Introduction: The Growing Anthropocene Consensus

Julia Adeney Thomas

This book aims to get the Anthropocene right in three senses. First, it conveys the scientific evidence of our altered Earth, showcasing how the concept of the Anthropocene captures the magnitude and complexity of the planet's dangerous transformation. Second, we try to get the Anthropocene right in human terms, exploring the kaleidoscope of experiences, contingencies, and decisions that led to the Anthropocene, from the deep history of our relationship with infectious diseases to recent nuclear disasters. These histories are echoed and expanded through fiction with two short stories bringing the vast scales of geology and Earth System science "to earth" in emotional and ethical terms, especially around the issues of colonialism and inequality. Finally, we talk about what hope might look like in this pretty hopeless situation, proposing mutualistic cities, greater equity, and new political forms. "Right" in this book means being as *accurate* as possible in describing the physical phenomenon of the Anthropocene; as *balanced* as possible in weighing the complex human developments, some willed and some unintended, that led to this predicament; and as *just* as possible in envisioning potential futures.

In other words, this book brings together many stories about our singular situation. Deep-time narratives plunge us back to Earth's origins and trace our species' long struggle with dangerous microbes. Narratives on shorter timescales unfold the way Earth System scientists have come to see our planet; the way the indigenous people see the winds sweeping over a Mexican isthmus; and how different modern political systems shape the natural world. The nuclear disaster at Chernobyl and tiny Crawford Lake in Canada make star appearances. Imaginative tales of a

fleeing spaceship, a living mountain, and flourishing futuristic cities also figure here. We even get a hands-on account of reorienting a cultural institution to absorb the startling truth that global cultures and planetary change have converged. What holds all these tales together? In a nutshell, the *reality* of the Anthropocene. Recent discoveries show that in the mid-twentieth century, Earth entered a different – and, for human beings, difficult – new stage due to things people have done and in all too many cases are still doing. To try to make sense of this human-altered Earth, the contributors here – scientists, humanists, social scientists, writers, and institution builders – have joined together to tell stories of our transformed world. We represent a democracy of voices, all responding to a single, shared, complex danger.

But what is the "Anthropocene"? In some ways it is an accidental concept, a high-profile improvisation made in 2000 by the Nobel Laureate and atmospheric chemist Paul Crutzen (though the term and concept had been used independently, in a more low-key manner, by biologist Eugene Stoermer). Accidental or not, this concept crystallized the growing perception of global change, set in train by human activities. So great is this change that Crutzen suggested a new geological epoch. Just two decades on, overwhelming evidence has been assembled to show that around 1950 our planet entered another distinct chapter in its approximately 4.54-billion-year history. The complex, integrated Earth System has moved away from the relative stability of the Holocene epoch to a less stable, less benign, and still evolving phase with, in many ways, no precedent in Earth's long history.[1]

Humans will not find it easy to live in the Anthropocene. It now seems clear that life as we have experienced it for the last ~12 millennia (known

[1] Earth System science approaches Earth as a single, integrated system in which the atmosphere, hydrosphere, cryosphere, lithosphere, pedosphere, and biosphere – and now the human sphere – mutually impact one another in complex ways. See Will Steffen, Katherine Richardson, Johan Rockström, et al., "The emergence and evolution of Earth System science," *Nature Reviews Earth & Environment* 2020; 1, 54–63. https://doi.org/10.1038/s43017-019-0005-6. In this book, we follow the convention of capitalizing both "Earth" and "System" to make it a proper noun, as explained by Will Steffen in "The evolution of Earth System science," blog post, *Future Earth* (December 14, 2015): https://futureearth.org/2015/12/14/the-evolution-of-earth-system-science/

as the Holocene) is going to be changing very rapidly, and largely for the worse. The air carries a third more carbon dioxide and so the climate will, almost certainly, soon be hotter than it has ever been in the history of *Homo sapiens*. The seas are rising. Global biodiversity is shrinking rapidly, thinning our life support system. People weren't around 65 million years ago when the last great extinction event occurred, but now our numbers and needs leave little habitat for other species. Fresh water is becoming scarce. Topsoil is being lost at the rate of at least 36 billion tons every year, endangering food supplies.[2] The pressure on the systems that nurture, shelter, and fuel us will become ever more intense in the years to come as human populations and demands rise. These intensifying pressures will impact our societies unevenly and unfairly, but no part of the globe will be unchanged.

The Anthropocene, with these novel ingredients, is a very new part of Earth's history, but to make sense of it, we need to look at more than the last few decades. We need to place it in the context of our planet's past, beginning roughly 4.54 billion years ago. We also need to place it in relation to the deep past of human history, in which *Homo sapiens* evolved some 300,000 years ago, to emerge slowly as a dominant force and then to explode into a planet-changing species in the mid-twentieth century. The extraordinary transformations of the Earth System that we are seeing today have taken place, effectively, within a single human lifetime. In terms of speed of change, the nearest comparison in the last half-billion years of Earth history is the meteorite impact that brought the Mesozoic Era to an abrupt close. Suddenly the age of dinosaurs was at an end. Now *we* are the meteorite, and it seems just as difficult to alter our trajectory as it would be to alter the course of a ten-kilometer-wide rock hurtling through space.

Understanding this very recent, massive human impact means explaining how the long course of human history formed a platform for the recent rise of the powerful anthropogenic forces that accelerated Earth's transformation in the twentieth century. As we examine the

[2] Pasquale Borrelli, David A. Robinson, Larissa R. Fleischer, et al., "An assessment of the global impact of 21st century land use change on soil erosion," *Nature Communications* 2017; 8 (1) DOI: 10.1038/s41467-017-02142-7

narrative leading from the earliest patterns of humankind to the vertiginous growth of economies, inequality, and human populations, we also seek stories that resist this destructive trajectory. Not all individual actions nor all social systems pushed the Earth System beyond Holocene norms. Some were mutualistic with their environment. These counterpoints to the dominant trajectory are also Anthropocene stories. They suggest that our arrival at this new epoch was not foreordained. Further, they provide political and cultural resources for imagining how we might, with a bit of luck and much determination, reshape our societies to mitigate the Anthropocene's harshest effects. If human activities are the equivalent of that ten-kilometer-wide rock hurtling through space, renarrating our human stories to account for pathways not taken is one means of cushioning the impact. To have any hope of understanding this new reality and transforming our societies, we need to span the enormity of geological time and deep human history, while also delving into the intimate and immediate exchanges between organic and inorganic systems and human behavior, values, ideas, and institutions. In the collective experiment in these pages, we wobble a course toward the kind of multidisciplinary understanding that is needed to grasp – and perhaps to cope with – our collective predicament.[3]

In short, the aim of this book is to give readers a handle on the Anthropocene both as a scientific concept and as a human dilemma. We assume no specialist knowledge. Instead these essays are gestures of inclusion from an array of people who care, as almost everyone does, about a habitable Earth. We aim to be generous. Our goal is not to impress readers with erudition or righteousness, but to open vistas on our common planetary dilemma. The very term "Anthropocene" implies that Earth's story and human stories can no longer be told without reference to one another. Earth's story and ours have converged in an

[3] For expanded discussions of this approach, see Julia Adeney Thomas, Mark Williams, and Jan Zalasiewicz, *The Anthropocene: A Multidisciplinary Approach*, (Cambridge: Polity Press, 2020) and Jan Zalasiewicz, Colin N. Waters, Erle C. Ellis, et al., "The Anthropocene: comparing its meaning in geology (chronostratigraphy) with conceptual approaches arising in other disciplines," *Earth's Future* March 2021; 9(3) https://doi.org/10.1029/2020EF001896

unprecedented way as human activities relentlessly alter biogeochemical systems and etch themselves into Earth's surface.

But stitching Earth's story and human stories together is no easy task. We speak and write from different perspectives and in different ways. Not even our citation styles are the same, something that this book doesn't try to mask. Each chapter uses the conventions most familiar to that particular author or set of authors. This is a deliberate choice. We want to make evident the scratchy textured way in which this new knowledge is being cobbled together. We also want to be as clear as we can, explaining terms, using metaphors, examples, and anecdotes to make larger points. These pieces are meant to intrigue, even as they show the bleak enormity of our collective destructiveness.

Facing this new world is tough. It doesn't require a history degree to know that in bad situations, the hydra-headed monster of fear, distrust, and contentiousness often rears its head, sowing dissent in a seemingly zero-sum game. Shouting past one another (or worse) is a common human reaction. But many studies have shown that trust brings better results.[4] That is what we've attempted here, recognizing that trust needs a shared foundation. As the contributors to this book try to explain to one another – and to our friends, students, and colleagues – what the Anthropocene looks like from where each of us stands, we all reference a common denominator. That common denominator is a shared respect for the scientific evidence – emerging from geology, Earth System science, and allied fields – that supports the Anthropocene concept. This reality is the foundation of our work. I think each of us has wished, privately and sadly, that the evidence was less compelling and that the science deniers were right. It would be a wonderful thing if Earth's resources were infinite and the stability of the Earth System assured. It would be glorious if our numbers and desires could grow forever, if all people on Earth now and in the future could live lives of increasing, heedless bounty, equitably shared. Many modern histories and theories

[4] Elinor Ostrom, the first woman economist to win a Nobel Prize, is one of among the many possible citations here. See, for instance, Elinor Ostrom, Joanna Burger, Christopher B. Field, Richard B. Norgaard and David Policansky, "Revisiting the commons: local lessons, global challenges," *Science* Apr. 9, 1999; 284(5412), 278–282.

of human society promised as much, but the discovery of the Anthropocene has ruptured that hopeful human trajectory.[5] Now, realistically, the sky *is* our limit; the thinning stratosphere, biosphere, pedosphere and much else constrain human possibilities. Even where our essays describe different aspects of how we got here, all take the physical reality of the Anthropocene and its difficult, complex challenges as our starting point – even though we'd happily wish them away if that were possible.

In short, the distinctive quality of all true Anthropocene stories is that they respond to geologists' evidence of the recent, global, near-synchronous, durable, human-made layer in the Earth's crust and to the corresponding findings in Earth System science showing that the old Holocene Earth System has been destabilized, and is now lurching toward dangerous thresholds and state shifts. The aim of each contributor here is to recount a story of the Anthropocene that is both true to the science as currently understood and true to that contributor's particular concerns. While sociologists, for instance, needn't become stratigraphers, they need to understand how stratigraphy's findings alter our view of societies. Conversely, stratigraphy, which once paid little attention to, say, economic systems, now must consider global capitalism's impact on the formation of strata. Our stories are rightly plural, rich, and nuanced, but on our altered planet they can no longer be rendered as soliloquies.[6]

Perhaps it goes without saying that there are other helpful ways of approaching the world. Certainly this book doesn't claim that the Anthropocene is the *only* useful concept. "Ecological crisis," "global warming," "pollution," and a host of other terms frame our challenges differently. Rubrics such as "early human migration and land use change," "the invention of agriculture and the rise of states," "climate

[5] Clive Hamilton introduced the helpful concept of "rupture" in "The Anthropocene as rupture," *The Anthropocene Review* 2016; 1–14, https://doi.org/10.1177/2053019616634741

[6] For an interesting exploration of this issue, see Roberta Biasillo and Claudio de Majo, eds. "Storytelling and environmental history: experiences from Germany and Italy," *RCC Perspectives: Transformations in Environment and Society* 2020, (2). doi.org/10.5282/rcc/9116.

change and capitalism," "species transfer and imperialism," or, simply, "modernity" provide other angles of understanding. What we *do* claim, however, is that the Anthropocene is a specific and distinctive framework, particularly helpful in connecting the local with the planetary and deep history with the future, and most particularly in orchestrating knowledge of the whole of the Earth System and its stratigraphic markers with all human activities from myth-making to microchip manufacture. The concept of the Anthropocene directs our attention to the magnitude of the many changes on Earth, and to their integration and interrelatedness, beginning with the minutely local and extending to the planetary across eons. It pushes us away from siloed-thinking to systems-thinking. Along with South Asian environmentalist and scholar Sharachchandra Lele, we see the need to move beyond a "narrowed framing of the problem: one value (sustaining future generations), one problem (climate change), one goal (reduce carbon emissions), and one solution (renewables)."[7] And that calls for a full understanding of the range of pressures we are putting on the planet, long- and short-term timescales, and of our interdependence with nature and one another. In short, this volume sees the Anthropocene as requiring new ways of systems-thinking from all disciplines, governments, and civic institutions: new knowledge for a new planet.

THE OCCASION FOR OUR BOOK: GROWING CONSENSUS

Altered Earth: Getting the Anthropocene Right appears at an important moment. Born in 2000, the concept of the Anthropocene has "grown up" on a human timescale of a little more than two decades. This book marks its maturity. It coincides with the growing consensus that the Anthropocene is an evidenced, accurate, and useful framework for understanding our planetary predicament.

The year 2022 sees the culmination of the Anthropocene Working Group's efforts. This group, known as the AWG, was created in 2009 to investigate the geological plausibility of Paul Crutzen's intuition. By 2019,

[7] Sharachchandra Lele, "Environment and well-being: a perspective from the global south." *New Left Review* 2020; 123, 41–63.

after a decade of evidence-gathering and debate, a binding vote by 88 percent of the AWG confirmed its consensus that Earth has entered a new phase marked by a distinctive, near-global stratal unit, reflecting the sudden rise in human population, globalization, and industrialization over the last 70 years or so. In December 2022, the AWG plans to meet to finalize its formal proposal. The proposal will rely on mounds of evidence, including the core samples collected by geologist Francine McCarthy and her team, as described in Chapter 9 and on display at Berlin's Haus der Kulturen der Welt (the HKW or House of World Culture) as described in Chapter 10. If committees higher up the geostratigraphic feeding chain approve, the Anthropocene would officially join the Eocene, the Pleistocene, and other such units on the great canvas of the Geological Time Scale charting the Earth's lifespan.

Other international organizations are also embracing the concept, shifting their frameworks away from "climate change" to "the Anthropocene." In 2018, the United Nation's Intergovernmental Panel on Climate Change (IPCC) acknowledged the Anthropocene as the overarching framework for understanding planetary change. Just as our book appears, the IPCC, currently in its sixth assessment cycle, will release its 2022 "Synthesis Report" for policy makers, drawing together the massive efforts of three working groups and three special reports.[8] Other United Nations organizations have adopted the Anthropocene as well. The 2020 UN Human Development Report was titled *The Next Frontier: Human Development and the Anthropocene*, explicitly recognizing that we face not a solvable problem, but a complex, many-faceted predicament that needs to be navigated.[9]

Important academic and civic institutions are taking this new description of our planetary reality as their point of departure. For instance,

[8] Intergovernmental Panel on Climate Change (IPCC) "AR6 Synthesis Report: Climate Change 2022." www.ipcc.ch/report/sixth-assessment-report-cycle/ (accessed September 2021).

[9] UN Human Development report: The Next Frontier: Human Development and the Anthropocene (http://hdr.undp.org/en/content/human-development-report-2020; accessed September 2021). See Julia Adeney Thomas, "Why the 'Anthropocene' is not 'climate change' and why it matters." *AsiaGlobal Online* 10 January 2019. www.asiaglobalonline.hku.hk/anthropocene-climate-change/ (accessed September 2021).

historian of science Buhm Soon Park persuaded the South Korean government to fund the Center for Anthropocene Studies at KAIST (Korea Advanced Institute of Science and Technology), one of the country's premier universities. In these pages, you will read how Bernd Scherer, Director-General of the HKW, decided to reorient his institution to confront the Anthropocene, gaining support from the German government. In May 2022, the HKW hosts a meeting of the AWG and exhibits the core samples supporting its conclusions. As Scherer notes, these core samples are artifacts of both culture and nature or, more precisely, the culture–nature conjunction that is the Anthropocene.

Likewise, the social sciences, humanities, and literature are reconsidering their narratives in relation to Earth's transformation. Recently, political theorists Duncan Kelly, Mark Beeson, John S. Dryzek, Jonathan Pickering, and Manuel Arias-Maldonado have laid the groundwork for a politics of the Anthropocene.[10] Anthropologists too are alert to the challenge. In *Overheating*, for instance, anthropologist Thomas Hylland Eriksen deploys the lens of accelerating change to show how current environmental, economic, and identity crises have converged.[11] Studies of specific communities by anthropologists Marisol de la Cadena, Anna Lowenhaupt Tsing, Cymene Howe and Dominic Boyer, among others, remind us that we live in "a world of many worlds."[12] Historians have also pivoted to the Anthropocene. In 2000, the same year that Paul Crutzen coined "Anthropocene," historian John R. McNeill published *Something New Under the Sun*, grappling with how planetary and human history have

[10] Manuel Arias-Maldonado, "Bedrock or social construction? What Anthropocene science means for political theory," *The Anthropocene Review* 2020, 7(2), 97–112. doi:10.1177/2053019619899536; *Antropoceno: La política en la era humana* (Madrid: Taurus, 2018); and Manuel Arias-Maldonado and Zev Trachtenberg, eds., *Rethinking the Environment for the Anthropocene: Political Theory and Socionatural Relations in the New Geological Epoch* (Abingdon: Routledge, 2019). See also Duncan Kelly, *Politics and the Anthropocene* (Cambridge: Polity, 2019) and John S. Dryzek and Jonathan Pickering, *The Politics of the Anthropocene* (Oxford: Oxford University Press, 2019). Nigel Clark and Bronislaw Szerszynski provide an overview in *Planetary Social Thought: The Anthropocene Challenge to the Social Sciences* (Cambridge: Polity, 2021).

[11] Thomas Hylland Eriksen, *Overheating: An Anthropology of Accelerated Change* (London: Pluto Press, 2016).

[12] This lovely phrase is the title of Marisol de la Cadena and Mario Blaser, eds. *A World of Many Worlds* (Durham, NC: Duke University Press, 2018).

come together.[13] Since then, this discipline has puzzled over why, when, and how humans came to overwhelm the great forces of nature, questions engaged here by Dipesh Chakrabarty, Kyle Harper, Kate Brown, and myself. All of these approaches to the Anthropocene are helpful but insufficient without works of imagination. This is where the volume's short stories told by Clive Hamilton and Amitav Ghosh come in.

None of these perspectives individually is the complete story. Indeed, there can be no complete story. The Anthropocene is still unfolding conceptually and physically. For our communities, its instigations and effects are uneven and heterogeneous – and will continue to be so. No totalizing vision, no single cause, no easy solution is possible.

ORGANIZATION

Altered Earth is divided into three parts. In the first part, Jan Zalasiewicz and I lay out the stakes for the physical sciences and the human sciences respectively. Part II consists of eight "stories" from different scientific and humanistic points of view. Part III, the final section, looks to the future.

In the first part, stories of human beings (the *anthropos*) and stories of planetary time (*cene*) are brought together. From the most official vantage, the Anthropocene story belongs to stratigraphers, the men and women strangely fascinated by layers of rock and what they tell us about time. These geologists explore the Anthropocene as part of Earth's vast history and as a very recent layer of the planet's crust, one that attests to humanity's sudden, brutish imprint with the twentieth-century "Great Acceleration."[14] As told by geologist Jan Zalasiewicz, former chair of the AWG, the central protagonist in this long story is the Earth System itself,

[13] John R. McNeill, *Something New Under the Sun: An Environmental History of the Twentieth-Century World* (New York: Norton, 2000).

[14] The Great Acceleration refers to the evidence produced by the International Geosphere Biosphere Program (IGBP) charting the abrupt, synchronous social and physical impacts on the planetary system in the twentieth century. See Will Steffen, Angelina Sanderson, Peter Tyson, et al., *Global Change and the Earth System: A Planet Under Pressure*, The IGBP Book Series (Berlin, Heidelberg, New York: Springer-Verlag, 2004), and Will Steffen, Wendy Broadgate, Lisa Deutsch, et al., "The trajectory of the Anthropocene: The Great Acceleration," *Anthropocene Review* 2015; 2:1, 81–98.