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Tyszczuk, R.A. (2016) Anthropocene Unconformities: On the Aporias of Geological Space and Time. Space and Culture. 1206331215621008. ISSN 1206-3312

https://doi.org/10.1177/1206331215621008

Anthropocene Unconformities:
On the aporias of geological space and time

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Paper submitted to *Space and Culture* 7.09.2013;
reviewed & accepted without revisions

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Abstract:

This essay considers the Anthropocene, or 'the Age of Humans', the new geological epoch that has been proposed to describe the present time. A geological 'unconformity' however, is 'missing time', an interval or hiatus in the sedimentary geological record that helps geologists determine where epochs begin and end. It is anticipated that the geological record of the Anthropocene might be visible in the future in the numerous possible unconformities in tornado, hurricane and earthquake zones, identified by successions of building rubble and metal oxides along with fossilized evidence of radioactive material, plastic pollution, increased CO^2 levels and the shifts, distribution and extinction of species. As the Anthropocene epoch gains ground and acceptance in a number of disciplinary fields it promises to alter more than the wording in geological textbooks. The text explores the aporetic nature of geological space and time evoked by thinking about anthropocene unconformities in an unstable world.

Keywords: anthropocene, environmental change, stratigraphy, geological unconformity

Anthropocene

> Of the Earth, the present subject of our scenarios, we can presuppose a single thing: it doesn't care about the questions we ask about it. What we will call a 'catastrophe' will be, for it, a contingency (Stengers, 2000, p.145).

The Anthropocene, or 'the Age of Humans', has been proposed as the geological epoch that has superceded the Holocene (Stratigraphy Commission, 2008 a, b). [1] The International Commission on Stratigraphy and the International Union of Geological Sciences are currently in the midst of a process to find evidence for the new geological stratum. This temporal moment in the strata coincides with the particular historical juncture that has seen predictions of human-induced climatic tipping points and extinction events, and promises to be more stratigraphically significant in the future. In addition to the build up of greenhouse gases, the new stratum is to be defined by human landscape transformations exceeding natural sediment production; by the acidification of oceans; by the relentless destruction of biota, and above all by radical instability. Geologists are generally in agreement that the abrupt and catastrophic transformations of the lithosphere in this epoch are rare in the Earth's 4.6 billion year history.

However, by identifying the Anthropocene as but one more stratum or 'contingent event' in a long and turbulent Earth history we are thrown into a strange historicity which in the same moment as it re-assserts humans as a meteor-scale force of planetary change, diminishes them altogether. Since the term Anthropocene was introduced in 2000 (Crutzen and Stoermer 2000; Crutzen 2002),[2] it has worked beyond the disciplinary boundaries of geology, stratigraphy or earth sciences, migrating to public and policy discourses and also established a presence in arts, humanities and social sciences (Ellsworth and Kruse, 2009). It has prompted a questioning of what it means to live in the epoch of the Anthropocene and concepts of humanity and nature and therefore what it means to be 'of this Earth' (Latour, 2013).[3] It has provoked questions that trouble the epistemological and ontological renderings of established disciplines. Many of its proponents announce its emergence as a paradigm shift that augurs a break with the 'old paradigm' ways of analysis and prediction and requires concerted efforts and reconfigured practices in the different domains and disciplines (Bennett, 2012).[4] But in whatever way researchers strive to accommodate it, the introduction of the term carries with it a series of impasses, paradoxes and aporias.

On the one hand, the disciplinary focus on naming the Anthropocene reinforces the presumption that everything is configured around 'us-humans' and 'our time' just when we have started to question humanity's exaggerated sense of its place in the world, the nature of disciplinary divisions and our relations with and even our obligations to the nonhuman natural world. On the other hand by naming humans as the driving force of geological change, capable of epochal shifts, the Anthropocene project simultaneously undermines all human constructions by presaging an age when everything we have made will be subsumed in the rocks and might leave behind only a fossilized trace.

The geological term for aporia is ‘unconformity’. A geological unconformity is ‘missing time’, an interval or hiatus in sedimentary geological records that helps geologists to determine where epochs begin and end. The geological record of the Anthropocene might be visible in the future in the numerous possible unconformities in tornado, hurricane and earthquake zones identified by successions of building rubble and metal oxides along with fossilized evidence of radioactive material, plastic pollution, increased CO^2 levels and the shifts, distribution and extinction of species. In short, the Anthropocene unconformity is likely to bear traces of our conurbations and their infrastructures.

The intersection of geophysical and ecological changes at the global scale, including climate change and biodiversity loss, in tandem with rapid urbanization and economic and cultural globalization, demands that humanity prepares itself practically and imaginatively for potentially sudden and unpredictable change. As a consequence urban designers are urged to think about cities and their infrastructures either in terms of resilience to crisis or the capacity to manage transformation and global environmental change. Strategies of adaptation and mitigation are now a priority for cities, governments and markets. There is also a growing interest in planetary scale responses with proposals for Earth systems augmentation through geo-engineering fixes (Lövbranda et al. 2009; The Institute of Mechanical Engineers, 2009) . However, increased focus on reducing the vulnerabilities of a rapidly changing environment has, paradoxically, tended to obscure the philosophical and cultural shifts that are inevitably bound up with the more scientific-technical adjustments to ‘living in the Anthropocene’. Contemplating a world with increasingly unfixed geographies, changing coastlines, climate-induced degradation, resource scarcity, contested states and displaced peoples, requires rethinking, rebuilding, redrawing of existing boundaries, new negotiations and settlements and a radical re-organisation of governance. Thinking through the anthropocene poses large questions for many human institutions that were taken for granted in a more stable world. These include globalized political decision making, cultural relations and physical and international laws.

As the Anthropocene project gains ground and acceptance in a number of disciplinary fields it promises to alter more than the wording in geological textbooks. Beyond any concerns for its legitimacy as scientific terminology, the new Anthropocene epoch draws attention to the inherent unconformities and paradoxes of an unstable world and the aporetic nature of geological space and time. It calls attention to the discrepancies of inhabitation and intervention: between human and geological temporalities; between planetary upheaval and human vulnerability; between what we build now and anticipated futures of the built environment; between assurances and uncertainty. The notion of the Anthropcene introduces doubt as to where to begin or what to say –the impassable state of being at a loss when confronted with the site and time in which humanity most obviously undermines itself. By asserting the presence of the Anthropocene all our ways of thinking and doing are destabilized, unsettled, countered and dismantled: How do we rethink? How can we rebuild? What do we redraw?

Missing Time

> ‘The result, therefore, of our present enquiry is, that we find no vestige of a beginning, –no prospect of an end.’ (Hutton, 1788; p. 96)

Unconformities and the notion of missing time are the very foundations of Geology. James Hutton ’s *Theory of the Earth* introduced the concept of deep time as long cycles of geological succession and upheaval, providing an account of the elemental instability of the planetary lithosphere that conceived of the geologic as a living system (Hutton, 1788; pp. 209-304). His theory was underpinned by the idea of geological unconformity – a gap in time or the separation of episodes in the formation of the rock record that revealed Earth history not as gradual decline into ruin but as a cycle of deposition, uplift and displacement. Hutton had observed striking evidence of geological unconformity in 1788 at Siccar Point on the East coast of Scotland, between almost vertical steeply dipping 425 million year old Silurian Greywacke strata and the overlying horizontal 345 million year old Devonian (Old Red Sandstone) rocks. The feature, named ‘Hutton’s Unconformity’ formed when crustal fragments that would become Scotland collided and fused as a result of the twisted surges and movements of the Earth's tectonic plates. John Playfair, Hutton’s colleague, wrote of the experience of seeing this evidence of geological unconformity:

> ‘We felt necessarily carried back to a time when the schistus on which we stood was yet at the bottom of the sea, and when the sandstone before us was only beginning to be deposited, in the shape of sand or mud, from the waters of the supercontinent ocean... The mind seemed to grow giddy by looking so far back into the abyss of time. (Playfair, 1805)

We struggle to relate to deep time with its long time signatures and its ruptures and discontinuities that last longer than any conceivable lifespan. And it doesn’t seem to follow: epoch after epoch, one stratum on top of the next. Deep time is so radically destabilising of conventional timescales, so insistent on long-term cycles, that it upsets any other notions of time. As Stephen Jay Gould has observed: Hutton’s rigidity is both a boon and a trap. It gave us deep time, but we lost history in the process. Any adequate account of the earth requires both.’ (Gould, 1987; p.97) With the advent of the Anthropocene, human time has again had to confront missing time: the quotidian activities of human life in the context of immeasurable time signatures of our making. Entering into the abyss of missing time we are shaken not only by the contemplation of earth processes, with durations exceeding human comprehensibility but also by realization of our own paradoxical capacity for upheavals of geological magnitude. It is not surprising that all our certainties – and our interpretive tools – founder.

The Anthropocene provokes simultaneous conceptualisation of both human and geologic timescales. Even if it were possible to find miniscule remnants of anthropogenic interventions in the future, the immediacy and particularity of our human life events would fail to register in the midst of planetary-scale mobilisations of life and rock in the geological strata. The ruins of St Helen’s Romanesque chapel one kilometer west of

Siccar Point reveal a tell-tale jumble of grey and red rocks hewn from Hutton's unconformity; a stratigraphic hodge-podge of amalgamated scales, memories, distances and temporalities – human, geological, planetary– that are impossible to reconcile even as they leave a trace of human time as a reassembly of deep time. The notion of the Anthropocene as an entangling in earth systems processes that captures the human folding into the atmosphere, cryosphere, lithosphere and biosphere calls up Michel Serres' topological image of time as a mixture folding in upon itself and constantly changing consistency: 'Time enters into the dough, a prisoner of its folds, a shadow of its folding over.' (Serres, 1991, p.81) In this image of the dough of history, it is as if time and space are endlessly re-gathering and mixing, so that what was near is dispersed and what was previously unimaginably distant is brought into proximity. The Anthropocene suggests an experimental relation to temporality: a thinking through the anomalies, curiosities, and ruptures within the multiple unfoldings of time.

Our world has ended

We are officially still in the Holocene epoch of the Quaternary period, Cenozoic era and Phanerozoic Eon, but the start of the official process for 'naming the Anthropocene', has prompted Mike Davis' plaintive farewell to the Holocene: 'Our world […] has ended' (Davis, 2008). The sub-commission of Stratigraphy investigating the Anthropocene now finds itself considering various human activities and their effects, including: agriculture, deforestation, resource extraction; combustion of carbon-based fuels and attendant emissions; extinction patterns and population growth; construction of cities and infrastructures. Blink and it might be possible to read their list like a roll-call of human achievements including all the things that have been the sum and substance of human 'progress' and 'modernity'.

The Holocene epoch, a time period of unusually stable climate, started around the time that humans started cleaning forests for agriculture. But if the Holocene epoch is over, when does the Anthropocene begin? Crutzen originally suggested its start date as coinciding with the invention of the steam engine in 1784 and the harnessing of fossil fuels as a source of energy that marked the beginning of an uninterrupted rise in atmospheric CO_2, methane and nitrous oxide levels (Steffen and Crutzen, 2003; pp.251-257). An alternative marker for the start of the Anthropocene is suggested by the presence of highly radiated soil from nuclear tests that works its way into sedimentary rock across the globe. The period since WWII will be marked by a clear increase in radioactivity and a global distribution of nuclear detritus but it also designates the dramatic increase in population growth, consumption and technological development that has been referred to as the 'great acceleration' ushering in a time when human activities go from merely influencing to dominating the global environment (Steffen and Crutzen, 2003). The Anthropocene is understood as marking the moment when human impact on earth systems becomes equal to or exceeds the forces of nature at a global scale (Steffen et al. 2011).

But one of the most difficult concepts for geologists is contemplating the short time frame allocated to said- new-epoch, especially when they are used to ranging from unfathomable eons through to more manageable epochs and ages. At best the Anthropocene is only 250 years in-the-making or only 63 (with the 'great acceleration'). The Holocene has so far lasted only 11 and a half thousand years, where an average epoch counts 13 million years. And the nomenclature of the geological time scale itself has been evolving for only 200 years, from the period of geologists' first forays into deep time. Beginning with the realization of the enormity of geological time encapsulated in Hutton's unconformities, it was only in the 20th c. that the geological timescale and its boundary changes were understood as reflecting fundamental changes in the Earth's climate state (Williams and Zalasiewicz, 2009). And it is only now that the geologic history of the Anthropocene has become entangled with human history, the planetary is mixed up with the global and that species thinking has collided with critiques of capital. As Dipesh Chakrabarty writes:

> At the same time, the story of capital, the contingent history of our falling into the Anthropocene cannot be denied by recourse to the idea of species, for the Anthropocene would not have been possible, even as a theory, without the history of industrialization. How do we hold the two together as we think the history of the world since the Enlightenment? […] The crisis of climate change calls for thinking simultaneously on both registers, to mix together the immiscible chronologies of capital and species history. This combination however, stretches, in quite fundamental ways, the very idea of historical understanding. (Chakrabarty, 2009)

In this reading, the Anthropocene is quite literally a 'work in progress' born of a particular mixed-up historical urge to appropriate, redistribute and exploit the world's resources. While human-induced environmental change is noted as the most significant factor in the world's obituary, the slippage from one geological era – the Holocene – to the next – the Anthropocene that marks this demise indicates that the frames of reference and therefore the systemic contradictions of our world may have nevertheless stayed the same. Geological time frames may remind us that all building is provisional but global urban practices show little recognition of the precarious interdependence of human and non-human worlds and their radical instability. In a world where all strategies are directed by the same capital-based systems Mike Davis warns of the continued abandonment of global mitigation and in its place the 'accelerated investment in selective adaptation for 'Earth's first-class passengers' (Davis, 2008). He draws attention to 'the prospect of creating green and gated oases of permanent affluence on an otherwise stricken planet' (Davis, 2008). But as Michel Serres' reminds us, in spite of our customary focus on intra–human struggles the deep weather of the earthly quagmire we are all part of is always ready to re-assert itself:

> Quicksand is swallowing the duellists; the river is threatening the fighter; earth, waters, and climate, the mute world, the voiceless things once placed as a décor surrounding the usual spectacles, all those things that never interested anyone, from now on thrust themselves brutally and without warning into our schemes and maneuvers. (Serres, 1995; p. 3)

According to Bruno Latour, another way to understand the recent history of modernity, would be as 'attachment' rather than as 'emancipation' and 'progress' and where, therefore, 'the unexpected consequences are the most expected things on Earth!' (Latour, 2007). The changes wrought by humans that might have the greatest stratigraphical significance may yet be still to come: we may not have yet reached the event horizon or mass extinction that geologists need or expect as evidence of a new stratum. Is it therefore too soon then to even begin to look for the Anthropocene? Is the Anthropocene an idea born before its geological time? Or is it – and the whole disciplinary stratigraphic process – simply of its time?

Rock Time

The Stratigraphy Commission have set themselves a new target date of 2016 to come to a decision as regards formal definition of a new epoch: 'A formal 'Anthropocene' might be defined either with reference to a particular point within a stratal section, that is, a Global Stratigraphic Section and Point (GSSP), colloquially known as a 'golden spike'; or, by a designated time boundary (a Global Standard Stratigraphic Age)'(Subcomission on Quaternary Stratigraphy, 2012). Chronostratigraphy or rock-time insists that identification of the beginning of the Anthropocene requires precise chronostratigraphic data according to several criteria, such as physical character (lithostratigraphy), fossil content (biostratigraphy), chemical properties (chemostratigraphy), magnetic properties (magnetostratigraphy) and also patterns within rock-time related to sea-level change (sequence stratigraphy). A 'golden spike', or the distinct magnetic, chemical, paleontological or climatic signals between Holocene and Anthropocene that can be detected worldwide is expected to simultaneously mark the boundaries between both the time units of geochronology and their equivalent time–rock units of chronostratigraphy (Zalasiewicz et al., 2011). But the Anthropocene is not yet legible in the sedimentary rock record and won't be for some time. Time-rock takes its time.

In this context, cities find themselves in the 'novelty' category of geological phenomena and strata in-the-making (Zalasiewicz et al., 2011). The built environment now comprises an amalgam of modified, fragmented and morphed geological materials such as sand, gravel, limestone, mudstone, oil shale, coal and mineral spoil, together with novel composite materials as well as plastics, metal alloys, and glass. Cities and towns tend to rest on the compacted materials of earlier settlements and anthropogenic deposits and the substantial subsurface constructions of foundations, pilings and pipelines in a layer several metres thick. British Geological Survey maps represent these collectively as 'artificial deposits' – a novel 'made ground' that complements the 'worked ground' of pits and quarries (Price et al. 2011). Although it is the infrastructure of cities, including its road and electricity networks that are the most visible expression of human influence and inhabitation on the Earth from space, the most visible constructions on land may nevertheless be the most transient when subject to forces of erosion (Kolbert, 2011). Like a giant footprint or burrow preserved in the rock record the massive trace fossils of cities will probably be made up of the subways, sewers, conduits and infrastructures

presently below ground. The manufactured constructions or human-designed trace fossil systems in production, along with the accelerated rate of change to the carbon and nitrogen cycles and the dominating and invasive species phenomenon on land and in the sea are all likely to leave time-rock signatures the likes of which have never been seen before.

The accelerated growth of cities is perhaps now the most characteristic geo-physical feature of the so-called Anthropocene-in-the-making. As Michel Serres has noted, 'When it is unevenly distributed, skyrocketing demographic growth becomes concentrated and stuck together in giant units, colossal banks of humanity, as powerful as oceans deserts or icecaps, themselves stockpiles of ice, heat, dryness, or water' (Serres, 1995; p.17) . The massive agricultural transformations and the global perturbation of the nitrogen cycle wrought by the need to nourish expanding cities will be harder to detect. Instead, the scale of 21st century industrial agriculture will remain in fossilized evidence of monocultures when compared to, for example, to the varied pollen record of rainforests. Plant and animal species shifting their ranges as a result of climate change may also leave a trace as might the new cocktail of organisms in the seas as a result of use of ballast water in shipping in global sea trade. The increased acidity of the oceans causing coral reef loss might register in the future in reef gaps. The stratigraphers think that the evidence for a suitable time-rock boundary is compelling. The last mass extinction event 65 million years ago that marks a major boundary in geological time, the K-T or Cretaceous-Tertiary boundary, as well as the end of the Mesozoic Era, was identified by reef gaps, the end of the dinosaurs, plesiosaurs, pterosaurs and ammonites along with a 'golden spike' or 'indelible extra-terrestrial signature' (Davis, 1996) of iridium-rich dust from an asteroid impact spread over the globe.

Earth systems science has developed an understanding of geological upheavals of this magnitude as 'expressions of a fractious but integrated geophysical system' (Clark, 2012; p.259). And as Mike Davis observes, in discussing the shift to an 'open system' view, [t]he biggest step for the Earth sciences has not been the admission of an occasional catastrophe or two, but rather the acceptance that terrestrial events, at a variety of time-scales, form a meaningful continuum with extra-terrestrial processes' (Davis, 1996; p.63). The Anthropocene has ushered in a speculative geology and geophysics; a converging of diverse fields of enquiry in what Clark has referred to as 'not only renewed philosophical, cultural and social theoretic interest in the possibilities of earth processes themselves, but also the past and present willingness of natural scientists to think beyond the empirical and into the realms of what has been, or might yet be' (Clark, 2012b). This speculative dimension also incites us to contemplate the impossibility of what might not be.

Future Fossils

In his popular science work, *The Earth After Us*, Zalasiewicz re-enacts the thought experiments that the Stratigraphy Commission are confronted with through a fictional

excursion into an unforeseeable post-human future. Zalasiewicz, a key member of the Stratigraphy Commission, was one of the first geologists to adopt the term 'Anthropocene' after it was first introduced by Crutzen. In his fictional narrative, alien scientist-explorers or indeed the forensic geologists of an imagined time 100 million years from now, probe the fossilized remnants of cities or urban traces found in what he calls the 'Human Event Stratum', revealing '[...] compressed outlines of concrete buildings, some still cemented hard, some now decalcified and crumbly: of softened brick structures: of irregular patches of iron oxides and sulphides representing former iron artefacts from automobiles to AK-47s: of darkened and opaque remnants of plastics: of white, devitrified fragments of glass jars and bottles [...] (Zalasiewicz, 2009; p.189).

The Anthropocene unconformity / 'Human Event Stratum' is likely to bear traces or mineralization of our conurbations and their infrastructures in relation to globalisation and environmental change. After all, as De Landa would have it, 'we live in a world populated by structures - a complex mixture of geological, biological, social, and linguistic constructions that are nothing but accumulations of materials shaped and hardened by history' (DeLanda, 1997; p. 25). The process of mineralization always tends to petrification, crossing 'the threshold back into the world of rocks', from the human endoskeleton to urban exoskeleton' (DeLanda, 1997; pp.26-27). But the collapsing of human, post-human and geological chronologies in the Anthropocene is complicated and contradictory. What makes it all the more perplexing is that stratigraphers are attempting to simultaneously observe and anticipate both the trace and cause of the geological record, for rock to be admissible as primary evidence of human geomorphic agency.

The identification of human influence and domination of earth processes asks us to recognise in advance forces of a magnitude and timescale that are difficult to comprehend let alone attempt to control (Williams et al. 2011). As Zalasiewicz has observed: technological and natural processes have already become so inextricably interlinked that our actions now will literally be raising mountain belts higher, or lowering them, or setting off volcanoes (or stifling them), or triggering new biological diversity (or suppressing it) for many million years to come (Zalasiewicz, 2009; p.240). Furthermore the chemical pollutants and radioactive waste that humans have accumulated over the past 200 years can leave a signal that stretches into the distant future, and one which could be identified by forensic geologists millions of years from now. But given human-scale temporal elasticities and limits of signification how can we know what all this earth-changing means for a future that isn't ours? What new forms of causality can even attempt to grasp such durations in terms of prediction for present decisions about courses of actions? (Van Wyck, 2005)[·].

Forensics requires both the fieldwork, or scientific tools of investigation, and a forum or the persuasive presentation of an argument (Weizman, 2012). But what if the imagination of forensics precedes the evidence? A science and practice that usually follows the evidence, stratigraphy is now immersed in the speculative world of

conjectures, in ‘pre-crime’ and the rhetorical upside down world of the thought experiment. Stratigraphers are attempting to define an epoch by anticipating the strata not by relying on physical evidence or testimony. But who speaks for the rocks?

With the customary hubris of the narcissistic naming and re-naming of earth strata in our image, the earth-rock ironically meets its maker. The presumption that everything is configured around our time, our witnessing, our prognostics has also unwittingly written us out of the picture. The Anthropocene reminds us of previous extinctions by naming our own, confronting us with our own fossilized demise. The Anthropocene continually undermines itself. It needs a rupture marker or boundary scar with the Holocene to assert its existence: an existence that corresponds also to the non-existence of humankind. Our advance into the Anthropocene puts us in a paradoxical situation since almost all political and ethical systems have been developed to deal solely with the here and now. If the world *as we know it* has ended how can we even begin to think about how we might respond and be responsible in a future world? How do we give an account of *the future* if it depends on descriptions of a past that has not yet occurred? What does it mean to have developed materials, industries, technologies and activities that even once we are gone promise to be highly disruptive for a future far longer than all of human history?

Assymetry

> All of a sudden the ground shakes off its gear: walls tremble, ready to collapse, roofs buckle, people fall, communications are interrupted, noise keeps you from hearing each other, the thin technological film tears, squealing and snapping like metal or crystal; the world finally comes to me, all in distress. A thousand useless ties come undone… (Serres, 1995; p.124).

Every now and again we are alerted to the earths’ perturbations, its propensity for unexpected climatic variability and seismic upheavals and the fragility of human life on a dynamic earth. Such unforeseen disasters defy containment by any of the systems we might have set in place prior to their occurrence. Michel Serres’ philosophical inquiry into human and non-human relations in the *Natural Contract* noted the ascent of human geologic agency but also the capacity for the forces of the Earth to rip apart any sustaining human connections. As Nigel Clark reminds us, the earth is astonishingly good at unleashing primordial forces of destruction and pulling the ground from under our feet. He also draws attention to the ‘radical asymmetry’ of realities beyond ‘the reach of negotiation’: ‘the impression that deep-seated forces of the earth can leave on social worlds is out of all proportion to the power of social actors to legislate over the lithosphere’ (Clark, 2010; p.xvi).

Although the Anthropocene epoch-in-the-making seems to mark a growing recognition of humankind as an unpredictable geological and geomorphic force, at the same time, intractable seismic, volcanic, meteoric, atmospheric and other earth-moving, earth-shattering and earth changing forces attest to the limits of the human yet also propel and

incite human agency. As Clark writes, '[w]hatever we have made or unmade of our world, in this sense, we remain partially under the sway of forces beyond our control, and even beyond our influence' (Clark, 2005). We might therefore need to confront a human spatiality and temporality not of our own making. In other words, our social political and communal life will need to be responsive to the unpredictability of hostile conditions and devastated ground on our earthly home; we may need to prepare for living in a permanent state of earth-quake.

With our new status as a geologic force we are charged with imperiling 'the safe operating space for humanity with respect to the earth system' and implored not to overstep 'planetary boundaries' newly calibrated to maintain a Holocene-like state for as long as possible (Rockstrom et al, 2009). Yet even if a return to a benevolent Holocene were possible or commensurable on these terms, there always remains the possibility for us to be periodically thrown off-course by unpredictable and cataclysmic events. The Earth has never been a safe space. Recent convulsions of earthquakes, tsunamis, flooding and wildfires demonstrate the convergence of two different earthly mobilities: 'human traversal of the earth's surface and the shifting of ground beneath our feet' (Clark, 2012a; p.23). But working out a way of dealing with the vulnerability of human habitation to earth processes is not simply a question of constructing settlements and infrastructures better able to cope with elemental stresses and provide adequate shelter. Given the precarious ground of human relations we might need to be better equipped to cope with experiences of estrangement and deprivation whenever and wherever they might be. It therefore makes sense to ask how it might be possible to extend infrastructures of hospitality across space and time for those that need it most. And as Clark has observed, 'If hospitality on an episodically inhospitable earth presents the most demanding of design problems, it also asks of us, from time to time, a hasty redraft of even our best laid plans' (Clark, 2012a; p.23).

Aporias

The Anthropocene as an aporia is a contradiction, a puzzle or a paradox, an expression of doubt, or *aporos*, 'without passage' or 'impasse'. Derrida identifies three types of border limits, impassable thresholds or aporias: first, those that 'separate territories, countries, nations, states, languages, and cultures'; second, 'the (im)possibility of (inter)disciplinarity' in domains 'represented, in an encyclopaedia or ideal university' ; and third, the 'lines of separation, demarcation, or opposition between conceptual determinations' (Derrida, 1993; p.23). The Anthropocene thus presents itself as the aporetic site of intersection of globality, disciplinarity and overdetermination. Anthropocene unconformities cannot be resolved by the usual appeals to the scientific logic of modern rationalism. Contemplation of aporias brings us instead to the ethical and the political: 'where we are exposed, absolutely without protection, without problem and without prosthesis, without possible substitution, singularly exposed in our absolute naked uniqueness, that is to say, disarmed, delivered to the other, incapable even of sheltering ourselves behind what could still protect the interiority of a secret' (Derrida,

1993; p.12). A responsive entanglement of us and the Earth in all of its aporias, complexities and dynamics across multiple scales is both where we sense time and where the actuality of lived experience unfolds.

The Anthropocene project presents an aporetic world of our constant dismantling, making and re-making. It operates as a worldly construction and demolition site with urgent questions, problems, and negotiations where our perceptions of time are challenged; our traditions are called into question; and where the unsynchronized simultaneities of planetary and human forces unfold. By entering the Anthropocene we find ourselves in a site that is both out of time and out of place, untimely and displaced. And where –here and now – we are prompted to imagine how a shift in perspective on a set of practices – not considered sedimented but instead as unconformities – might reconfigure them. Facing up to the times and places of paradox and impasse with questions of responsibility and thoughtful attention might propel us to think beyond the limits of our own work, and our own disciplines. As Gibson-Graham has noted: '[f]or us the project of belonging involves both participating in the vast experiment that is the Anthropocene and connecting deeply to specific places and concerns'(Gibson-Graham, 2011).

If the Anthropocene reminds us that we are both of a missing time and a ruptured space then it also suggests a constitutive approach to where the geophysical constitutes the political; but in the manner of Stengers' 'Cosmopolitical Proposal', 'that requires no other verification than the way in which it is able to slow down reasoning and create an opportunity to arouse a slightly different awareness of the problems and situations mobilizing us' (Stengers, 2005 p.994). Seeking to recast the terms of engagement among science, philosophy and politics, Stengers' 'cosmopolitics' refers to a shift from a problematic which sees a gulf between science and politics to one which takes the entanglements of the world as a given. The cosmopolitical is then neither an appeal to universality or to global or metropolitan citizenship but rather a plea to query – through the figure of the idiot – our assumptions about the world 'that we don't consider ourselves authorized to possess the meaning of what we know' (Stengers, 2005 p.995). Following Stengers, perhaps then the role of the Anthropocene – like that of the idiot – is not simply to produce 'abysmal perplexity' but to offer an interstitial domain for addressing the challenges of a world in the making. This position of 'slowing down' or indifference to urgency is not about the definition of what is most important or about proofs but rather invites, 'an affair of a process that one must *follow'* (Stengers, 2000; p.145). Our present moment – call it the Anthropocene – requires a responsiveness to both a complex folded dynamic terrain and the irreversibility of Earth processes. It also suggests a following through with our responsibilities and 'continuing to care for unwanted consequences' (Latour, 2011). This is not a question of how to engage authoritatively with a world that we have already made but how to take part with a good deal more humility or 'groundedness' in the process of re-making the world we are living in now. The Anthropocene in its unconformities may unsettle us for a little while yet.

Notes

[1] The term *Holocene* was first proposed at the third International Geological Congress in 1885 as the chronostratigraphic division that follows the Pleistocene Epoch. It comes from the Greek words *holos* ('whole') and *kainos* ('recent'), referring to fact that this epoch was considered the most recent division of Earth history.

[2] The term *Anthropocene* was first introduced in 2000 by the Dutch atmospheric chemist and Nobel Prize winner Paul J. Crutzen and by Eugene F. Stoermer in a publication of IGBP and later expanded on in an article by Crutzen in 2002 in the journal *Nature*. However, the concept itself, the idea that human activity affects the Earth to the point where it can move into a new age, is not new and dates back to the late nineteenth century. Different terms have been proposed over the decades; for example the Anthropozoic (Stoppani, 1873; Stoppani, A. 1873 *Corsa di geologia,* vol. II, *Geologia stratigrafica.* Milan, Italy: Bernardoni & Brigola), Noosphere (de Chardin, 1922; Vernadsky, 1936), Eremozoic (Wilson, 1992), and Anthrocene (Revkin, 1992).

[3] Bruno Latour, 'Facing Gaia: A new enquiry into Natural Religion'; The Gifford Lectures, February 2013; The Anthropocene was the subject of Latour's 4th lecture: 'The Anthropocene and the Destruction of the Image of the Globe' (publication forthcoming); http://www.ed.ac.uk/schools-departments/humanities-soc-sci/news-events/lectures/gifford-lectures/archive/series-2012-2013/bruno-latour/lecture-four; accessed 1.04.2013.

[4] For example, the 'Anthropocene Project' has recently announced: 'Humanity and nature are one, embedded within the recent geological record. This is the core premise of the Anthropocene thesis, announcing a paradigm shift in the natural sciences as well as providing new thought models for culture, politics and everyday life.' 'The Anthropocene Project: An Opening' January 10-13 2013. The Anthropocene Project is an initiative of Haus der Kulturen der Welt in cooperation with the Max- Planck-Gesellschaft, Deutsches Museum, the Rachel Carson Center for Environment and Society, Munich and the Institute for Advanced Sustainability Studies, Potsdam; https://www.hkw.de/en/top/presse/pressemitteilungen/pressemitteilung_84660.php;accessed 12.12.2012.

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