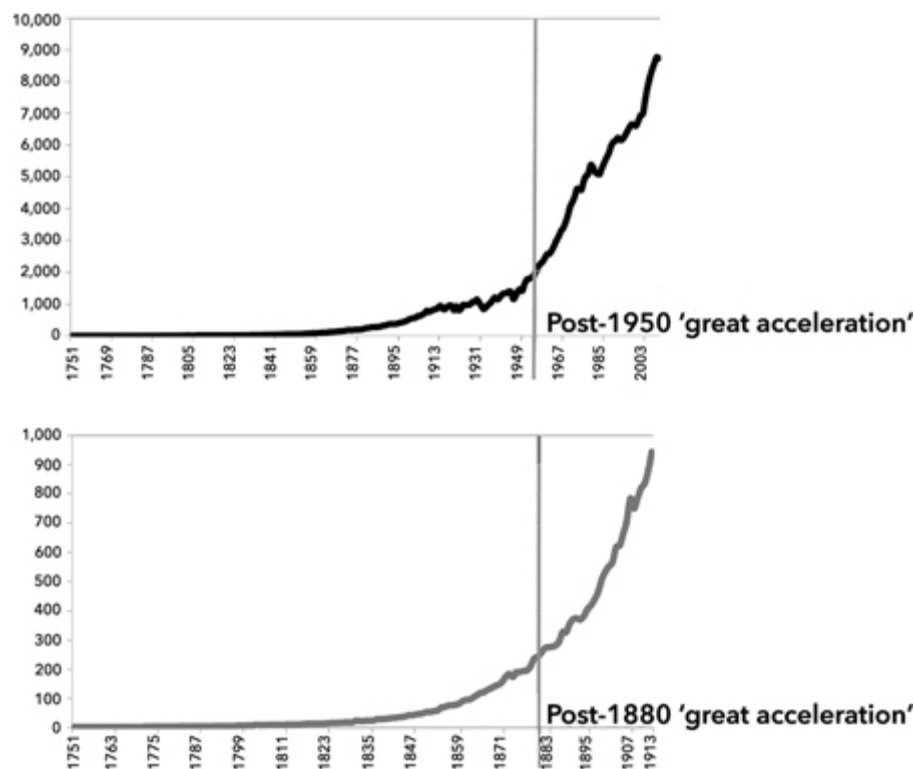


Figure 4: Global carbon emissions from fossil fuels since 1751 (in millions of tons)

On [Figure 4a](#), which shows emissions from 1750 to 2006, we can see a vertical rise after 1950. But let us now look at [Figure 4b](#). This shows the same data but stops at 1914 and presents a similar vertical rise – though this time after 1880. Should we conclude that a 'great acceleration' took place in the years 1870–1914, and seek its causes in the second industrial revolution, the expansion of European imperialism, and the remarkable commercial and financial globalization of this period ([Chapter 10](#))? Conclusion: if the seriousness and change of scale of human impacts on the Earth system from 1945 is incontestable, the slope of a curve is not in itself sufficient to decide on the start of a historical or geological epoch and can certainly not take the place of causal historical explanation.

Today, the notion of ‘stages’ seems to many historians obsolete and excessively teleological. And yet it has returned with the anthropocenologists’ grand narrative, like an inverted replica of economic history à la Rostow. Just as the quantitative history of half a century ago, fascinated by the movement of technology and economics and challenging the primacy of politics, formed part of the productivist ideology of that time,²⁰ so the official narrative of the Anthropocene could well be part of the contemporary ideology of an ecological modernization and a ‘green economy’ that internalizes in markets and policies the value of the ‘services’ supplied by nature.

Indeed, quantifying nature is today big business, just as quantifying the economy had been after the Second World War. We should not be surprised, therefore, that the grand narrative of the anthropocenologists seeks truth by way of an accounting of the flows and stocks of nature. And it is no accident that one of their leading figures, the director of the IHOPE project, is Robert Costanza, a student of Howard T. Odum, the founder of the ecology of ecosystems. Costanza is a master in the accounting of nature. In 1997 he published a famous article in *Nature* that assessed the annual value of the services rendered by the biosphere at about \$33 billion, or twice the world’s GDP.²¹ The notion of ‘ecosystemic services’ and the project of measuring their monetary value were inscribed in 2005 in the Millennium Ecosystem Assessment published by the UN. All values of nature, even those far upstream from production and including the most spiritual (renamed ‘cultural services’), thus enter into an accounting logic. And the International Union for Conservation of Nature now presents nature as ‘the largest company on Earth’.²²

History as conceived by the anthropocenologists could thus be to contemporary green economics what economic and social history was to the Keynesian and productivist economics of the post-war period. Like the latter, it tells us a history governed by quantities, in this case biogeochemical and ecological ones. The principal marker that divides the Anthropocene into three stages is the concentration of carbon in the atmosphere, expressed in parts per million. This is followed in second place by other magnitudes such as global average temperature (an abstraction that does not correspond to any particular place), the percentages of the Earth’s surface that are anthropized and the millions of tonnes of nitrogen and potassium that are in circulation. In each case, these quantities are related to the pre-industrial values as evidence of a leap into the Anthropocene and of limits that are dangerous to exceed.

This dominant history of the Anthropocene is written in the great book of global environmental accounting, with stocks being ‘capital’ and flows the ‘impacts’ or ‘services’ to be measured. In *Something New under the Sun*, the magnum opus on twentieth-century environmental history by the American historian John McNeill, the chapters are organized according to the various compartments

of the Earth system: atmosphere, biosphere, hydrosphere, lithosphere.²³ This remarkable book of over 400 pages has only one page on the emergence of mass consumption and mass markets, five pages on international economic exchange and some twenty pages on political processes. The historical account of the environmental crisis that results from this is one of a more or less undifferentiated demographic, economic and technological growth, with no focus on the strategies of the actors involved, the choices that could have been made differently or the controversies and conflicts around these choices. We thus have a kind of global growth dynamic that serves as the motor of history and danger for the planet.

Systemization: the Earth as a great cybernetic machine?

Under such headings as ‘Assessing Human Impacts on the Earth System’ or ‘Human-Nature Interactions’, these historical narratives of a new type are full of concepts and methods that have been rather unfamiliar to historians until recently, such as ‘non-linear systems’, ‘multi-agent models’, ‘modelling’, ‘adaptive capacity’, ‘resilience’ and ‘socioecological systems’.²⁴ Such a story of the Anthropocene fits into a series of operations of systemization, which lead to conceiving the Earth as a ‘complex system’, a great self-regulating cybernetic machine (but one that human excesses could cause suddenly to deviate from its trajectory). It is important therefore to understand the historical genesis of this view, its contributions and its limitations.

The view of the Earth as a system lies at the source of modern geology. The term was used both by Charles Lyell and by James Hutton, his predecessor in the formulation of the uniformitarian theory. In his *Theory of the Earth* of 1788, Hutton presents the terrestrial system as ‘a machine of a peculiar construction’, with its components, mechanical principles and functions. But he goes on to add right away that the Earth can ‘be also considered as an organized body’, with ‘a constitution in which the necessary decay of the machine is naturally repaired, in the exertion of those productive powers by which it had been formed’.²⁵ This tension between machine and organisms not only pervades all biological thinking, but also all thinking about the Earth.

After the Second World War, scientists sought to overcome this tension, to go beyond Cartesian analytic reductionism while preserving the ambition of control and engineering. This gave birth to the concepts of ecosystem and cybernetic machine, games theory and complex systems theory (or ‘general system theory’, in the title of the major book by the biologist and mathematician Ludwig von Bertalanffy, published in 1968).

James Lovelock, for his part, drew on this ambivalence between machine and organism in his famous ‘Gaia hypothesis’ of 1974. Having participated during the 1960s in a NASA project that aimed to identify criteria by which the possible presence of life on other planets could be detected, he asked what could explain such a long habitability of a planet by living beings as is found on Earth. Lovelock formulated the hypothesis that this habitability was also the product of the action of living beings themselves, acting to maintain conditions favourable to life.²⁶ The blue algae or ‘cyanobacteria’ that appeared more than 3 billion years ago actually changed the course of the Earth. As the first living creatures to practise photosynthesis, they fixed carbon from the atmosphere into sediment in the ocean depths and released oxygen into the air, making it possible for the animals that appeared later to breathe, and forming the ozone layer that protects the planet from highly mutagenic ultraviolet radiation. Without the action of algae and plants, the biogeochemical cycles that make it possible for various life forms to maintain themselves would not be the same. Hence the idea of Lovelock and Lynn Margulis that life, by acting on the various biogeochemical cycles, stabilizes the state of the Earth system, ensuring the continuous habitability of the planet. The Earth system sciences have in recent years confirmed the existence of feedback loops between the living world and the basic physico-chemical parameters of the Earth system, and recognized their intellectual debt to Lovelock.

If what is often associated with Lovelock is his image of a New Age sage, and the teleological tone of his theory, he was in reality a pure product of the scientific-military-industrial complex of the Cold War. After collaborating with NASA, he worked for the CIA during the Vietnam War on detecting human presence under forest cover. His post-democratic conception of planetary government, his apology for nuclear power and his systemic view of the planet as a self-regulated system are the legacy of a world-view born from the Second World War and the Cold War.

These global wars, in fact, promoted the emergence of new knowledge and world-views such as cybernetics, followed by general systems theory, which claims to be applicable to all domains: every object of study from organisms to machines, cities to ecosystems, is broken down into discrete elements whose interactions and overall behaviour can then be analysed. Cybernetics, game theory and operational research became *the* privileged means for analysing situations, managing complex systems and rationalizing action, whether it was the Korean War, city planning, the management of health care or the whole Earth.²⁷ Simulations (computer models, war games or strategy games around the control of resources) thus played a determining role in the emergence of a new relationship to the Earth seen as a ‘system’. The elites of the two post-war blocs conceived the planet as a ‘closed world’,²⁸ a unified theatre where the battle between the two superpowers was played out; a vast reserve of

supplies of strategic resources to make possible a faster growth than the other bloc and ensure social peace; a ‘gigantic laboratory’²⁹ with its thousands of nuclear explosions,³⁰ whose ecological and health effects were studied. Deriving from these ‘closed world’ views came the metaphor of ‘Spaceship Earth’³¹ that seen from the Moon suggests its finite and fragile character ... not without giving a new sense of geo-technocratic power, the pleasure of imagining oneself piloting the whole system.

The Earth viewed from nowhere

The Anthropocene inherits a second element from the Cold War: a view of the Earth – and of our earthly issues – from above.³² The V-2 missiles developed by Nazi technology were already used by the US Army in 1946 to measure solar radiation above the ozone layer and show the protective role this played.³³ Since the Cold War was global, the whole Earth became a strategic terrain to study. To guide ballistic missiles, a better knowledge of the atmosphere and geomagnetism was necessary. To cross and control the oceans, the oceanography of great depths had to be developed. To survey the movement of hostile submarines, it was necessary to know when and where they surfaced, and so to observe by satellite the polar ice caps and their seasonal changes.³⁴ According to the US Army in 1961, the ‘environment in which the Army, Navy, Air Force and Marine Corps will operate covers the entire globe and extends from the depths of the ocean up to the far reaches of interplanetary space’.³⁵

The scientific imaginary of the Anthropocene inherited ideologies, knowledge and technologies from the Cold War. Marshall McLuhan already proclaimed the end of Earth-nature and the emergence of a ‘man-made’ Earth in a celebrated article of 1974:

Sputnik created a new environment for the planet. For the first time the natural world was completely enclosed in a man-made container. At the moment that the Earth went inside this new artefact, Nature ended and Ecology was born. ‘Ecological’ thinking became inevitable as soon as the planet moved up into the status of a work of art.³⁶

Hannah Arendt warned against this interpretation in 1958, opening her book *The Human Condition* with a reflection on the philosophical significance of Sputnik: humankind’s alienation from ‘an Earth who was the Mother of all living creatures under the sky’,³⁷ from his original earthly cradle, detaching himself from it in order to look on it from above. She saw Sputnik as representing a modernist denial of the human condition, ‘a rebellion against human existence as it has been given, a

free gift from nowhere (secularly speaking), which he wishes to exchange, as it were, for something he has made himself'.³⁸

These remarks of Arendt's could also apply to the Anthropocene: a humanity abolishing the Earth as natural alterity in order to occupy it entirely and transform it into a techno-nature, an Earth entirely permeated by human activity, as if only what *Homo faber* makes has any genuine value. Arendt denounced this 'instrumentalization of the whole world and the Earth, this limitless devaluation of everything given'.³⁹

Since Sputnik, thousands of satellites have circled the Earth in ninety-minute orbits. Their electromagnetic waves now envelop the globe in a second atmosphere, a technosphere. The dense network of data gleaned from satellite observations, and the heavy computer infrastructure enabling this to be processed, are both part of the solution, by enabling us to know better the human impacts on the Earth, and part of the problem, the project of absolute domination of the planet that is one of the causes of our further swing into the Anthropocene after 1945. This ambivalence was illustrated by the Apollo programme. On the one hand, it offered us the picture of the 'Blue Marble' (Figure 5), an iconic image for the Western environmental movement. On the other hand is the hubris of control: just after the 'conquest of the Moon' in July 1969, Werner von Braun – the Nazi inventor of the V-2 rocket, and subsequently father of the US space programme – announced to the press that 'from this marvellous observation platform we will be able to examine all the riches of the Earth: unknown oil wells, mines of copper and zinc'.⁴⁰ The Apollo missions also polluted the Moon by leaving behind plutonium-238 and caused the extinction of at least one species, the dusky seaside sparrow (*Ammodramus maritimus nigrescens*), killed by massive DDT spraying around NASA's space facility.

41

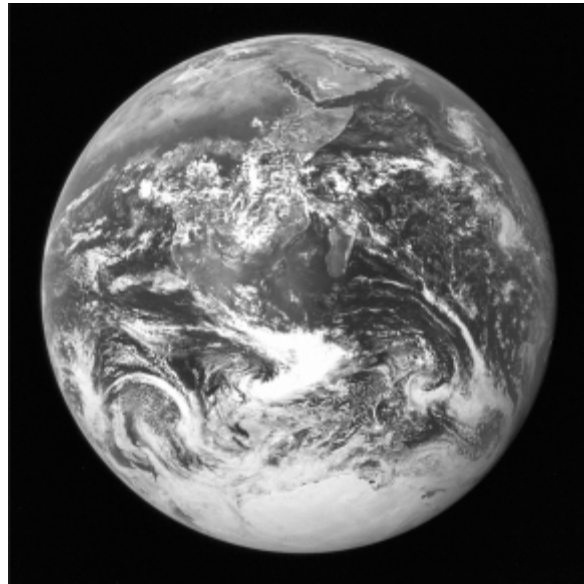


Figure 5: *The Earth seen from midway to the Moon, Apollo 17, 7 December 1972*

Above all, the image of the Earth seen from space conveys a radically simplistic interpretation of the world.⁴² It gives an intoxicating sense of total overview, global and dominating, rather than a sense of humble belonging. It crowns what Philippe Descola has called the ‘naturalism’ born in the West, by which we conceive other earthly creatures as sharing the same ‘physicality’ as we humans while having an interiority that is radically different from our own,⁴³ thus placing us at a vantage-point in relation to nature, a strategic external position from which the Earth system may be managed and piloted. This interpretation of our place on Earth from a spatial perspective thus extends a view of objectivity as the ‘view from nowhere’ born in the mid nineteenth century,⁴⁴ according to which true knowledge is that produced by abstraction from the system observed, so as to let nature speak for itself. In this view, it is only possible to understand and manage the planet’s problems properly by looking at it from space, in a kind of ‘de-Earthed’ vision. This superior standpoint not only postulates that we have ‘only one Earth’ (the famous slogan of the Stockholm conference of 1972), but also that there is a superior knowledge of the planet’s problems. It perpetuates a *naturalist* imaginary (which the anthropology of Philippe Descola has shown is only one of four main models for the relationship of humans to the world) and, still more, a ‘de-Earthed’ imaginary, the product of a techno-scientific culture that developed in parallel with the dynamics that have led us into the Anthropocene.

The dominant view of the Anthropocene hence encapsulates a long process of Weberian ‘disenchantment’, pre-eminence of ‘instrumental rationality’ (Adorno and Horkheimer) and negation of the world as given otherness (Arendt), a process that has made the moderns ‘men without a world’ (Déborah Danowski and Eduardo Viveiros de Castro).⁴⁵ This imaginary is not neutral and dominates other imaginaries (such as those of indigenous communities and of other grassroots socio-

environmental movements), which may themselves be the bearers of relevant perspectives and solutions in the face of our present ecological disarray.

1 Peter Sloterdijk, *In the World Interior of Capital: Towards a Philosophical Theory of Globalization*, Cambridge: Polity, 2013, pp. 169–76.

2 Sebastian Grevsmühl, *La Terre vue d'en haut. L'Invention de l'environnement global*, Paris: Seuil, 2014.

3 In particular, Paul Crutzen's article 'Geology of Mankind', *Nature*, 415, 3 January 2002: 23; that by the climatologist Will Steffen, together with Paul Crutzen and the historians Jacques Grinevald and John McNeill, 'The Anthropocene: Conceptual and Historical Perspectives', *Philosophical Transactions of the Royal Society A* 369:1938, 2011: 842–67; a programmatic article on the piloting of the planet, by Will Steffen and Paul Crutzen along with the geologist Jan Zalasiewicz, 'The Anthropocene: From Global Change to Planetary Stewardship', *Ambio*, 40, 2011: 739–71; and that of Johan Rockström, specialist in 'systems approaches' and director of the celebrated Resilience Centre in Stockholm. This body of work is enriched by some other articles, including those on 'planetary limits', published also by Rockström together with some thirty colleagues (including Steffen and Crutzen, but also the American climatologist James Hansen as well as Robert Costanza, the ecologist who calculated in 1997 the monetary value of the services rendered by the biosphere), 'A Safe Operating Space for Humanity', *Nature*, 24, September 2009: 472–5; or 'Planetary Boundaries: Exploring the Safe Operating Space for Humanity', *Ecology and Society*, 14:2, 2009: 1–33.

4 Will Steffen, Paul J. Crutzen and John R. McNeill, 'The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?', *Ambio* 36:8, 2007: 614–21, 614.

5 Michel Serres, *The Natural Contract*, Ann Arbor: University of Michigan Press, 1995, 17.

6 Ibid., 110.

7 Paul Crutzen and Eugene F. Stoermer, 'The "Anthropocene"', *Global Change Newsletter*, 41, 2000: 17–18. The steam engine, however, did exist before James Watt's patent of 1784, being basically used to pump water in mines.

8 We know from Georges Canguilhem the aporiai of the quest for precursors, and will not deal with this question in the present book.

9 Robert Costanza, Lisa J. Graumlich and Will Steffen (eds), *Sustainability or Collapse? An Integrated History and Future of People on Earth*, Cambridge, MA: MIT Press, 2007. See also aimes.ucar.edu/ihope.

10 Steffen, Crutzen and McNeill, 'The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?'; Libby Robin and Will Steffen, 'History for the Anthropocene?', *History Compass*, 5:5, 2007: 1,694–719; John R. McNeill, *Something New under the Sun: An Environmental History of the Twentieth-Century World*, New York: Norton, 2001; Steffen et al., 'The Anthropocene: Conceptual and Historical Perspectives'.

11 Steffen et al., 'The Anthropocene: Conceptual and Historical Perspectives', 848.

12 Ibid., 849.

13 Ibid., 850.

14 Ibid., 850 and 853.

15 Ibid., 856.

16 OECD, 'Emissions of Carbon Dioxide', in *OECD Factbook 2011–2012: Economic, Environmental and Social Statistics*, oecd-ilibrary.org.

17 With few exceptions, such as the works of Alfred Crosby and John McNeill.

18 Walt W. Rostow, *The Stages of Economic Growth: A Non-Communist Manifesto*, Cambridge: Cambridge University Press, 1960, 4.

19 Will Steffen et al., 'The Trajectory of the Anthropocene: The Great Acceleration', *Anthropocene Review* 2:1, April 2015 (first published online 16 January 2015): 81–98.

20 Jean-Baptiste Fressoz and François Jarrige, 'L'histoire et l'idéologie productiviste. Les récits de la révolution industrielle après 1945', in Céline Pessis, Sezin Topçu and Christophe Bonneuil (eds), *Une autre histoire des 'Trentes Glorieuses'. Modernisation, contestations et pollutions dans la France d'après-guerre*, Paris: La Découverte, 2013, 61–79.

21 Robert Costanza et al., 'The Value of the World's Ecosystem Services and Natural Capital', *Nature*, 387, 1997: 253–60, especially 254.

22 IUCN, 'Wildlife Crisis Worse than Economic Crisis – IUCN', news release, 2 July 2009, iucn.org.

23 McNeill, *Something New under the Sun*.

24 See for example Marian Glaser et al. (eds), *Human-Nature Interactions in the Anthropocene*, London: Routledge, 2012.

25 James Hutton, *Theory of the Earth* (1788), 11 and 15. We are grateful to Pierre de Jouvancourt for drawing our attention to this author. See Pierre de Jouvancourt, 'Tenir à Gaïa. Une anthropologie politique de l'Anthropocène', master's thesis in philosophy, June 2013, University of Paris I; Christophe Bonneuil et Pierre de Jouvancourt, 'En finir avec l'épopée. Récit, géopouvoir et sujets de l'Anthropocène', in Émilie Hache (ed.), *De l'univers clos au monde infini*, Paris: Éditions Dehors, 2014, 57–105.

26 James Lovelock, *Gaia: A New Look at Life on Earth*, Oxford: Oxford University Press, 2001.

27 Amy Dahan and Dominique Pestre (eds), *Les Sciences pour la guerre, 1940–1960*, Paris: Éditions de l'EHESS, 2004; Peter Galison, 'The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision', *Critical Inquiry*, 21:1, 1994: 228–66; Robert Leonard, *Von Neumann, Morgenstern and the Creation of Game Theory: From Chess to Social Science 1900–1960*, Cambridge: Cambridge University Press, 2010; Geof Bowker, 'How to be Universal: Some Cybernetic Strategies, 1943–70', *Social Studies of Science*, 23:1, 1993: 117–27; Agatha C. Hughes and Thomas P. Hughes (eds), *Systems, Experts, and Computers: The Systems Approach in Management and Engineering, World War II and After*, Cambridge, MA: MIT Press, 2000.

28 The 'closed world' is the focus of the historian Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America*, Cambridge, MA: MIT Press, 1997.

29 Georges Bernanos, 15 November 1945, quoted in Christophe Bonneuil, Céline Pessis and Sezin Topçu, 'Pour en finir avec les "Trentes Glorieuses". Vers une nouvelle histoire de la France des décennies d'après-guerre', in Pessis, Topçu and Bonneuil, *Une autre histoire des 'Trente Glorieuses'*, 19.

30 See the striking cartography of the 2,053 nuclear explosions between 1945 and 1998: 'A Time-Lapse Map of Every Nuclear Explosion Since 1945 – by Isao Hashimoto', YouTube video of Isao Hashimoto's 2003 multimedia artwork 1945–1998, posted by 'aConcernedHuman', 24 October 2010, youtu.be/LLCF7vPanrY.

31 The expression was coined by Kenneth Boulding in 1966.

32 The French term *vision déterrestre* gets well to the point. It comes from Geneviève Azam, *Le Temps du monde fini. Vers l'après-capitalisme*, Paris: Les Liens qui libèrent, 2010. Heidegger already spoke in 1966 of an 'uprooting of man' by visualizations of Earth seen from space; see Benjamin Lazier, 'The Globalization of the World Picture', *American Historical Review*, 116:3, June 2011: 609.

33 Grevsmühl, *La Terre vue d'en haut*.

34 Ronald Doel, 'Quelle place pour les sciences de l'environnement physique dans l'histoire environnementale?', *Revue d'histoire moderne et contemporaine*, 56:4, 2009: 137–63.

35 Quoted in *ibid.*, 158.

36 Marshall McLuhan, 'At the Moment of Sputnik the Planet Became a Global Theater in Which There Are No Spectators but Only Actors', *Journal of Communication*, 24:1, 1974: 49.

37 Hannah Arendt, *The Human Condition*, Chicago: University of Chicago Press, 2013, 2.

38 *Ibid.*, 2–3.

39 *Ibid.*, 157.

40 See Eduardo Galeano, *Open Veins of Latin America*, London: Serpent's Tail, 2009, 134.

41 Fernando Elichirigoity, *Planet Management*, Evanston, IL: Northwestern University Press, 1999, 8. This bird species was endemic to the region of Florida that was set aside for space launches and sprayed with DDT.

42 Grevsmühl, *La Terre vue d'en haut*.

43 Philippe Descola, *Beyond Nature and Culture*, Chicago: Chicago University Press, 2013.

44 The notion of a 'view from nowhere' proposed by Thomas Nagel, and its history as a norm of scientificity in the nineteenth century, are analysed in Lorraine Daston, 'Objectivity and the Escape from Perspective', *Social Studies of Science*, 22:4, 1992: 597–618.

45 Déborah Danowski and Eduardo Viveiros de Castro, 'L'arrêt de monde', in Hache, *De l'univers clos au monde infini*, 221–339.

CHAPTER 4

Who Is the *Anthropos*?

The official grand narrative of the Anthropocene presents not only a unique view of Earth, of which we should all have the same representation, ‘from nowhere’, but also a humanity seen as biological entity and geological agent. The grand narrative of the Anthropocene becomes that of ‘the evolution of humans ... from hunter-gatherers to a global geophysical force’.¹ The anthropocenologists then present themselves as guides for a ‘humanity’ deficient in knowledge, recommending it to ‘reconnect with the biosphere’.² Let us decipher this view of *anthropos* and the implications it holds.

The odyssey of the species

‘Humankind, our own species, has become so large and active that it now rivals some of the great forces of Nature in its impact on the functioning of the Earth system.’³ This is the unchallengeable heart of the Anthropocene thesis. But it supports the idea of a totalization of the entirety of human actions into a single ‘human activity’ generating a single ‘human footprint’ on the Earth, an idea that deserves discussion. The key article on the Anthropocene and its history in *Philosophical Transactions* counts no less than ninety-nine occurrences of the adjective ‘human’ or the noun ‘humanity’.⁴ The anthropocenologists’ dominant narrative of the Anthropocene presents an abstract humanity uniformly involved – and, it implies, uniformly to blame.

But viewing an undifferentiated *anthropos* as the cause of the Earth’s new geological regime is scarcely sufficient. This explanation might be sufficient for polar bears or orangutans seeking to understand what species was disturbing their habitat.⁵ And again, this would be orangutans and polar bears without much competence in ‘humanology’, unable to discern the ‘dominant males’ and asymmetries of power in the complex causal chain connecting the retreat of their habitat to human action. The human species’ geological action is the product of cultural, social and historical processes.

The findings and approaches of decades of social sciences and humanities should not be overlooked in the name of ecological emergency and the interweaving of ‘socio-ecosystems’. From the Marxist concept of class to the anthropology of Claude Lévi-Strauss, feminist and post-colonial

studies, these works have attacked the old universalism of ‘Man’ and emphasized the equal dignity but also diversity of cultures, societies, social classes and sexual identities. And they have worked to make visible the mechanisms of domination by which certain of these collectives are destroyed, exploited or subjugated by others in asymmetrical social relations.

The advent of the Anthropocene concept turns the human and social sciences upside down, shaking their paradigms and categories.⁶ Now it is the sciences of the Earth system, and no longer historians, who name the epoch in which we are living. And, as dizzying as it may seem, scholars in the humanities need to rethink human action *also* on a geological scale of tens of thousands of years.

This dizziness has disarmed major thinkers in the human and social sciences, who, in their desire to contribute to the official narrative of the Anthropocene, have endorsed an all-inclusive view of humanity in which great socially indifferent causal factors such as demography, economic growth and the mobilization of fossil fuels are put forward as responsible for the unprecedented increase in the human footprint on the planet. In the end, however, these yield a rather poor explanatory grid. Thus, in an article of 2009 that drew great attention, Dipesh Chakrabarty, formerly a Marxist historian and a leading figure in subaltern studies, explained that the main critical categories he had previously applied to understand history had become obsolete in the time of the Anthropocene. He justified this great theoretical reversal as follows: ‘A critique of capital is not sufficient for addressing questions relating to human history once the crisis of climate change has been acknowledged and the Anthropocene has begun to loom on the horizon of our present.’⁷ In short, since capitalism has triggered a geological phenomenon far greater than itself, and one which will survive it, the critique of capitalism is no longer sufficient. Chakrabarty then gives the category of ‘species’ a major role in the historical narrative (fifty-one occurrences) and adopts the dominant phraseology of the anthropocenologists: ‘Humans – thanks to our numbers, the burning of fossil fuel, and other related activities – have become a geological agent on the planet.’⁸ This manner of envisaging causalities by placing humanity in the narrative as a universal agent, indifferently responsible, illustrates the abandoning of the grid of Marxist and postcolonial reading in favour of an undifferentiated humanity.

The dizziness of the human sciences in the face of the Anthropocene, the difficulty that they have in connecting socially differentiated historical phenomena with the evolution of the planet (with consequences for humans that are common yet differentiated), similarly emerges in the grandiose narratives of the environmental crisis. For major authors, either explicitly or implicitly, our ecological troubles are rooted in modernity itself. We find from their pens all the usual suspects in the great fresco of Western intellectual history: Greek science first of all, which conceived nature as an externality subject to laws independent of human intentions; then Christianity, which invented the

singularity of man within a creation that was his to dominate; and finally the scientific revolution, which substituted for an organicist view of nature that of an inert mechanics which could be rationally modified.⁹ The eschatological issue in the environmental crisis thus presses them to propose immense and majestic narratives, emphasizing a hypothetical ‘great divide’, a great separation between humans and other beings.

Caught in the storm of Gaia, major sociologists and philosophers have decided to jettison from ‘Spaceship Earth’ the whole analytic, explanatory and critical arsenal of the human and social sciences. In a very influential essay, for example, Michel Serres deploys the geological metaphor of ‘tectonic plates’ visible ‘from satellite’: ‘On Planet Earth, henceforth, action comes not so much ... from the groups analysed by the *old social sciences* ... no, the decisive actions are now, massively, those of enormous and dense tectonic plates of humanity’.¹⁰ Whole books can now be written on the ecological crisis, on the politics of nature, on the Anthropocene and the situation of Gaia without so much as mentioning capitalism, war or the United States, even the name of one big corporation (one figure here, however: ninety corporations are responsible for 63 per cent of the cumulative emissions of carbon dioxide and methane between 1850 and today).¹¹

A fruitful encounter between the Earth system sciences and the humanities would have to take into account social asymmetries and inequalities, exploring how these are mutually constructed – on different scales, including the global – with the distribution of flows of matter and energy through economic, political and technological mechanisms. This encounter has already taken place, for instance in dialogue between global history of the ‘world-system’ (in the wake of Immanuel Wallerstein’s work) and the associated global ecological changes,¹² or again in the research field of political ecology.¹³

As a concept arising from Earth system sciences, it is natural that the Anthropocene should direct historical questioning according to their particular interests. For our anthropocenologists, the role of history consists in measuring the effect of human activities on the Earth system with a view to including them in the modelling, and, in return, testing the models in relation to past events. That is the specific perspective of the IHOPE project: Integrated History and Future of People on Earth.¹⁴ The key terms here are biogeochemical cycles, integration (of data, systems, disciplines), complexity and non-linear systems. History might introduce a degree of unpredictability (how to model Hernán Cortés?), but in the end its results are fairly predictable: the Anthropocene is the product of a generalized increase in population, agriculture, industry, deforestation, mineral extraction and GDP.

Exaggerating a little, we could say that history for the anthropocenologists comes down in the end to a set of exponential graphs. The specificity of historical reasoning, the effort to construct an

explanatory account, is eclipsed in favour of a descriptive and quantitative view. But if the concordant upward curves are indeed chronological indexes, they are only explanatory at a secondary level. Environmental statistics simply measure the results of the historical phenomena that are the prime movers of the crisis. The less undifferentiated and more explanatory history of the Anthropocene that we propose in this book seeks to shift the focus of the study from the environments affected and the biogeochemical cycles disturbed onto the actors, institutions and decisions that have produced these effects.

The anthropocenologists' official narrative heralds the return of the human species into history. But what is this *anthropos*, the generic human being of the Anthropocene? Is it not eminently diverse, with extremely different responsibilities in the global ecological disturbance? An average American, for example, consumes thirty-two times more resources and energy than an average Kenyan. A new human being born on Earth will have a carbon footprint a thousand times greater if she is born into a rich family in a rich country, than into a poor family in a poor country.¹⁵ Should the Yanomami Indians, who hunt, fish and garden in the Amazonian forest, working three hours a day with no fossil fuel (and whose gardens have a yield in energy terms nine times higher than the French farmers of the highly fertile Beauce),¹⁶ feel responsible for the climate change of the Anthropocene? A recent report shows that the 1 per cent richest individuals on the planet monopolize 48 per cent of the world's wealth, while the poorer half of humanity have to make do with 1 per cent.¹⁷ The eighty richest individuals in the world have a combined income higher than that of the 416 million poorest – each one earning more than a million times that of their fellow humans!¹⁸ This widening of inequalities is a major source of global ecological disarray, since the richest individuals set a standard of consumption that those below them seek to equal, and so on, as Thorstein Veblen already showed in 1899.¹⁹ It follows from this, as has been recently demonstrated by economists, that policies of taxing the richest are beneficial to the environment.²⁰

It would be better, indeed, to use Erik Swyngedouw's term 'Oliganthropocene', a geological epoch caused by a small fraction of humanity, rather than Anthropocene. The choice of this latter term, and the grand narrative that comes with it, actually uses the abstract category of 'human species' to mask the great differentiation of responsibilities and incidences between the classes, sexes and peoples of Gaia. This choice has its effects on the type of 'solutions' that are proposed for ecological problems, whether they are legitimated or not in the narrative of the anthropocenologists. The keynote article in *Philosophical Transactions* attests to this obscuring of asymmetries, which are mentioned only in passing in a delicate newspeak: 'Equity issues are often magnified in the Anthropocene'.²¹

We should be suspicious, therefore, of a grand narrative of the Anthropocene that presents interactions between the human species and the Earth system. This leads to historical explanations that are impoverished or erroneous, comforting the interests of a minority of the planet's population. On the contrary, the challenges of the Anthropocene demand a differentiated view of humanity, not just for the sake of historical truth, or to assess the responsibilities of the past, but also to pursue future policies that are more effective and more just; to construct a common world in which ordinary people will not be blamed for everything while the ecological crimes of the big corporations are left unpunished; in which the inhabitants of islands threatened by climate change will see their right to live on their territories recognized, without their weak numbers condemning them to statistical and political non-existence; a world in which the 30,000 people who still live as hunter-gatherers and are threatened with extinction by the year 2030 will continue to exist. The wealth of humanity and its capacity for future adaptation come from the diversity of its cultures, which are so many experiments in ways of worthily inhabiting the Earth.

‘They knew not what they did’: an account of the awakening of environmental consciousness

‘Father, forgive them, for they know not what they do’ are the words of Jesus on the cross as reported in the gospel of St Luke. Humans allowed the execution of the Saviour, but humanity is not irredeemably condemned as it could be in the Old Testament, once expelled from the Garden of Eden. Salvation is possible by conversion and faith.

Two centuries ago already, Charles Fourier used the rhetoric of revelation and pardon to foretell the ‘material deterioration of the planet’:

This truth is more palpable for the moderns than for the ancients; the latter, still novices in the progress of society, may be pardoned for their illusions ... but after the pictures that history has provided us with over 3,000 years ... we have a superfluity of experience on the misdeeds of Civilization, and it is no longer permissible for upright men to deny that Civilization is the plague of humanity, that the present order of the globe is simply a material and social hell, and that reason should cease all other business to concern itself with seeking an escape from it.²²

Two centuries after Fourier, the Anthropocene narrative works in a similar way: if the ‘moderns’ were at fault in disturbing the planet, they must be excused as they did not know what they were doing. They had neither science nor awareness of the global and geological character of their actions.

The moderns only have to embrace the anthropocenic gospel to obtain remission of their sins and perhaps even salvation.

The grand narrative of the Anthropocene is thus the story of an awakening. There was a long moment of unawareness, from 1750 to the late twentieth century, followed by a sudden arousal. ‘We are the first generation with the knowledge of how our activities influence the Earth system, and thus the first generation with the power and the responsibility to change our relationship with the planet’,²³ the anthropocenologists maintain. ‘Environmental problems received little attention during much of the Great Acceleration [after 1945]’, and ‘the emerging global environmental problems were largely ignored’.²⁴ In the same vein, James Lovelock asserted that ‘by changing the environment we have *unknowingly* declared war on Gaia’.²⁵

The media echo this cliché of an inadvertent environmental destruction and a quite recent awakening, the better to heroize those scientists who opened humanity’s eyes. The newspaper *Libération* portrayed the glaciologist Claude Lorius in the following terms:

Now in the evening of his life, Claude Lorius knows that he was one of the scientists whose work enabled man to know what he is doing. And the question is not to pardon humanity for acting in the past without knowledge, but to act with this new knowledge that is inscribed in a new word ... Anthropocene.²⁶

The *Economist* likewise evokes the coining of the new term in the first decade of the new century as ‘one of those moments when a scientific discovery, as with Copernicus’s understanding that the Earth moved around the Sun, could radically change our vision of things’.²⁷

Major philosophers participate in this sublime concordance of contrition: in the past, we failed to recognize the global dimension of nature, we separated it from society, we reduced it to an external backdrop of human action. According to Michel Serres, it was only with the beginning of climate change in the late twentieth century that nature ‘burst in on our culture, which had never formed anything but a local, vague, and cosmetic idea of them ... What was once local – this river, that swamp – is now global: Planet Earth.’²⁸ In his commentary on an 1820 painting by Goya, with which Serres opens *The Natural Contract*, he maintains that at that time ‘the world wasn’t considered fragile’,²⁹ while for Bruno Latour it is ‘unwillingly’ that humans have become geological agents.³⁰

Whether scientists or philosophers, the anthropocenologists thus present subjects from the past who did not act deliberately, who were unaware – who once were blind but now can know. This accent on a radical break is a rhetorical feature of any prophetic discourse that seeks to win people to the idea of an advent. The narrative of the Anthropocene does not escape this.

But this binary narrative schema also derives from major social theories that oppose a non-reflexive moment of modernity (from the eighteenth to the twentieth century) to the emergence in the late twentieth century of a reflexivity on the side-effects of modernization such as health risks, major accidents and environmental crisis. This is the case with Anthony Giddens's thesis on 'reflexive modernity', Ulrich Beck's thesis on the 'risk society' heralding the end of a supposed innocence on the secondary effects of progress, or that of Michael Gibbons and his colleagues on a new 'mode 2' of production of knowledge, more open and reflexive.³¹ It is also the perspective of the ecological modernization theory.³²

We can include in this binary narrative the overly simple thesis according to which modernity has established a great separation between nature and society, a separation that allegedly prevented us from becoming aware of ecological issues, and that was only challenged quite recently. As if the thinkers of antiquity had not already established this division between nature and culture, whether to promote it or to question its value and limitations;³³ as if modernity, ever since the Renaissance, was not also constructed around knowledge that emphasized the belonging of human beings to the enveloping order of Nature.

Even from the subtle Bruno Latour, we find this 'great divide' narrative, only slightly modified. According to him, modernity lied to itself in believing it had cut itself off from nature, whereas in laboratories, the crucibles of this modernity, scientists enrolled non-human beings in combinations with humans, thus surreptitiously weaving new hybrid collectives despite claiming to separate nature and society, science and politics. Thus, for Latour, though 'we have never been modern' from the point of view of this break between nature and society, we can take account of this only now and thanks to his sociology of scientific practice, which makes it possible to solemnly close a falsely modern parenthesis of 300 years ... once again the alleged novelty of reflexivity!³⁴

The problem with all these grand narratives of awakening, revelation or arousal of consciousness is that they are historically wrong. The period between 1770 and 1830 was marked on the contrary by a very acute awareness of the interactions between nature and society ([Chapter 8](#)). Deforestation, for example, was conceived as the rupture of an organic link between woodland, human society and the global environment, and the use of coal was promoted as a way to restore forests. Neo-Hippocratic medicine explored interaction between the state of the organic body, that of the social body, and that of the environment. An organicist scientific thought conceived the Earth as a living being right to the mid nineteenth century. This attests to an intertwining of environments, bodies and societies. By

proposing in 1821 that ‘it is therefore the planet as a whole that is compromised [by deforestation and other environmental damages], and not just certain regions’, Charles Fourier simply drew on a large number of scientific writings and warnings of his time.³⁵

Yet it was in this very period that Western Europe plunged the world into the Anthropocene! Far from a narrative of blindness followed by awakening, we thus have a history of the marginalization of knowledge and alerts, a story of ‘modern disinhibition’³⁶ that should be heeded ([chapters 9](#) and [11](#)). Our planet’s entry into the Anthropocene did not follow a frenetic modernism ignorant of the environment but, on the contrary, decades of reflection and concern as to the human degradation of our Earth.

Likewise, the Great Acceleration of the Anthropocene after 1945 in no way went unperceived by the scientists or thinkers of the time ([chapters 8](#) and [11](#)). Well before the images of the Earth seen from the Moon, the atom bomb stood out as the event that unified the human condition and the Earth. The books *Road to Survival* by William Vogt and *Our Plundered Planet* by Henry Fairfield Osborn,³⁷ which together sold between 20 and 30 million copies, were organized respectively around the inclusive categories of ‘the planet’ and ‘the Earth’, and launched a warning about the future of the global environment and its profound human repercussions. These authors already saw humanity as ‘a geological force’.³⁸ Human action and natural cycles mutually determined one another in a ‘total environment’ of systemic character.³⁹ Following Svante Arrhenius, who explained the greenhouse effect in the late nineteenth century, the American scientists Roger Revelle and Hans Suess wrote in 1957:

Human beings are now carrying out a large-scale geophysical experiment ... Within a few centuries we are returning to the atmosphere and oceans the concentrated organic carbon stored in the sedimentary rocks over hundreds of millions of years. This experiment, if adequately documented, may yield a far-reaching insight into the processes determining weather and climate.⁴⁰

It is either historical error or culpable ignorance, therefore, to maintain that ‘we’ entered the Anthropocene in the early nineteenth century, or with the Great Acceleration of the mid twentieth century, without awareness or knowledge of global ecological disturbances.

Why should we criticize the anthropocenologists, whether scientists or philosophers, for a grand narrative of this kind? After all, is this not needed to dismantle the opposing grand modernist narrative of progress? ‘We have ... to counter a metaphysical machine with a bigger metaphysical machine!’⁴¹ Does not the end (making humanity aware of the scale of ecological disarray) justify the means? Not as we see it.

First of all, because this fable, claiming to break with the world-view of the moderns that it incriminates, in the end actually reproduces it. It proceeds from the same regime of historicity that dominated the nineteenth century and a part of the twentieth, in which the past is assessed only as a backdrop, for the lessons it yields for the future, and in a representation of time as a one-directional acceleration.⁴² It presents a ‘modernization front’,⁴³ leaving a blind past towards a future in which our knowledge will have become global and solid, eventually compelling us to take this into account in politics (but differently from before: with no ‘great division’, without an authoritarian Nature or blind certainties). The new teleology of ecological reflexivity and collective learning replaces the old teleology of progress. Such heralding of the end of modernization is in fact a new modernist fable.

Secondly, this narrative, ‘forgetting’ the environmental reflexivity of modern societies, tends to depoliticize the ecological issues of the past and thus obstructs understanding of present issues. Taken seriously, the Anthropocene and its continuing acceleration buries the dream of a society that has at last become reflexive. Who can still believe that if individuals, societies, states and corporations do not behave in an ecologically sustainable way, it is because the scientific knowledge to convince them is still too recent or not yet complete? Scholarly work in the human and social sciences shows how certain socio-economic and cultural processes are far more determining than the quantity of scientific information: such phenomena as lobbying, story-telling, rebound effect, technological coup, green-washing, recuperation of criticism, complexification, banalization or a simulated taking into account.⁴⁴ There is a whole arsenal that makes it possible to ignore warnings and protests; it is important to see this at work in the past and propose a dynamic reading of it, one politically less naive than the grand narrative of an awakening of awareness ([Chapter 11](#)).

Rather than suppressing the environmental reflexivity of the past, we must understand how we entered the Anthropocene *despite* very consistent warnings, knowledge and opposition, and forge a new and more credible narrative of what has happened to us.

A grand narrative with scientists as its heroes

The assimilation of the environmental preoccupations and knowledge of the past to timid and incomplete ‘precursors’ leads to an exaggerated glorification of today’s scientific knowledge. The grand narrative of the Anthropocene places *anthropos*, humanity, into two categories: on the one hand, the uninformed mass of the world population, who have become a geological agent without realizing it, and on the other, a small elite of scientists who reveal the dramatic and uncertain future of the planet. In the former, we have a non-reflexive group objectified by demography, biology and

economics; in the latter, an idealist history made up of intellectual filiations, precursors and stubborn resistances:

In the sixteenth century America was discovered. In the twenty-first century, it is not in the sense of an extension of space that other lands that are discovered, but rather in the sense of an intensification of our relationship to this Earth ... The Anthropocene and Gaia are two concepts developed by researchers in the exact sciences; extraordinarily more advanced for their time than the whole mass of intellectuals, politicians and artists interested only in the history of human beings.⁴⁵

In this type of prophecy, the modernist fable that places specialists in the Earth system in the glorious filiation of the explorers of the sixteenth century (as if America had not been ‘discovered’ by the humans who crossed the Bering Strait more than 25,000 years ago, by the Polynesians who brought back the sweet potato a thousand years before Christopher Columbus, and then by the Vikings around 1000 AD), scientists are represented as the ecological vanguard of the world. Not only do they appear as spokespeople for the Earth, but also as shepherds of a public opinion that is ignorant and helpless. In this dominant grand narrative of the Anthropocene, humans have been ‘wandering in the desert’, but can finally ‘reach not the Promised Land but Earth itself, quite simply ... the aptly named Gaia’,⁴⁶ or again experience a new Renaissance by ‘reconnecting with the biosphere’.⁴⁷

This then is a prophetic narrative that places the scientists of the Earth system, with their new supporters in the human sciences, at the command post of a dishevelled planet and its errant humanity. A geo-government of scientists! By throwing overboard the categories of the ‘old social sciences’, bearing on asymmetries between human groups, do democratic political ideals also have to be cast adrift? What is left for a politics on the geological scale to which the Anthropocene summons us? What can we still do on the individual and collective scale given the massive scale of the Anthropocene? The risk is that the Anthropocene and its grandiose time frame anaesthetizes politics. Scientists would then hold a monopoly position both in defining what is happening to us and in prescribing what needs to be done.

This is how experts in global environment, in keynote articles that introduced the concept of Anthropocene in 2000 and 2002, imagine the rescue of humanity by science and engineering:

Mankind will remain a major geological force for many millennia, maybe millions of years, to come. To develop a world-wide accepted strategy leading to sustainability of ecosystems against human induced stresses will be one of the great future tasks of mankind, requiring intensive research efforts and wise

application of the knowledge thus acquired ... An exciting, but also difficult and daunting task lies ahead of the global research and engineering community to guide mankind towards global, sustainable, environmental management.⁴⁸

A daunting task lies ahead for scientists and engineers to guide society towards environmentally sustainable management during the era of the Anthropocene. This will require appropriate human behaviour at all scales, and may well involve internationally accepted large-scale geo-engineering projects, for instance to 'optimize' climate.⁴⁹

We see here how at the same time as the Anthropocene is announced, geoengineering (the set of technologies for manipulating climate on a global scale, by the emission of sulphurous aerosols into the atmosphere, iron into the oceans, reflective satellites around the Earth, etc.) is promoted, despite its uncertainties and dangers (hundreds of thousands of premature deaths to be imagined in the case of the 'solution' of sulphurous aerosols),⁵⁰ and despite the existence of a UN moratorium on such interventions. In the journal of the British Royal Society, four anthropocenologists precisely list the 'innovative approaches' that scientific technology can contribute as responses to ecological disarray. Not only do these include large-scale technological systems to pursue the observation of the planet and set scientifically the limits that humanity must not exceed, but also synthetic biology to create new artificial forms of biodiversity, adaptive management applying the rules of ecology to public action, and geoengineering to remake the climate.⁵¹

Does the irruption of nature into politics imply entrusting ourselves completely to scientists, or on the contrary a critique of technoscience and the abandonment of a posture of mastery of the Earth? The first option seems the only one possible in the Anthropocene's dominant grand narrative. If past innovations upset the planet, let's have the innovating approaches that contemporary technology presents. In the major scientific periodicals dealing with the Anthropocene, everything is presented as if the environmental knowledge and initiatives of civil society did not exist. Indigenous peoples struggling against the devastation of mining or oil exploitation on their lands, activists who build tree cabins in the path of bulldozers constructing pipelines and airports, antinuclear or neo-Luddite, anti-high-tech movements, collectives that experiment with less materialistic and 'simpler' ways of living, 'degrowth' practitioners or the 'transition towns' movement, all of these are absolutely invisible in the grand narrative. If we believe the anthropocenologist experts, serious solutions can only emerge from further technological innovation in the laboratory, rather than from alternative political experiment 'from below' in society as a whole! This is how Bruno Latour asks the sorcerer's apprentices to return to their laboratories to save humanity:

We remember perhaps how, in the novel by Mary Shelley, Dr Victor Frankenstein accused himself of one sin – that of having been a sorcerer’s apprentice – only to disguise another infinitely more serious, that of having been horrified by the sight of his creature, who had only become a monster because its author had abandoned it. Instead of crying: ‘Victor, stop innovating, believing, growing and creating’, it would seem more fruitful for him to have said, in the end: ‘Dr Frankenstein, return to your laboratory and finally give a face to your unsuccessful attempt.’ But how will we be able to return to our laboratories and revise every detail of our material existence?⁵²

While criticizing the modernization project and viewing the Anthropocene as a refutation of modernity, Bruno Latour, together with the Breakthrough Institute’s ‘ecomodernists’, urges us to ‘love our monsters’. He reads Mary Shelley’s *Frankenstein* not as a cautionary tale against technological hubris, but rather against irrational fears in the face of technology’s side-effects. Dr Frankenstein failed not because he created a monster but because he fled in horror instead of repairing and improving him. ‘The sin is not to wish to have dominion over nature’, goes the story, ‘but to believe that this dominion means emancipation and not attachment.’⁵³

‘They still don’t know what to do’: the ‘public’ seen by the Anthropocene experts

If humanity needs scientific shepherds and eco-Frankensteins, this is, according to the anthropocenologists, because traditional politicians have failed, while the public is insufficiently aware or trapped in a ‘cognitive dissonance’. The whole world needs to be educated, enlightened by the luminaries of science:

Up to now the concept of Anthropocene has been confined almost entirely to the research community. How will it be perceived by the public at large and by political or private sector leaders? ... The notion, subsequently strengthened by further scientific research, that we are ‘just’ another ape and not a special creation ‘above’ the rest of nature shook the society of Darwin’s time, and still causes tension and conflict in some parts of the world ... The concept of Anthropocene, as it becomes more well known in the general public, could well drive a similar reaction to that which Darwin elicited ... [T]he Anthropocene will be a very difficult concept for many people to accept.⁵⁴

While the Earth system scientists compare themselves to Darwin, Latour compares Lovelock to Galileo and Pasteur.⁵⁵ Praise of this kind paints the picture of a science well above society, bringing revolutionary findings that shatter accepted beliefs. The anthropocenologists then turn to psychosociology to understand why the public resist the evidence of facts that show the gravity of global ecological unbalances. Diagnosis: the public suffer from cognitive dissonance, described half a

century ago by psychology as a phenomenon of distancing between what one learns (in this case, for example, climate disturbance) and what one clings to (here, the continuance of a certain way of life): ‘When facts that challenge a deeply held belief are presented, the believer clings even more strongly to his or her beliefs and may begin to proselytize fervently to others despite the mounting evidence that contradicts the belief.’⁵⁶

After Galileo and Darwin, therefore, we are said to be in a new stage of history in which ‘science’ must turn upside down a ‘system of belief’ of society. Like the dogma of the virgin birth of Jesus, in which God saves the world without compromising himself with humans, it is from a distance, way above society, without a dialogue with socioecological movements or accepting its part and responsibility for the first two centuries of the Anthropocene, that science is presented as our saviour. In this logic, the right policy will be that which involves the ‘advised application’ of the neutral findings of science. Humanity will become ecologically sustainable when the scientific message has properly penetrated it and humanity has adopted its solutions.

Age of man, death of nature?

Announcing the advent of the Anthropocene makes it possible for certain anthropocenologists to proclaim the death of Nature with a capital ‘N’, nature seen as external to humans. We are said to be entering an anthropo-nature, a techno-nature, a post-nature (Latour) that is hybrid and dynamic, in which humans will at last recognize themselves as taking part: ‘There is no ecosystem without humans and no humans who do not depend on the functioning of ecosystems.’⁵⁷

The old nature no longer exists. The myth of the *wilderness*, external and virgin, is shattered. Natural parks and reserves are criticized on all sides for having excluded local populations: from now on nature has to be participative: ‘No need to be a postmodernist in order to understand that the concept of Nature ... has always been a human construction, forged for human purposes.’⁵⁸

In fact, cybernetics and the cyborg science of the post-war era did not wait for Latour, Donna Haraway or Philippe Descola to celebrate the dissolution of the nature/culture boundary, since they precisely sought to optimize systems that connected humans and non-humans. Thus, as Catherine and Raphaël Larrère have shown, ‘the thesis of the end of nature is that of its complete intelligibility ... and of its complete mastery’.⁵⁹ In the sciences of conservation, the notion of the Anthropocene is accompanied by the diffusion of a doctrine accepting the inevitable character of certain modes of

artificialization of nature, proclaiming that what matters is to preserve biodiversity as a function of the services it provides for humans rather than as a value in itself, or again presenting urban nature as having as much value as so-called ‘wild’ nature.

The dominant narrative of the anthropocenologists magnifies the irruption of human action as a telluric force. We have become ‘equipotent to the Earth’.⁶⁰ The figure that is put forward is that of ‘Man, gardener of the planet’. This new model of the biosphere moves us away from an outdated view of the world as ‘natural ecosystems with humans disturbing them’ and towards a vision of ‘human systems with natural ecosystems embedded within them’.⁶¹

Thus, the sublime of catastrophe is succeeded by the giddiness of omnipotence. For Mark Lynas, ‘Nature no longer runs the Earth. We do. It is our choice what happens here.’⁶² After having briefly raised fear by imagining a planet out of control, a number of scientists and journalists have adopted the almost glorious story of the advent of humanity as pilot and engineer of the planet.⁶³

What does it mean for us humans to have the future of the planet in our hands? A feeling of terror, very soon combined with a sense of power? After centuries of doing geo-bioengineering without knowing it, are we now in a position to make all our interactions with Gaia conscious, voluntary and scientifically calculated, to convert ourselves to a generalized ecological engineering? Whereas it should mean a call to humility, the Anthropocene is summoned in support of a planetary hubris. ‘We’ve engineered every other environment we lived in, why not the planet?’ asks Lowell Wood, an astrophysicist and champion of geoengineering.⁶⁴ We will be ‘proud of the planet that we create’, adds the geographer Erle Ellis, one of the first anthropocenologists and a member of the Breakthrough Institute, an eco-modernist think-tank that celebrates the death of nature and preaches a ‘good anthropocene’, one in which advanced technology will save the planet.⁶⁵

To position humanity in this way as pilot means seeing the Earth as simply a cybernetic machine, rather than a dynamic becoming and a history. It also means, with the functional discourse of an anthropo-nature, denying nature and Gaia any alterity: even if we are part of it, and if nature must be brought within our collective politics, it is important to recognize this alterity, through a listening that is not instrumental and a respect for certain limits to human action. Fusion and omnipotence, these sentiments characteristic of early infancy, lie at the basis of such ‘post-nature’ discourse, participating in the dream of a total absorption of nature into the commercial technosphere of contemporary capitalism (Chapter 9).⁶⁶

The discourse of a new geopower

The representation of the Earth and its contemporary disarray proposed by the anthropocenologists must be taken seriously, in two ways. On the one hand, it brings knowledge and warnings that are absolutely essential and indispensable, while on the other, it is a product of Western naturalism and the scientific culture of the Cold War. It cannot be the unique point of view, the unique imaginary of the Earth, or the unique way of inhabiting it collectively and in peace. There are multiple narratives about the change of existential regime under way on our Earth. In Western culture alone it is possible to distinguish at least five: the (naturalist) official narrative that prevails today in the scientific and international arenas (discussed in [chapters 3 and 4](#)), the post-nature and ‘eco-modernist’ narrative of a high-tech ‘good Anthropocene’ (as mentioned above), an eco-catastrophist narrative that envisions a collapse of industrial civilization and seeks local resilience, an eco-Marxist narrative in which the Anthropocene is better described as a ‘Capitalocene’ (see [Chapter 10](#)) and an eco-feminist one that relates male domination to the degrading of the Earth.⁶⁷ But many more narratives, imaginaries, cosmologies and types of knowledge have an essential role to play in order to inhabit the Earth in a proper fashion. We need a variety of civic initiatives and popular alternatives, of transition and abstemiousness, which explore the outlines of ‘living better with less’, rather than relying upon ‘solutions’ offered by a circle of planetary eco-technocrats. It is also essential to note in the dominant narratives of the Anthropocene (the first two of the five mentioned narratives) the elements that could form part of a new *geopower*.

What do we mean by *geopower*? As historians have shown (Michel Foucault above all), the biological knowledge of the nineteenth and twentieth centuries made possible the constitution of new scientific objects: ‘population’, ‘life’ and ‘race’. Biological advances heralded a new form of power, biopower, with the particular property of taking biological life as an object and political project. This biopower, characteristic of the industrial age and the construction of the nation-state, aimed to optimize the number, quality (health, physical, intellectual, genetic, etc.), military ‘strength’ (war becoming total) and productivity of populations.⁶⁸

The new knowledge and imaginaries of the global environment that have asserted themselves since the Cold War, and the dominant narratives of the Anthropocene, can be read as elements of a new knowledge-power that bears not only on the ‘bio’ but also on the ‘geo’. After life, it is the Earth as a whole (from the lithosphere to the stratosphere) that simultaneously becomes the object of knowledge (‘geo-knowledge’) and government (‘geopower’). The advent of new subjectivities of ‘citizens of the planet’, the geological turn of our – previously ecological – understanding of the ‘global environmental crisis’, its increased timescale that seems to make the ordinary time of

collective and political action inoperative (if the problem is geological, what can the mere citizen do except trust experts?), the hyper-interdisciplinarity of global expertise of Earth socioecological systems as envisaged by the IPCC (or ‘Future Earth’, the recent global research platform launched by the UN), and finally the monitoring systems of the planet by satellite,⁶⁹ are so many indexes of the emergence of a new geopower that establishes the Earth as a ‘system’ to know and govern as a totality, in all its components and all its functions.

It is true that an ‘imperial ecology’⁷⁰ developed in the nineteenth century, but it was only well after the Second World War, with atomic weapons, new international institutions and, above all, a Cold War that conceived the whole globe as the theatre of an imminent conflict, that a new knowledge-power of the entire globe was born, from the submarine depths to the Moon.⁷¹ At the same time, ecology became systemic and global. The biosphere, a concept initially proposed by Vladimir Vernadsky in the 1920s, was thus redefined by UNESCO in 1968 as ‘an ancient, extremely complex, multiple, all-planetary, thermodynamically open, self-controlling system of living matter and dead substance which accumulates and redistributes immense resources of energy and determines the composition and dynamics of the Earth’s crust, atmosphere and hydrosphere’.⁷² Armed with this cybernetic conception of nature, the champions of systems ecology claimed the role of global experts in the governing of the planet’s ‘biological productivity’ – a term frequently encountered in articles of the time, with a view to reconciling short-term economic profitability with the long-term maintenance of the ecosystems that supplied resources.⁷³

This understanding of the environment as a global system to control and optimize formed part of a *Weltanschauung* of the ‘closed world’ forged in each bloc by the culture of the Cold War ([Chapter 3](#)). The United States, in particular, saw itself as the guardian of the progress of the whole world and worked for the establishment of a global market. There then emerged a new planetary subjectivity, a new deterritorialized and uniform way of inhabiting the Earth. Whatever the place you found yourself, you were subject to the universal struggle of ‘freedom versus slavery’,⁷⁴ prey to new fears and scenarios of planetary catastrophe,⁷⁵ and the subject of a ‘state of exception’ (Giorgio Agamben) justified by the threat of death from attack by the opposing bloc (today by climate disruption or a global collapse). Caring for nature thus became ‘managing planet Earth’,⁷⁶ whether to extract a maximum and sustainable yield, or to limit (and adapt to) its tempestuous disruptions. This is how the Brundtland Report depicted the human condition in the age of this new geopower:

In the middle of the twentieth century, we saw our planet from space for the first time. Historians may eventually find that this vision had a greater impact on thought than did the Copernican revolution of the sixteenth century ... This new reality, from which there is no escape, must be recognized – and managed.

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Geopower is based on a common matrix and mechanisms in which knowledge, power and subjects of a new type emerge together. This geopower exhorts its subject, the *anthropos*, to ‘reconnect with the biosphere’ and tends to establish an ever-greater number of human problems as soluble only at a global level and only by way of technological solutions.⁷⁸ The nascent geopower is a ‘space of calculation’ (Foucault) at the level of the Earth system: accounting of flows of matter and energy and of ‘natural capital’, markets in ‘ecosystemic services’, control and management of the components and processes of the Earth system, instruments of anticipation, prediction and global simulation, and making places commensurable in an isonomic space.

This geopower, faced with the upheavals of the Earth system under way, aspires to regulate the globe’s thermostat and, in order to do so, to control the Earth by a new engineering of humanity’s envelopes.⁷⁹ The project of geoengineering is a concrete embodiment of the nascent geopower. Its aim is nothing less than ‘improvement of the environmental characteristics of the atmosphere’,⁸⁰ or even the entire functioning of the planet, biosphere included. Still more here than with nuclear tests or the imaginary of ‘Spaceship Earth’, the entire Earth is now explicitly reified as object of experimentation and control.

The project of climate engineering goes back to the Cold War. For example, the technology of ‘global management of solar radiation’ by dispersal of aerosols in the upper atmosphere finds its origin in a proposal by the Soviet scientist Mikhail Budyko at a conference held in Leningrad in 1961 on ‘problems of climate control’, warning that human activities could in due course shift the Earth’s radiative balance. His colleague M. Ye Shvets then proposed injecting 36 million tonnes of aerosols into the stratosphere in order to reduce solar radiation by 10 per cent.⁸¹ An analogous project can be found in the writings of James Lovelock, who, after working for NASA on a programme for the colonization of Mars, published in 1984 a fiction that imagined the use of intercontinental missiles spreading hundreds of tonnes of chloro-fluorocarbons around the red planet in order to create a greenhouse effect that would make it habitable.⁸² Born in the post-war United States, then appearing in the Soviet Union and China, multiple projects of cloud seeding with the aid of balloons, planes or projectiles of all kinds attest to a ‘real war waged on the atmosphere’, in a culture of manipulation of the Earth system favoured by the context of the Cold War.⁸³

After the fall of the Soviet bloc, the project of geoengineering was recycled in 1992 as a means of combating climate change, in a report of the US Academy of Sciences.⁸⁴ Similarly, if in the first decade of the new century Paul Crutzen finally rallied to geoengineering, this was also because of his background in this culture of the Cold War that made the entire Earth (and even Mars!) a theatre of large-scale intervention: he had worked in the 1980s on the first scenario of ‘nuclear winter’ resulting from a nuclear war.⁸⁵

In February 2014, John Kerry presented climate change, along with other threats such as epidemics and terrorism, as ‘perhaps the world’s most fearsome weapon of mass destruction’.⁸⁶ In the age of ‘global environmental governance’, the logic of warfare, of total control of the planet in the name of a state of exception, seems indeed to have made its return in the face of the possibly violent consequences of global ecological disturbance, fuelling new geopolitical cleavages. Though seemingly very different, projects such as geoengineering, UN-REDD (the official acronym for the programme of Reducing Emissions from Deforestation and Forest Degradation) mechanisms that insert forests into a global carbon market, dreams of terraforming, etc., proceed from the same logic of emergency (‘climate emergency’), if not that of a ‘state of exception’:⁸⁷ they manufacture a global nature-system that is no longer a commons regulated by collective debate, practices and rights, but one ‘whose exclusive access is strictly regulated as a function of the rights, subject to emergency circumstances, to alter, pilot and optimize the whole of the planet and its atmosphere’.⁸⁸

It is difficult to predict the future of geopower. Will it be multilateral and UN-based? Regional or even private? (There have already been certain corporate experiments with the seeding of oceans.) Combined with logics of sovereignty and a national security imperative, this could very well be exercised unilaterally; combined with contemporary neoliberal doctrine and the extension of the domain of private property, it conceives the market as the best calculator to save the planet by giving a price to ‘natural capital’ and ‘ecosystemic services’, and would make financial flows the controllers of biogeochemical ones (at the risk of a crash of the Earth system?).⁸⁹

The dominant narrative of the anthropocenologists already involves an embryonic redefinition of what it is to be human on the Earth. The subject of the Anthropocene and of geopower is caught in a ‘geodestiny’, of ‘humanity as geological force’ that is both heroic and unsustainable, arousing both admiration and terror while reinforcing a certain number of socio-environmental injustices under the consensual banner of the species. The subject of the Anthropocene, moreover, appears as an eco-citizen optimizing her carbon credits, managing her individual footprint (and governed by way of her

environmental reflexivity). This is a being plugged into the flows of ‘ecosystemic services’ that the different compartments of the Earth system supply her with.⁹⁰ And finally, the subject of the Anthropocene is constructed as a passive public that leaves solutions to geocratic experts.

Right from the 1970s, political ecologists signalled the dangers of such a geopower. André Gorz called it ‘eco-fascism’, while Ivan Illich, in his book *Tools for Conviviality*, saw ‘a well-organized elite, vocally promulgating an antigrowth orthodoxy’ as ‘highly undesirable. By pushing people to accept limits to industrial output without questioning the basic industrial structure of modern society, it would inevitably provide more power to the growth-optimizing bureaucrats and become their pawn.’

⁹¹ As for Félix Guattari, he spoke of the knowledge and powers of ‘scientific’ management of the environment as a ‘mechanical ecology’, insufficient or even dangerous if it was not complemented and controlled by a ‘social ecology’ as well as by a ‘mental ecology’ or ‘ecosophy’.⁹²

And what if ‘Earth seen from nowhere’ and the narrative of ‘interactions between human species and Earth system’ were not the most interesting perspectives for relating what has happened to us in the last two and a half centuries, not to mention predicting the future? Perhaps we should accept the Anthropocene concept without succumbing to its dominant narrative. Without handing full powers to the experts and losing the specific resources that every community has, which in their diversity and local attachments are essential motors for a just ecological transition. In 1949, the poet René Char posed a similar problem in his poem ‘Les Inventeurs’:⁹³

They have come, the foresters from the other side, unknown to us and rebels to our customs.

They have come in large numbers.

Their troop appeared on the dividing line of the cedars ...

We have come, they said, to warn you that the hurricane will soon arrive,
your implacable enemy.

What is this ‘hurricane’? Char wrote his poem at a time rich in scientific warnings about the state of the planet: the erosion linked to the retreat of forest cover in the mountains of his native Provence, the threat of a nuclear winter, the scarcity of resources discussed at a Food and Agriculture Organization conference in 1949, the destruction of nature denounced by the naturalists who founded the International Union for the Conservation of Nature at Fontainebleau in 1948. But these whistle-blowers, who in Char’s poem are represented by the ‘foresters’ (a leading profession in the conservationist movement of that time), are ‘inventors’, a term Char had used pejoratively in previous poems, seeing them as mechanical demiurges harmful to social and inner life. The poem continues:

We thanked them and bade them farewell ...

Men of trees and axes, able to withstand any terror
 but unsuited to conduct water, to align houses and daub them in pleasant colours,
 they knew nothing of winter gardening and the economy of joy ...
 Yes, the hurricane soon will come;
 But was it worth speaking of it and disturbing the future?
 Here where we are, there is no urgent fear.

Let us pursue the parallel. The ‘inventors’ of the Anthropocene, the scientists of the Earth system who warn of planetary unbalances, are very useful in coming to alert us of danger. But, says the poet, they are ‘from the other side’, unsuited for a warm presence in the world, for the ‘economy of joy’ and ‘pleasant colours’. If the danger is indeed real (‘yes, the hurricane soon will come’), Char proclaims the resistance of a society that refuses to abdicate its autonomy and its culture to bow to the heteronomy of an eco-technocratic government. Are the scientists of the Earth system (whose champions propose a general engineering of ecosystems and climate) not the equivalent of Char’s inventors? Are they not bearers of a relationship to the world that has precisely produced the danger that they warn us of and offer to save us from? As opposed to the satellites that orbit the Earth and the experts who travel at great speed from conference to conference, another poet, Henri Michaux, proposes that we should slow down:

By slowing down, you feel the pulse of things; you snore, you have all the time in the world; calmly, all of life ... We have all the time. We savour ... We no longer believe that we know. We have no more need to count ... We feel the curve of the Earth ... We no longer betray the soil, no longer betray the minnow, we are sisters by water and leaf.⁹⁴

1 Will Steffen et al., ‘The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?’, *Ambio*, 36:8, 2007: 614–21, 614.

2 Carl Folke and Lance Gunderson, ‘Reconnecting to the Biosphere: A Social-Ecological Renaissance’, *Ecology and Society*, 17:4, 2012: 55.

3 Will Steffen et al., ‘The Anthropocene: Conceptual and Historical Perspectives’, *Philosophical Transactions of the Royal Society A*, 369:1938, 2011: 842–67, 843.

4 Ibid.

5 We have taken this joke from Andreas Malm and Alf Hornborg, ‘The Geology of Mankind? A Critique of the Anthropocene Narrative’, *Anthropocene Review*, published online 7 January 2014, anr.sagepub.com.

6 This is the contention of Dipesh Chakrabarty, ‘Postcolonial Studies and the Challenge of Climate Change’, *New Literary History*, 43:1, 2012: 1–18.

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