

□ Archaeology of the Anthropocene

□ Introduction

■ Matt Edgeworth
University of Leicester, UK
me87@ul.ac.uk

During the opening of the UN's Rio+20 summit on sustainable development in 2012, a short film called "Welcome to the Anthropocene" (Gaffney and Pharand-Deschenes 2012) was introduced by Ban Ki-moon and shown to over 150 heads of state and ministers. The film uses stunning graphics to show the impact of human beings on the planet. A steeply climbing curve on a graph provides data on accelerations in energy use, urbanization, damming of rivers, deforestation, loss of species, resource depletion, and so on. There is a low musical hum, like an engine running in the background. The spectacular image of Earth as viewed from space gets progressively covered by finely spun filaments of light circling the globe and coalescing into thick webs—networks of roads, railways, urban expansions, airline routes, communication networks and other mesh-like patterns of human artifice. These are traced forward from a single moment in time and a particular location in space, rather as physics takes the whole of the known universe to have expanded outwards from the Big Bang. Point zero in this instance is the start of the Industrial Revolution in England just over two hundred years ago—the specified moment of birth for the new geological epoch. "We are entering," the narrator intones to dramatic effect, "the anthropocene."

The screening of the film before all those world leaders at the Rio summit is a measure of the extent to which the idea of the anthropocene has captured the global imagination (or certain layers of it) in the decade or so since the term was first coined. For those with an anthropological sensibility, there is much there that is myth, not least an origin myth of the birth of modern science and technology, and a wholly Eurocentric one at that. There is also much that is publicity and promotion, and it must be acknowledged that the idea of the anthropocene has flourished in the context of Internet and other

multi-media environments. But behind the media image there is a solid corpus of work being carried out on anthropocene-related issues by scholars from multiple disciplines (see collected volumes of papers in Ehlers and Krafft 2006; Williams *et al.* 2011; and Waters *et al.* forthcoming). If there are myths, these are closely woven around harsh facts and statistics on global developments that are all too real. Most important of these is that human population has doubled in the space of a single lifetime, and is growing exponentially at an extraordinary rate. The acceleration of so many other key parameters of environmental change—such as increasing levels of carbon dioxide in the atmosphere—stems in large part from the explosion in numbers of people inhabiting the planet, the unequal distribution of its resources, and unsustainable trajectories of economic expansion on the part of richer nations.

Such developments have to be addressed, and the idea of the anthropocene is rapidly opening up a multidisciplinary space in which to do so. The proposal of a new geological epoch characterized by human impact on Earth systems, whatever its faults, has set the grounds for a debate in which scholars from the natural sciences, social sciences and humanities can participate together. It is encouraging specialists from discrete fields—economists, geologists, anthropologists, climatologists, oceanographers, environmental historians, political theorists, ecologists, geographers, hydrologists, biologists, sociologists, microbiologists, archaeologists—to work in collaboration. Interest in the idea is crossing disciplinary boundaries and academic divides in unprecedented fashion, and proving a catalyst for the setting up of interdisciplinary research projects.

Although the concept of the anthropocene was introduced in a paper jointly written by an atmospheric scientist and a freshwater biologist (Crutzen and Stoermer 2000), it is geologists—in their search for a stratigraphical basis for the proposed new epoch—who have been pushing the debate forward (Williams *et al.* 2011). There is collision of scales, a colossal shift in focus from macro to micro levels, as geological perspectives move from four and a half billion years of Earth history to focus in on the relatively brief period of human evolution and technological development, and the thin envelope of material deposits associated with it that will arguably one day form a geological layer in its own right.

Far from being separate and apart from archaeological concerns, the anthropocene debate has come to us, has already moved onto our territory, and could even be said to be partly emerging from it. Geologists are currently carrying out investigations of archaeological stratigraphy in formulating their concept of “artificial ground” (Price *et al.* 2011). Climate scientists are using archaeological material (along with other kinds of stratigraphic evidence such as bubbles of ancient atmosphere trapped deep in polar ice) to date their versions of the start and development of the proposed new epoch (Ruddiman 2005). Meanwhile atmospheric chemists and other Earth scientists are devising chronological schemes for periods of human history that are normally dealt with by historians and archaeologists, basing these on a primary divide between anthropocene and pre-anthropocene phases (Crutzen *et al.* 2007).

Contentious issues arising out of that work—for example about the date of the start of the anthropocene, and how it might be represented in stratigraphic evidence—can be tackled and partly resolved through archaeological investigation and analysis. There

is an imperative for archaeologists to deal with such issues alongside natural scientists. So far archaeologists have considered the implications of the anthropocene for heritage and conservation issues (Solli *et al.* 2011), and some discussion of how archaeology might be used to date the start of the proposed new epoch (Balter 2013). But the role of archaeology may yet prove to be much wider and more substantial than that. Up to now we have perhaps underestimated the value of the formations of the anthropogenic layers, cuts, features, fills, stratigraphic sequences and artifact assemblages that make up the archaeological record, for other disciplines as well as our own (see Edgeworth 2013).

The anthropocene brings with it a convergence of planetary and human timescales, and the folding of the human into the geological and vice-versa—a “crease in time” as Dibley (2012) puts it. A corresponding folding together and convergence of attention of natural scientists and scholars from the social sciences and humanities on matters anthropocene would seem to be a necessary step. As a mark of its entry into social science discourse, Bruno Latour devoted much of his 2013 Gifford Lectures in Edinburgh to exploring connections between the concept of the anthropocene and the Earth-systems approach of “Gaian” scientists like James Lovelock (Latour 2013). And an important new book by Timothy Morton takes the anthropocene as a framing concept for a groundbreaking discussion on the emergence of hyperobjects (Morton 2013). This engagement is important. The anthropocene has political, economic and social dimensions that can never be fully apprehended by methods of the natural sciences alone, any more than data from ice-cores and climate measurements can be fully evaluated by social scientists. Working together is the way forward, and archaeology can be a meeting-ground of sorts between quantitative and qualitative methods of investigation, playing its part in building a global science of sustainability (Hudson 2013).

No-one is suggesting that archaeology should tie its flag to the anthropocene mast, uncritically accept the assumptions it presently enshrines, or wholly agree with ideas put forward by its proponents. But there is a growing sense that archaeology has something substantial and important to contribute here—not only in terms of ideas and arguments (whether in support or in critique), but also in terms of a large body of material evidence, in the form of the archaeological record, against which specific arguments can be checked and evaluated, along with a tried and trusted methodology for doing so. Collaboration with other disciplines has the potential to lead to new forms of knowledge that transcend disciplinary divisions, opening up as yet unimagined spaces for further research which could prove to be of some benefit to future generations as well as our own. That in itself is a good reason for embarking on an interdisciplinary adventure with the idea of the anthropocene.

The forum started out as a session entitled “Archaeology in the Anthropocene” in the Theoretical Archaeology Group (TAG) Conference at the University of Chicago in May, 2013. The session began with the same film “Welcome to the Anthropocene” that was shown to world leaders at the UN’s Rio+20 summit described earlier, though perhaps finding a more critical audience in this smaller and humbler academic setting. Many contributors to the forum were in the original session, either as presenters or in the audience. One talk was given via Skype from Australia, spanning the globe and its time zones by means of the same space age communications technology that was in

part the subject of the talk. As serendipity had it, our session was followed by another on the subject of “Ecology and/of Archaeology” which tackled connected themes, and three forum participants were co-opted from that. Further participants were invited subsequently from wider afield in an effort to broaden out the debate. Archaeologists and other scholars from five continents are represented in the forum discussion which follows.

In formulating the question for the forum—circulated to all participants and addressed in different ways by each of the papers—the aim was to gather a range of responses to the emergence of the concept of the anthropocene, and to discuss the potential contributions that archaeology might make to the wider debate, while allowing space for voices of scepticism and dissent.

The question for the forum

Until recently we thought we were living in the Holocene epoch. But some Earth scientists now argue that we have moved into a more unstable geological time, characterized by human impact on planetary systems. Though not yet formally accepted into geological time-frames, the anthropocene has become one of the hottest topics of interdisciplinary debate, with relevance to some of the most difficult and pressing problems facing human beings today.

If the anthropocene has objective reality, a material record of it must exist in the cuts, deposits, stratigraphic sequences, material residues and artifact assemblages that constitute archaeological evidence. Does the proposed new epoch have a distinctive stratigraphy? What are the principal artifacts / structures / markers of the anthropocene? Is the term “anthropocene,” with its emphasis on the “anthro” and its inherent lack of symmetry in its dealing with the non-human as well as the human, an appropriate term to use for the latest phase of Earth’s history and development?

What roles might archaeology play in formulating, substantiating, challenging, dating, critiquing, investigating or reworking the idea of the anthropocene?

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□ When was the Anthropocene? (and Why?)

■ Paul Graves-Brown
University College London, UK
slightlymuddy@gmail.com

In 1893 Frederick Jackson Turner proclaimed the demise of the American frontier (Faragher 1994). Hakim Bey (1991), contemplating the "closure of the map" in 1899, declared the twentieth century "the first...without terra incognita, without a frontier." Crutzen and Stoermer's (2000) anthropocene represents a new (but related) temporal frontier in "the latter part of the eighteenth century" but there is a danger in treating this as a fixed boundary, as opposed to something that is part of a dynamic process. Thus far this human-generated geological epoch has been conceptualized in terms of stratigraphic boundaries, but the principal role for archaeology in debating the anthropocene is, I suggest, to deconstruct frontiers, both temporal and spatial. As Edward Harris points out (this forum), archaeologists are much more interested in surfaces than they are in layers. Surfaces are where the action is. Unlike geology, where the principal concern is with processes of accumulation and erosion, an archaeological surface constitutes an assemblage of artifacts with spatial and temporal depth that transcends stratigraphy and is thus only bounded by *châines opératoire*.

Frontiers and boundaries are often conflated with specific events. Crutzen, Stoermer and their collaborators have identified the beginning of the anthropocene with "James Watt's invention of the steam engine." Ruddiman (2003) sees human impact on CO₂ emissions as spanning the last 8000 years due to deforestation. Smith and Zeder (2013) equate the anthropocene with the Holocene due to human "niche construction" (domestication of plants and animals). Experience has taught archaeologists and historians that such attempts at periodization, which Crutzen and Stoermer themselves admit

are “somewhat arbitrary,” often create more problems than they solve. As Green (1995) argues, the ancient/medieval/modern periodization of history constituted a “straitjacket” with “insidious” consequences; whatever their pedagogical value, periods, ages and eras create boundaries in thinking where no substantive rupture exists. More importantly they mask significant spatial and temporal *longue durée* processes.

The steam engine is a case in point; was it invented by Hero of Alexandria, Taqi al-Din, Giovanni Branca, Jerónimo de Ayanz y Beaumont, Denis Papin, Thomas Savory or Thomas Newcomen? Certainly not James Watt. Whilst steam power marks a quantum shift in human appropriation of the Earth’s resources—the first non “natural” power source—the age of steam was the product of proximate and distal causes spanning several centuries. Indeed, steam power only began its significant impact on the planet around 1825 when George Stephenson built the *Locomotion* for the Stockton and Darlington Railway. Change, be it slash and burn, domestication or steam power, is a process, not a eureka moment.

Spatially, similar problems exist. Indeed, the whole concept of an anthropocene can look rather Euro/West/Northcentric. Whilst we may assume that CO₂ emissions have always had a global impact, the human impact on the Earth’s surface has been patchy, and its existence as a global epoch ultimately depends upon the level of interaction between spatially dispersed regions. A series of events, particularly around the sixteenth and seventeenth centuries (c.f. McNeill 1995), document the closing of the map; the process by which human impact on the planet began to be rationalized into a globally inclusive system.

Rubbishing the anthropocene

As a student of the recent past, I am particularly intrigued by the concept of a “great acceleration” in human impact on the planet beginning at the end of World War II (Hibbard *et al.* 2007; Steffen *et al.* 2011). This is attributed to factors including: science, technology, demography, production, consumption and political economy (especially free trade). Indicators such as population, GDP, paper consumption and numbers of motor vehicles show a considerable acceleration beginning around 1950 (Figure 1a; Steffen *et al.* 2011, Figure 1). Such patterns ought to be clearly observable archaeologically and waste disposal should be a critical source of information. Here, indeed, we are fortunate to have some comprehensive sources of data (Spiegelman and Sheehan 2005; UNEP/Berne Convention Secretariat 2004, 2006, 2012; USEPA 2010) and the extensive work of the Tucson Garbage Project (e.g. Rathje and Murphy 2001).

However, waste presents us with some apparently contradictory results. Rathje and Murphy (2001, 50) ask: “Are Americans, on a per capita basis, bringing into existence a lot more municipal solid waste than they did twenty, fifty or a hundred years ago?... the answer...may very well be no.” This view is supported by other sources. Changes in *per capita* municipal solid waste generation in New York (Figure 1b; Spiegelman and Sheehan 2005, Figure 1) between 1905 and 2001 do not show a great increase (although composition changes – see below). Similarly statistics for US solid waste between 1960 and 2009 (Figure 1c; USEPA 2010 Figure 26) show a relatively slow growth, especially when demographics are taken into account (US population grew from 180 million to 307 million—USEPA 2010, Table 29). Indeed, after recycling, composting and incineration,

municipal waste to landfill is in decline. A similar pattern may well exist throughout the OECD countries (UNEP/Berne Convention Secretariat 2004, 26). Does the archaeological record rubbish the claim for a great acceleration in the later anthropocene?

Not being short sited

Clearly the answer is no, but for what seem to me to be interesting reasons. Traditionally, archaeological research has tended to concentrate on the “site.” As noted above, this can be conceived as a bounded assemblage of artifacts across a surface connected by *châines opératoire*, e.g. a lithic scatter or the pattern of refuse around a settlement. Of course, since the palaeolithic, there is evidence that artifacts and materials, be they *spondylus* shells or stone axes, have been transported over considerable distances. But for all intents and purposes, most “sites” would consist of materials obtained from and discarded within a small locality. Yet, as Foley (1981, 157) suggests, “archaeological material is spatially continuous” and therefore in order to understand the anthropocene

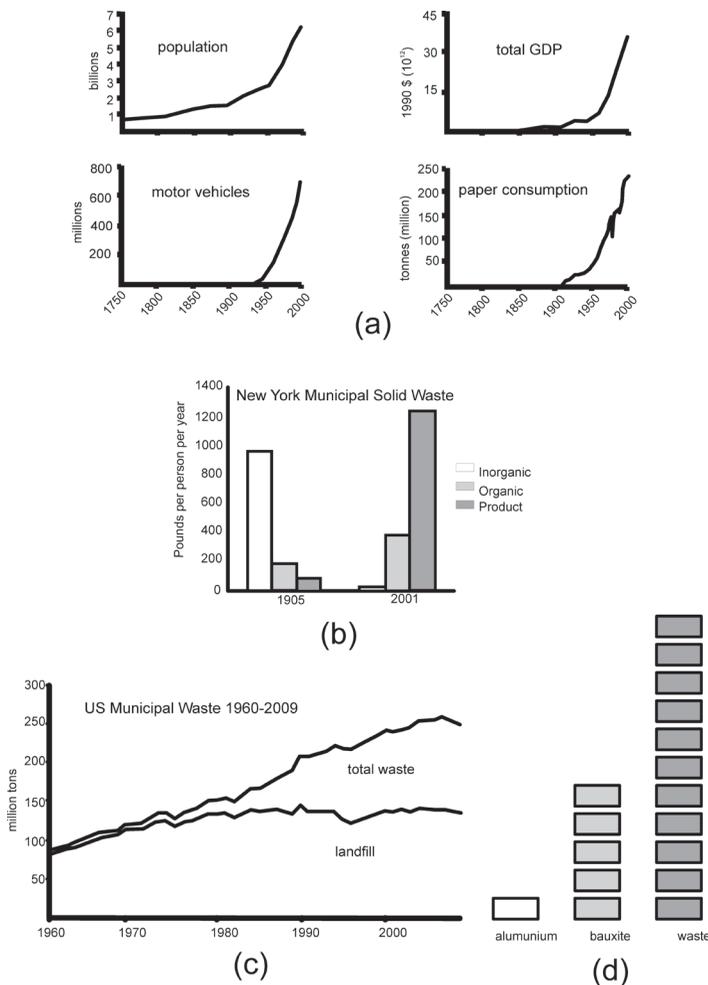


FIGURE 1. Changing patterns of production, consumption and waste in the anthropocene.

we need to look “off site”; all boundaries are permeable and ill-defined.

Taking the case of New York cited above (Spiegelman and Sheehan 2005), the majority of waste in 1905 was inorganic ashes from burning coal. Conversely, the majority of waste in 2001 was composed of products; 32.5% containers and packaging, 27.3% non-durable goods and 15.7% durable goods (as percentages of total municipal waste). In both cases waste is the product of materials transported over long distances, but much of the 2001 waste, by-products of manufacturing processes, will have ended up elsewhere. The two *fossile directeurs* of the late twentieth/early twenty-first century are almost certainly aluminium and plastics, much as iron had been for the nineteenth century. The production of aluminium requires 4–5 tonnes of bauxite for 1 tonne of metal, with a further 10 tonnes of waste rock and mud (Figure 1d; UNEP/Berne Convention Secretariat 2006, 7), with principal sources in Australia, Brazil and China. Similarly, most plastics are made from oil, and whilst almost all fractions of crude oil are utilized, a high percentage end up as waste in the form of gasses and particulates. Generally speaking, then, whilst Rathje and Murphy (2001) are probably correct that domestic waste is not increasing (*per capita*), this is simply because the global distribution of waste has changed. Similar principles apply to industrial processes; and where waste is recycled, analogous global patterns exist; much of the world’s metal and e-waste (computers, phones, etc) is now re-exported to India, Pakistan, Bangladesh and China for recycling (UNEP/Berne Convention Secretariat 2012, 18).

Throughput and logistics

To reiterate, whilst human atmospheric pollution, be it caused by neolithic forest clearance or car exhausts, has always had a global impact, other aspects of the anthropocene must depend on the global integration of human appropriation of resources. From this perspective, as noted above, the key impact of steam power was in facilitating the movement of materials, goods and people by both land and sea, rather than just pumping water from coal mines. Whilst explanations of the origin of the anthropocene tend to center on technological or economic innovation, the key variables seem to me to be throughput and logistics; the amounts of material appropriated and how efficiently it is moved around the world. Whilst steam power networks may account for earlier phases of the epoch, I suggest that logistic organization is a key factor in the “great acceleration,” and it is no accident that this occurs in the aftermath of World War II.

The obvious case in point here is containerization (see Graves-Brown 2013). Largely the result of logistics innovation in World War II, containerization revolutionized the movement of goods, but one could not claim that this was the result of any radical change in technology or economics. Container technology is relatively simple and container ships are not particularly fast. Whilst the free trade policies of the post-war era may have facilitated containerization, the real impact was logistic; returning to the waste streams discussed above, the growth of product waste can be directly linked to the facility with which finished products, and most importantly their components, can be moved around the world, breaking spatial links between raw material extraction, labour, consumption and capital. And more recently, the internet did for information what containerization had done for goods, with similar consequences.

Rubble: new frontiers

Ironically, the demands of a consumer society are demonstrating that the map is not yet closed; new initiatives to exploit resources in Africa and the Arctic, and ultimately on the “final frontier” of space, are still pushing the boundaries of the system of resource exploitation that constitutes the anthropocene. Here, Rathje and Murphy (2001, 216) state that: “The obsolescence of material culture is at once inevitable and essential,” suggesting that the frontiers of appropriation will never close. Consumption of construction material, one of the fastest growing sources of waste in the developed world, should be a case in point (UNEP/Berne Convention Secretariat 2004, 2006). As early as 1910, the 22 storey Gillender building in New York was being demolished, it was only 12 years old (Byles 2005, 37–39). Archaeologists are well placed to study this aspect of the anthropocene, since much of their work is driven by construction. In my view, a thorough archaeological analysis of the generation and distribution of waste will tell us whether such examples of material culture change are “inevitable” or the result of a system addicted to consumption for its own sake.

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□ Dark Artifacts: Hyperobjects and the Archaeology of the Anthropocene

■ Mark James Hudson

University of West Kyushu, Kanzaki, Japan

hudsonm@nisikyu-u.ac.jp

Both as an idea and as a physical reality, the anthropocene proposes a radical yet confusing and uncanny re-evaluation of humanity's role in the world, past, present and future. Yet archaeology has always concerned itself with worlds created by human activity, investigating how human actions have transformed our life worlds and those of connected species such as domesticated plants and animals (Bleed 2006). It is no coincidence that one of the most famous books in archaeology is called *Man Makes Himself* (Childe 1936). How, then, does the concept of the anthropocene change archaeological understandings of human relationships with the living environment, with ecology in the broad sense?

In the West, classical and Christian beliefs about how nature is transformed into things of value by human labour were crucial in the development of the idea of a world made by and for humans. Secularized in the Enlightenment, such narratives spread widely with modernity (Merchant 2003). In the nineteenth century, growing social alienation resulting from industrial work led to new critical philosophies such as Marxism, but the essential link between labour and value was not questioned. The English socialist and leader of the Arts and Crafts movement, William Morris, for example, did not doubt that, "Wealth is what Nature gives us and what a reasonable man can make out of the gifts of Nature for his reasonable use," despite his passionate concern over the fact that "the fruits of our victory over Nature [have] been stolen from us" (Morris 2008 [1885]).

The archaeological concept of the "artifact" built on this history by seeing artifacts as objects crafted for human living. The traditional definition of an artifact is "An object made by humans." Bray and Trump (1970, 23) accepted that, "The line is sometimes hard to draw between a natural object and one used by man..., but there is no doubt when it can be shown that he shaped it in any way, even if accidentally in the course of use." In other words, even the accidental usage of objects by humans completely transforms their significance. From this perspective, the concept of "ecofact" was an attempt to assign a similar significance to objects that had apparently *not* been transformed by human labour. However, the limited popularity of this concept suggests that for most archaeologists it has been the concept of human *control* that has given the artifact its special meanings. Thus, many archaeologists have found it difficult to talk about suggestions from evolutionary theory that plants and animals might transform themselves towards domestication (cf. Rindos 1984; Smith 2007; Bleed and Matsui 2010).

Archaeology has also seen the artifact as a site of contested memory about the past, a Tintern Abbey-like object that can be studied and experienced to evoke historical associations. Approaching artifacts with the right attitude enables the viewer to see

beyond their fragmentary nature. Thus, one of the great attractions of archaeology has been its ability to dig up “real” life and livelihoods, to uncover actual behaviour, even to give voice to people silenced or marginalized in the past and in texts.

Hyperobjects

In recent years there has been a growing number of critical studies of artifacts and the material within archaeology. Employing the title of one such work (Hodder 2012), many of these studies can be summarized by the word “entanglement.” These studies have often mirrored, but not necessarily directly engaged with, recent work on human–nature connections. Global climate change and other environmental crises—and our ability to measure such changes—have radically transformed our understanding of the links between humans and the environment. Environmental historian Brett Walker (2009, 16) writes that, “Everything on earth, living or otherwise, is integrated into one interconnected, bufferless web that is neither artifice [read *artifact*] nor nature.” In contrast to the pre-anthropocene era (and most contexts studied by archaeologists), everyday life for most people today is essentially damaging to the natural environment through what environmental sociologist Hasegawa (2004) calls “everyday life pollution.” The sub-title of Annie Leonard’s 2010 book *The Story of Stuff* is even more direct: “How our obsession with stuff is trashing the planet, our communities, and our health.” These processes require a change in how we understand the artifact, eliding the barriers between objects and bodies (Hudson *et al.* 2012, 321). The history of plastics in postwar Japan, for example, cannot be understood apart from the history of bodies contaminated by mercury wastes (cf. Aoyama and Hudson 2013; Walker 2009).

Timothy Morton (2013) has made the most explicit argument that the anthropocene has produced a new type of artifact, which he calls the “hyperobject.” Hyperobjects are “real objects that are massively distributed in time and space. ...[they] are so vast, so long-lasting that they defy human time and spatial scales” (Morton 2011, 80). The scale of hyperobjects breaks the aesthetic distance dividing viewer and viewed that Benjamin termed “aura” (Morton 2011, 83). Hyperobjects are therefore difficult for us to see or to frame yet they “never leave us alone” (Morton 2011, 82). Examples of hyperobjects suggested by Morton include global warming, plutonium and Styrofoam (Morton 2010, 2011, 2013).

Some further characteristics of hyperobjects suggested by Morton (2011, 2013) are as follows. First, they are “viscous,” meaning that they stick to whoever or whatever they touch. This “stickiness” is both physical and conceptual. Second, hyperobjects are “molten,” meaning that they “are so long lasting and so massive that they physically refute the idea that space and time are firm, consistent boxes.” Third, they are “nonlocal,” so massively distributed that they are never in place. Fourth, they are “phased” or “transdimensional.” Finally, hyperobjects are “interobjective,” formed as interactions between more than one entity.

Many hyperobjects proposed by Morton can be clearly linked with the anthropocene. These include mass-produced objects made from synthetic and often very long-lasting materials such as plastics. Other suggested examples—including the Florida Everglades and the Aboriginal Dreamtime (Morton 2013, 1, 69)—are not necessarily linked with

the anthropocene or with any cultural stage or mode of production. While there is room here for discussion (from archaeological and other perspectives) over whether Morton's usage of the hyperobject concept is really consistent, it should be noted that he gives great significance to the role of new technologies in enabling humans to begin to discern the presence of hyperobjects.

How does Morton's concept of hyperobjects differ from existing approaches to artifacts and objects in archaeology? Despite the philosophical complexity of Morton's writings on hyperobjects, it is important to begin by noting that Morton sees them as "real objects," not as semiotic texts. In fact, hyperobjects have a terrifyingly real reality, one that goes far beyond the materiality of heritage that Solli (2011) attempts to rehabilitate in her discussion of archaeology and the anthropocene. Thus, for Morton (2010, 131), "Hyperobjects invoke a terror beyond the sublime... A massive cathedral dome, the mystery of a stone circle, have nothing on the sheer existence of hyperobjects." The scale of hyperobjects makes them profoundly uncanny in the Freudian sense. Archaeology, in contrast, usually sees artifacts as "honest" messages from the past awaiting the appropriate Middle Range theory or hermeneutic circle to unlock their meanings. For archaeologists, a disturbing artifact might be the hot dogs found by the Tucson Garbage Project to be preserved in landfills apparently for several decades (Rathje and Murphy 1991, 114), but Morton's hyperobjects are even more uncanny.

Despite their reality, however, hyperobjects are intrinsically difficult to see or comprehend. Archaeologists emphasize the skills of looking at and drawing artifacts, but hyperobjects cannot necessarily be seen by the naked eye, often requiring new technologies or massive computing power even to identify their existence. As taxonomic tools, artifacts can be used to classify past assemblages and cultures but hyperobjects are too large in scale to be linked with time- or space-specific sociocultural units. Over the very long time scales of their existence, hyperobjects will be concomitant with many different types of society—perhaps more types than archaeology has so far identified.

Several archaeologists have emphasized the importance of the life cycle of artifacts. For Michael Shanks, "The physical processes and changes that occur and accrue to objects and people in their life-cycles are archaeology's *very condition of being*: archaeology is simply not conceivable without them" (Shanks 1998, 17, original emphasis). For Shanks (1998, 19), it is aging and decay that give people and things a common materiality, but hyperobjects do not age or decay in any way that could be called a life cycle. Many studies of material culture, from Heidegger to Hodder, have stressed the active function of artifacts in bringing together humans and things. Yet hyperobjects such as global warming and plutonium are active in a disturbing way that never seems to benefit human actors.

Aspects of Morton's approach to objects were anticipated by Shanks (1992a, 1992b, 1998) some two decades ago, perhaps because of shared influences from romanticism. Shanks' (1998) emphasis on the decay and pathology of artifacts recalls Morton's "dark ecology" in its dark intimacies of decay as an "*essential adjunct to a living past*." Shanks (1998, 28) concludes an essay on artifacts and interpretive archaeology with comments that read as if they could be straight out of Morton: "Herein is a recovery of strangeness (strange-mess) and historical particularity. A pot becomes something unfamiliar, yet still

understandable. And we too are monstrous and outrageous assemblages of material practices, interests, goods and thoughts.” Although Shanks’ work does include some rare archaeological examples of environmental writing (e.g. Shanks 1998, 17–18), he does not pay much attention to Nature as usually defined. Yet his work is very ecological in its emphasis on connections. Perhaps the biggest difference with Morton is Shanks’ argument that archaeology, like Wordsworth’s poem “Tintern Abbey,” “focuses upon the gap between the lived past and its ruin now” (Shanks 1992a). Morton’s concepts of hyperobjects and the ecological thought would appear to rule out any such analytical or aesthetic gap.

Directions

Timothy Morton’s concept of hyperobjects has important implications for our understanding of nature, history and the material. For archaeologists, a pertinent issue is whether hyperobjects really comprise a separate category of artifact. Let us briefly consider Morton’s own example of Styrofoam. The trademark for polystyrene injected with air, Styrofoam was invented in the 1940s and is now widely used for drink and food containers, among other uses. Styrofoam contains styrene, a possible carcinogen (EPA 1994), and is found in garbage on both land and sea in huge quantities. It is unclear exactly how long it takes for Styrofoam to decompose but it will almost certainly take thousands of years. In the ocean, the plastic can break down into small particles that damage marine life yet can also create new ecological habitats for microorganisms—a habitat that has been dubbed the “plastisphere” (Zettler *et al.* 2013).

A more traditional archaeological example of a widely distributed artifact might be “Indo-Pacific glass beads,” a type of bead that was ubiquitous across eastern Eurasia and east Africa for over two thousand years (Francis 2002). Like Morton’s hyperobjects, these beads could be described as “massively distributed in time and space.” Both Styrofoam and glass beads do not easily decompose. Yet Indo-Pacific glass beads would seem to differ from hyperobjects in that the latter are much more inescapable in the environment, their distribution transcending the extensive but particular networks of glass bead production, exchange and consumption reconstructed by Francis (2002). Styrofoam, like many hyperobjects, is also potentially damaging to human and ecosystem health, a characteristic that sets it apart from glass beads. Hyperobjects possess an unusual combination of indifference and danger that may establish them as distinctive artifacts of the anthropocene.

The “indifference” of the hyperobject contrasts with the archaeological concept of the artifact that draws on Marx’s insight that human labour produces things that extend and ultimately *improve* human culture and history. Thus, “It is human labour that transforms nature into objects, creating this mirror in which we can come to understand who we are” (Miller 2010, 58). Yet, hyperobjects would not seem to be able to reproduce a dialectic of cultural progress. Rather than a mirror in which a person can “contemplate himself in a world he has created” (Marx 1975, 329), hyperobjects become like the mirror that sticks to Neo’s hand in *The Matrix*, dissolving our “very capacity to ‘mirror’ things, to be separate from the world” (Morton 2011, 83). Hyperobjects appear alien and oppressive, potentially leading to an indifference of the type proposed by Simmel (1968) for the

modern metropolis, although Morton himself would probably argue that new intimacies with all aspects of “Nature” represent our only ecological hope. Whether or not the hyperobject proves to be a useful concept for understanding the material traces of the anthropocene, there is no escaping the fact that humanity has summoned forth new objects that will affect human and other life forms for a very long time.

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□ The Anthropocene in the Solar System

■ Alice Gorman

Flinders University, Australia

alice.gorman@flinders.edu.au

Observing the anthropocene

Perspectives and data derived from satellites in Earth orbit have been integral to the very apprehension of what is now being called the “anthropocene.” The launch of Sputnik 1 by the USSR in 1957, as part of the scientific programme of the International Geophysical Year (IGY), enabled the first observation of Earth from outside the atmosphere. The data from the early generation of satellites was thus the first ever collected at a global scale, capturing the whole Earth.

During the IGY, more than 20,000 scientists from 67 nations studied solar activity, cosmic rays, geomagnetism, ocean currents and polar ice (Odishaw 1958). As well as new technologies for collecting data in the form of satellites, this monumental effort of international cooperation was supported by computers that could process increasingly large quantities of data in a way never possible before (Lovbrand *et al.* 2009).

In the 1960s, the Apollo era of lunar exploration, images of the whole Earth (first taken by the Apollo 8 mission in 1968) contributed to a growing consciousness of the Earth as a fragile ecosystem surrounded by unforgiving space. James Lovelock was heavily influenced by the Apollo 8 images of the whole Earth and Earth observation data in his formulation of the Gaia hypothesis (Clark 2005, 167). Lovelock’s vision of Earth as a self-regulating feedback system was foundational in the emergence of Earth Systems Science as a discipline (Lovbrand *et al.* 2009).

Earth Systems Science is sustained by satellite data and its analysis; and it is this data which has allowed the measurement of global changes now attributed to anthropogenic effects (Vince 2011, 34). Satellites have been integral to both defining and characterising the anthropocene.

Spaceship Earth vs ex-orbitant globality

The concept of Earth as a spaceship with limited resources was first popularized in a 1966 book by the influential economic theorist Barbara Ward (1966). In this view, Earth was a hermetically sealed capsule of life: the integration of humans and nature in the Earth system was defined in opposition to the menace of the cold and lifeless space outside. This formulation is still very prevalent in popular understandings; however, it is not the only way to contextualize the Earth. Smolin (1997) argued against the vision of Earth as a living island alone in a dead universe, highlighting the role of stars as the source of light and energy, and the Earth as part of a mobile solar system participating in the greater galactic movement. Clark (2005) pointed to the incursions of Near Earth Objects, solar radiation, meteorites and meteor showers, the electromagnetic phenomena of the northern and southern lights, the tidal effects of the Moon, and the estimated

40,000 tons of cosmic dust which falls to Earth each year, as evidence of “earth as an open system in interchange with a dynamic cosmos” (2005, 166). For him, theorizing “ex-orbitant globality” destabilized the conceptual perimeter of the planet and created an opening for events beyond the human realm.

Since the 1960s, research has also dethroned the Newtonian paradigm of the clock-work solar system. Far from being sempiternally stable, its non-linear mechanics indicate a state of unstable equilibrium; erratic and catastrophic movements of celestial bodies have been demonstrated in the past, and predicted for the future (e.g. Milani and Nobili 1992). While the “anthropocene” creates an anxiety that the Earth has been thrust into a state of disequilibrium from which there may be no return, it could be argued this is the “natural” state of the solar system, rather than an aberration.

The human footprint in space

In any case, the boundaries of Spaceship Earth have already been breached by human activities (Figure 1). As well as satellites in Earth orbit, spacecraft orbit the Moon, Sun, Venus, Mars and several other celestial bodies; there are landing sites on the Moon, Mars, Venus, Titan, asteroids, and comets, and four spacecraft in the region of the heliopause, where the solar wind meets interstellar space. The interchange with the cosmos has been far from one-sided.

In this smear of human culture across the 40 astronomical unit span of the solar system, Earth orbit remains the densest in artifacts. According to figures from NASA, there have been more than 4,600 rockets launched since 1957. The fragmentation of these objects, by factors in the space environment, occasional collisions with other bits of space junk, and deliberate destruction, has resulted in more than 21,000 objects that are larger than 10 cm, a general limit of tracking capability (NASA Orbital Debris Program Office 2012). The estimated population of particles between 1 and 10 cm in diameter is approximately 500,000, while those smaller than 1 cm exceed 100 million. Together, this material is estimated to weigh 6,000 tons, equivalent to 1,000 elephants in Earth orbit. Only 6% are operational spacecraft. And the quantity of space junk is constantly increasing.



FIGURE 1. The human footprint in space (Image courtesy of NASA).

Despite the common perception of space as a vacuum, it is a rich and complex environment. Beyond the atmosphere are high energy cosmic rays emanating from the far reaches of the galaxy, the constant stream of sub-atomic particles that is the solar wind, charged clouds of high temperature gases, swarms of meteors, and atoms of hydrogen, helium and oxygen. The interpolation of spacecraft has added elements, minerals and molecules that are not “naturally” found in interplanetary space. The most common material in spacecraft manufacture is aluminium, the third most abundant element in the Earth’s crust, but absent in the predominantly hydrogen/helium environment of space. Other common materials are titanium, carbon fibre composites, silicon in photovoltaic cells, fuels such as hydrazine, nickel and cadmium used in batteries. If the anthropocene on Earth has involved the redistribution of elements such as carbon and nitrogen, this is also true of the movement of elements from terrestrial environments into space.

As for measuring the extent or impact of such redistribution, at this point in time I can only say that there is “insufficient data for a meaningful answer” (Asimov 1986 [1956]). There are few studies which compare the “natural” space environment to the “cultural” space environment because this is not a question which concerns space scientists. Most satellites focus their gaze either on Earth or far space. Moreover, in order to obtain such data, satellites must be designed to collect it, thus contributing to the very effect they seek to measure in a classic Heisenbergian paradox.

There are more subtle changes too. Satellites are merely the visible component of their core function: the collection and transmission of data in the electromagnetic spectrum. In certain parts of the spectrum, activity has escalated from “quiet” to “noisy” with the proliferation of electronic devices and the increase in satellite telecommunications. Keeping bands of the spectrum clear for scientific and other uses is now a constant battle as spectrum allocation is a critical limit on telecommunications. Again, available data is rarely geared towards assessing the contribution of human activity to the overall electromagnetic character of the solar system. Reflectance spectroscopy in the visible wavelengths has been used to determine that older satellites reflect less blue light due to their rougher, more weathered surfaces (Bédard *et al.* 2010), but this has not been compared to non-human space objects. The rest of the spectrum is regarded as an economic resource.

Extreme anthropocene

In contrast to the anxiety-inducing terrestrial anthropocene, Clark’s notion of “ex-orbitant globality” (2005) creates a positive “space” for new structures, processes, and potentialities. At their most extreme, these might include Dyson spheres and Matrioshka brains. Dyson spheres are planet-scaled shells used to capture a star’s entire energy output for the planets enclosed within it, hypothetically necessary to fuel the growth of a space-industrial civilization (Dyson 1960). Matrioshka brains are computing devices arranged in concentric Dyson shells which encompass entire planetary systems (Bradbury 1997–2000). To build such megastructures, whole planets may be dismantled and cannibalized. Far-fetched this may seem; but there is a reasonable amount of theorizing around such structures, as their detection in this or other galaxies can be taken as evidence of other technological sentient life. Indeed, our own anthropogenic signatures are the very things that might alert such a “civilization” to this “utterly insignificant little blue-green planet” (Adams 2002, 5).

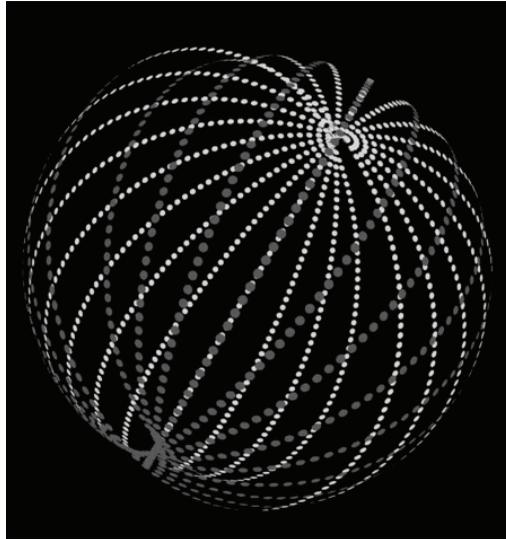


FIGURE 2. A Dyson swarm (Image courtesy of Wikimedia Commons)

A variant of physicist Freeman Dyson's concept is a spherical constellation of solar-orbiting satellites (Figure 2). The assemblage of space junk currently orbiting Earth may be a precursor of such a structure, incohesive and ramshackle, but to the outside observer equivalent perhaps to the Berekhat Ram figurine or an East Anglian eolith: evocative in its similarities, but barely recognisable as a cultural object.

The extension of signals in human-preferred bands such as Ka (26.5–40 GHz) throughout the solar system, but especially in Earth orbit, could be likened to the early stages of Teilhard de Chardin's noosphere (1959), emerging through the interaction of human minds via the medium of Earth observation and telecommunication satellites. Taken to its logical conclusion, Teilhard de Chardin's schema of human evolution approximates the Matrioshka brain as the hardware needed to support human thought is increasingly sustained outside the body.

The anthropocene cannot be understood without reference to space. The Sun, Moon, and electromagnetic environment shape and drive the climate of the Earth. Clark (2005) reminds us that terrestrial processes are inevitably intertwined with the extraterrestrial, and that by breaking the confines of spaceship Earth and allowing space in, we open up an "ex-orbitant" excess in place of perceived limits. Others have been predicting a new paradigm linking Earth and space sciences, a trajectory initiated by the IGY (Davis 1996). With the development of terrestrial space industry, there is now a constant two-way traffic between Earth and space; and their separation no longer provides useful parameters for understanding the impacts of global industry (Gorman 2009).

An archaeological perspective transfigures space into a new entity incorporating elements, minerals, materials and wavelengths created by human activities, which are not separate and removable from an inert Cartesian substrate, but now part of its essence. The terraforming of Earth is the first human act of planetary-scale engineering, despite its unintentional nature. By sending little chunks of Earth matter into space, we are also changing the very fabric of near space by the merest chemical fraction, as the earliest

Archaean photosynthesizing bacteria did 3.5 million years ago. The anthropocene is more than just a new geological era: the archaeologist's lens reveals it to be a cosmological phenomenon.

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▣ The Anthropocene and Transdisciplinarity

■ Jason M. Kelly

Indiana University-Purdue University Indianapolis, USA

jaskelly@iupui.edu

From the early 2000s, the term "anthropocene" circulated widely in both academic and journalistic circles. By 2008, a group of scientists argued that the anthropocene was a useful concept for denoting the measurable impacts of humanity on the planet. They submitted a proposal to the Stratigraphy Commission of the Geological Society of London, lobbying for an official geological designation (Zalasiewicz *et al.* 2008). The Earth, they argued, had emerged from the Holocene; humanity was now living in the anthropocene.

Scholars from across the disciplines quickly discovered the term to be pliant, popular, and therefore useful for a host of different claims and theoretical constructs. Consequently,

rather than speaking of “the anthropocene,” it might be more appropriate to speak of “anthropocenes.” Doing so captures the fragmentary discourses emerging from this debate and sharpens focus on the socio-political stakes in defining the term. This essay argues for a transdisciplinary approach to studies of the anthropocene and concludes by summarizing one example of what a transdisciplinary collaboration might look like.

At first glance, the claim that there are multiple anthropocenes may not be apparent. From one perspective, there either are or are not significant, measurable anthropogenic traces in the geological record. And, consequently, there is or is not an age of the anthropocene. For example, human-induced salinization, arheism, chemical contamination, and a host of other riverine syndromes can be described and measured through historical data sets (Meybeck 2003). And, human transformations of river systems through technology, such as dams, are measurable, contributing to significant transformations of the geomorphology of river deltas and even continental shelves (Syvitski and Kettner 2011). Multiple data points suggest not only increased anthropogenic changes to the planet during the last 250 years, but recognizable global transformations of Earth systems since 1950—a period some term the “Great Acceleration” (Steffen 2005; Steffen *et al.* 2011; Steffen, Crutzen and McNeill 2007; Steffen *et al.* 2008).

However, the introduction of the term into the scholarly and popular lexicon was never going to be a value-neutral proposition. The anthropocene is laden with meaning because it is a historical category. It tells a story, embodies assumptions, and expresses desires about the meaning of the past and the making of the future. The dominant metanarrative is one of modernity—a narrative in which energy- and resource-intensive industrialization and capitalism have been accompanied by population booms, increased flows of goods and peoples, the central role of nation-states, and demands for improvements in quality of life. It is a story in which humans have exploited the environment at unprecedented and ever-expanding rates, soon finding that their local actions have consequences on global scales.

In part, the category of the anthropocene is a discursive critique of modernity’s excesses (Chakrabarty 2009; Dibley 2012). It imposes on modernity the notion of limits, thresholds, and boundaries—an approach sparked by the Club of Rome’s “Limits to Growth” report in 1972 (Meadows *et al.* 1972; Rockström *et al.* 2009). However, the concept still retains many of the intellectual formulations and assumptions associated with modernity. For example, in its critique of nature–society binaries, it assumes that human and natural systems are entangled: humans shape their environments, and their environments shape them. Yet, despite this critique of nature–society dualism, research generally remains anthropocentric. Planetary boundaries are human boundaries—the necessary conditions for stabilizing the planet’s systems for human survival. Likewise, while responding to the worst excesses of technologically induced environmental change, the concept retains much of modernity’s faith in scientific and technological solutions. And, anthropocene research, especially among scientists, has often expressed an interest in geoengineering or bioengineering solutions in order to mitigate anthropogenic impacts and Earth system feedbacks. By extension, this expresses a hope that humans will remain stewards of the Earth, albeit more responsible stewards than they have been in the past.

As a corrective to the assumptions of the anthropocene's dominant metanarrative, criticism has emerged from work by scholars of environmental ethics, environmental justice, and ecocriticism. These critiques focus on the anthropocene as a normative category. For example, the anthropocene, like the concept of modernity, is laden with Eurocentric assumptions against which large swathes of land and humanity are measured and excluded. As such, research in the anthropocene is often more focused on the environmental effects of industrial and consumer capitalism than on the underlying socioeconomic and political relations that make them possible. Moreover, environmental justice research delves into the reasons why global environmental resources have been used and shared unequally and how anthropocene changes to the planet often affect the most disadvantaged. Consequently, a counter-narrative of the anthropocene has emerged—what we might term the “subaltern anthropocene” (Mosley 2006; Sze and London 2008; Ottinger and Cohen 2011; Pulido 1996; Timmons Roberts 2007; Egan 2002).

Despite the fluidity of the term, the anthropocene does speak to a number of key issues. At the heart of most arguments about the anthropocene is a progressivism that seeks to mitigate or reverse anthropogenic environmental change. To varying degrees, anthropocene research addresses global inequalities, whether the approach is framed through neoliberal, postcolonial, or neo-Marxist analyses. It is also policy oriented, and researchers and working groups often work in an advisory capacity to governments and NGOs.

Given the power of the anthropocene as a discursive category, which drives research agendas, policy discussions, and popular perspectives, scholars from across the disciplines have a responsibility to critique its underlying assumptions and claims. One area where criticism might be constructive focuses on transdisciplinarity.

Earth system science has consistently made the claim that humans play a central role in the complex interactions between the atmosphere, hydrosphere, lithosphere, and biosphere. To understand these interactions, scientists have to pay close attention to anthropogenic biophysical systems, which they often refer to as the anthroposphere, designating humanity's central role in the Earth system (Schrader 1919; Steffen *et al.* 2011). It has become common for Earth system scientists to argue for the importance of integrating human systems into Earth system modeling. And, more and more scientific projects include environmental sociologists, archaeologists, or historians on the team. Taking the lead in interdisciplinary approaches is IHOPE, the Integrated History and Future of People on Earth, which is a project of the International Geosphere and Biosphere Programme (IGBP). Since being established in 2003, scholars involved in IHOPE have consistently articulated the position that social scientists and humanists need to be more fully involved in Earth system science (Costanza, Graumlich and Steffen 2007; Costanza *et al.* 2012; Davies and M'Mbogori 2013; Hibbard *et al.* 2010; Hornborg and Crumley 2006; Mosley 2006; Sörliin 2012). Likewise, UNESCO's International Hydrological Program has commissioned a series of studies on water that promise to integrate a broader range of disciplinary approaches (Hassan 2011). In 2012, a report, RESCUE, which was commissioned by the European Science Foundation, Strasbourg and European Coopera-

tion in Science and Technology, Brussels, lamented the lack of interdisciplinary research collaborations and articulated the need for conceptual and methodological disciplinary integration from the earliest stages of new research projects (Jäger *et al.* 2012).

As recognized in the RESCUE report, the social sciences and humanities have typically been auxiliary to the core agendas of scientific environmental research—despite the fact that the environmental social sciences and humanities have been around for decades. For their part, the social sciences have been easier to integrate into scientific research. After all, human population patterns, economies, and governance frameworks are measurable and quantifiable. Likewise, historical and archaeological research have provided quantitative and qualitative data on environmental phenomena for developing and testing scientific theses (Carey 2012). On the other hand ethnography, social and cultural history, environmental ethics, and postcolonial literary criticism have been tangential to environmental science.

This disciplinary divide hampers transdisciplinary environmental research. Not only can the social sciences and humanities correct and amplify scientific knowledge by demonstrating the limits and false assumptions of quantitative work, but they can also provide valuable qualitative research, inaccessible through quantitative methods. Moreover, focused as they are on human agency at both the individual and community levels, they can explicate deep sociocultural constructs. Rather than measuring the effects of human actions on ecology, they seek to understand why humans act the way they do in different cultural, material, and historical environments. Furthermore, in addition to descriptive analysis, the humanities and social sciences bring rich traditions of analytical and critical theory, which make clear the socio-economic and political dimensions of epistemological and institutional expectations and practices. In effect, they play a necessary self-reflexive and critical role in research and policy.

One research project that has adopted a transdisciplinary framework from the outset is the Rivers of the Anthropocene project (rivers.iupui.edu), a collaboration between Indiana University-Purdue University Indianapolis (IUPUI) and Newcastle University. Rivers of the Anthropocene is a comparative study of global river systems since 1750. The project approaches rivers and their landscapes not simply as natural phenomena, but as human artifacts—a human–environment entanglement (Edgeworth 2011).

During the first phase of the project, the focus is on examining the Ohio River and the Tyne River in a global context. It brings together a team of researchers, policy experts, policy makers, teachers, and community organizations to focus on creating a methodological and conceptual model for analyzing anthropocene river systems. The Rivers of the Anthropocene research group follows the recommendations of IHOPE and RESCUE, focusing first on building a transdisciplinary framework, which can be applied to other environmental systems.

Unlike many other environmental research projects, Rivers of the Anthropocene integrates individuals who are embedded in education, policy, and community organization from the outset. These individuals will help shape research methods, but they will also create the framework for educational and community outreach programs. During the first phase of

the project, Rivers of the Anthropocene is working with middle school teachers, teaching development programs, and governmental institutions to create an online interface for middle school and secondary school teachers and students. These groups are embedded in the research project from the outset, and will help translate research and develop curricula. Additionally, the IUPUI team is working with local organizations to develop a community-based service learning project targeted at the White River, part of the Ohio River system.

The power of the anthropocene as a descriptive category can sometimes hide the fact that it is a contested framework for understanding the environment. By focusing on “anthropocenes,” we can elucidate discursive constructs that may limit research agendas. One approach to this would be through transdisciplinary research, which integrates the strengths of the sciences, social sciences, and humanities to constructively question, challenge, and amplify the others’ approaches. Furthermore, following the framework of Rivers of the Anthropocene, which integrates policy makers, secondary school teachers, and community organizations, there is the potential for immediately expanding the reach and local impact of environmental research projects.

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■ The New Age of the Anthropocene

■ Ewa Domanska

Adam Mickiewicz University, Poland

ewa.domanska@amu.edu.pl

The anthropocene (Gr. *anthropos*—human being and *koinós*—new, current) is understood by Paul Crutzen and Jan Zalasiewicz as a new geological epoch/era and a new age of the Earth's history dominated by the human (Zalasiewicz *et al.* 2010; also Davis 2011). This notion is a challenge for thinking about the future of the Earth, human societies and their transformations as well as for reconsidering the goals of knowledge-building and the idea of an academic system adequate to it. It invites me—as a historian—to think about the world (its past, present and future), knowledge-building and the academic system in the frame provided not only by the humanities and social sciences, but also by the natural and life sciences. Thus, next to familiar ideas of living in Eastern Europe in the post-Cold War period, in the era of globalization, I learn that I also live on a "symbiotic planet" (Margulis 1998), in the "geologic now" (Ellsworth and Kruse 2013), in a deep time of a new geological era, as well as in a shorter timescale of a "biological age" (Venter and Cohen 1997; Rose 2013) and in a "neurocentric age" (Becker 2010).

While focusing on anthropogenic climate change, environmental catastrophes, natural disasters, species extinctions and ecocides, the discourse of the anthropocene participates in the critiques of the ideology of human speciesism, mechanistic world-view, and an exploitative attitude toward nature. Paradoxically, the growing interest in the anthropocene (named also as “The Age of Man”), which focuses on the impact of human activity on the Earth, indicates a decline of the anthropocentric paradigm. Thus, in my view, “anthropocenic” does not mean anthropocentric in the sense that human beings have been the central and most important species on the planet. I would say that the idea of anthropocene as understood by scholars of the natural and life sciences (such as Paul Crutzen and Jan Zalasiewicz) is a sign of a shift to a post-anthropocentric (and post-planetary) new age. Therefore we might understand the anthropocene as a human-dominated period of Earth history (on a geological scale) and as a discourse (Dibley 2012) of a “new age of the anthropocene” as signalling a growing awareness among humans of the negative consequences of their domination of all other species and the environment, and attempts to build a more sustainable future (on a historical and social scale). In this last sense the anthropocene is a counter-discourse to modernity and modernization that promises the liberation of human kind by a continuous progress of technology, industrialization, urbanization and rationalization of human–environment relations. Certainly these two understandings coexist and are interdependent.

In the following comments, I propose to focus on three topics: 1) I will consider discussions of the anthropocene as symptomatic of a new age as envisaged in the writings of Russell L. Ackoff, Fritjof Capra, Illia Prigogine and Isabelle Stengers (Ackoff 1981; Capra 1996; Prigogine and Stengers 1984), among others; 2) I will treat the anthropocene as a conceptual platform, meaning a set of ideas and approaches ideal for practicing a new paradigm and building the future-oriented integrative knowledge of a new present and its pasts; and 3) I will indicate the role that archaeology might play in its development.

The new age of the anthropocene: from Humans to Terrans

Future-oriented knowledge presupposes participation in the process of changing human attitudes toward the environment (ecological consciousness-raising). In this context, because of various approaches toward ongoing changes in the Earth’s ecosystems (such as the planetary perspective advocated by the anthropocene) and visions of its future, it is worth distinguishing between Humans (Lat. *humus*—earth, ground, soil) and Terrans (Lat. *terra*—earth, land). Humans belong to the human race; they are the indigenous inhabitants of planet Earth who are living on the planet, and are carbon-based forms of life (as against silicon-based life). Terrans are Earth-born beings only some of whom are humans. Human Terrans might live in off-Earth colonies and space habitats. In the future they might be descendants of Humans. The notion of Terrans symbolizes a post-planetary (or post-geocentric), post-anthropocentric, post-individualistic and community oriented world-view. It considers the nation-state form of social organization as a kind of counter-evolutionary human tribalism and favours a post-national and open attitude toward cooperative co-existence of the many different species in the cosmos.

I situate a growing interest in the concept of the anthropocene and its popularity in the various fields of the humanities and social sciences (art, archaeology, anthropology,

history, geography, literary studies, museology, sociology, etc.) in the context of a paradigm shift (Domanska 2014), as marked by a growing number of turns (neuroscientific turn, biological turn, geological turn, cognitive turn, species turn, turn to non-humans, animal turn, return of things, post-secular turn, etc.), that indicate a more general post-anthropocentric orientation of the avant-garde humanities and social sciences. This paradigm shift might be analyzed in terms of the discourse of the anthropocene as the above mentioned conceptual platform. The success of the anthropocene as a human-dominated period was also made possible by the proclaimed necessity in some fields of knowledge for a change of consciousness (a shift from a mechanistic to an organicist world-view and the rise of ecological consciousness) which perceives the world in terms of interdependency, co-existence and a less hierarchical view of relations between humans and nonhumans and between humans and the environment.

Integrated knowledge as a guide to the future

In the mission statement of the special exhibition planned by the Deutsches Museum and Rachel Carson Center for Environment and Society (opening October 2014), entitled “Anthropocene—Nature and Technology in the Age of Humans,” an important declaration proclaims that: “Beyond the geological interpretation, the anthropocene denotes a new framework of thinking and action, which builds a bridge between the natural sciences and the humanities and which interlinks the history of our planet and humankind with the present and the future” (Deutsches Museum 2013). The exhibition, the organizers declare, will propose scenarios for the future, focusing on such topics as urbanization, food, mobility, evolution, human–machine relations, nature, and also on environmental consciousness. I am interested in two topics that originate from this statement: whether (and how) the notion of anthropocene might provide a “new framework of thinking” that bridges humanities, social sciences, art and natural sciences, and if and how such an “anthropocenic frame” might help to provide a possible scenario of the future dominated by environmental (I would rather say—ecological) consciousness. Let us call this frame “anthropocene biohumanities” (I use this term by analogy to “Anthropocene Humanities,” the title of the 2012 Annual Meeting of the Consortium of Humanities Centers and Institutes, Canberra) and think about it in terms of an anticipatory knowledge of the future. Such an approach is rendered possible by the current multidisciplinary interest in “an ecological enlightenment” that opens a space to create an inclusive, holistic, integrative, and visionary knowledge that combines humanities, social sciences, art and life sciences, cognitive and neurosciences as well as indigenous ways of knowing.

I am one of these scholars who when living in the *new age* of the anthropocene became aware of the need to focus not only on the human cultural past, but also on human-environmental problems and relations between humans and non-humans. Big picture questions need big ideas and innovative, visionary thinkers who would be able to deal with them. Answering such questions requires integrative and holistic knowledge. By holistic I mean here an approach that considers knowledge as an integrated, complementary and transdisciplinary system of scientific, humanistic and indigenous epistemologies and ways of knowing. The Natural Sciences that are usually understood as the study of physical, nonhuman aspects of the Earth and the universe around (astronomy, biology,

chemistry, Earth science, geology and physics) will have to—in the age of the anthropocene—include the human impact on the Earth. So too the humanities and social sciences interested in the anthropocene must, in order to research the phenomena related to it, take into consideration nonhuman aspects of the Earth as studied by natural scientists. In this context William C. Clark, Paul J. Crutzen, and Hans J. Schellnhuber called in 2004 for a new social contract for planetary stewardship between science and society and proclaimed the stage of a second Copernican Revolution and an emergence of a new paradigm (Clark *et al.* 2008; Ayestaran 2008).

A growing awareness of the necessity of building integrative knowledge, complexity science, system thinking, modelling, problems of self-organization and the “new science of networks” have grown in recent years. There are also a number of attempts to create a new metalanguage for such integrative knowledges (note the transdisciplinary popularity of such concepts as autopoiesis, emergence, fractals, self-organization, and complex systems, relations, assemblages). There are already visible changes in the academic system where integrative interdisciplines such as Environmental Studies and Sciences (EES) or Science and Technology Studies (STS) are flourishing. Rapid development of existing hybrid subdisciplines and a growing number of new ones is also observable (biohistory, geoarchaeology, zoohistory, to mention only a view). There are also observable changes of scale and perspective from global to planetary and cosmic on the one hand, and molecular on the other (Molz and Edwards, 2013; Seidl *et al.* 2013).

Along with these developments, we also see a need to reinvent the Humanities—humanities that would help us to construct a viable new worldview. If we are indeed going through the process of a transformation of consciousness, there is a need for a “new science.” However, I would prefer a more inclusive and neutral term—such as knowledge (rather than science)—that embraces the humanities and sciences as well as the kind of practical, adaptive wisdom characteristic of indigenous ways of knowing, the value of which for implementation of a sustainable development has been widely recognized.

The task of building such knowledge is utopian—some sort of collective intelligence or meta-cognition necessary to create an integrated knowledge to guide the future (Van der Leeuw *et al.* 2011); knowledge of—as Bruno Latour says—“how to live together” and “compose a world that is not yet common” (Latour 2005, 259; 2009, 2); and an ability to envision a sustainable future. I agree with Ilya Prigogine, who claims that “what we do today depends on our image of the future, rather than the future depending on what we do today” (Prigogine 2004, 12). Thus we need utopian visions of the future. We need knowledge that not only allows us to better understand the world around us but first of all prepares us for the future-to-come that will be fundamentally different from the present. I would particularly stress the issue of belonging. Following the distinctions between Humans and Terrans mentioned above, the following questions might be posed: Do we still want to be human? Do we have a sense of belonging to the human species? Do we feel solidarity with the species? Do I want to live on Earth?

Anthropocene archaeology

What would an “anthropocene archaeology” look like? What is the function of archaeology in the discussion on the anthropocene? And what is the function of anthropocene

theories in historical/archaeological reflection? I would claim that archaeology is one of these disciplines (next to anthropology and geography) that have particular predispositions to bridge disciplines and play an important role in cross-epistemological dialogue, connecting and integrating the humanities and social sciences as well as the life and natural sciences (Parikh and Hall 2012, 3) with indigenous knowledges. While dealing with the problem of the past, contemporary pasts as well as cosmic heritage, variously understood Earth and space archaeologies (Darrin and O'Leary 2009) are already being affected by a change of consciousness and becoming transformative knowledge (helping to transform the current type of Western science and consciousness) useful for Humans as well as for Terrans.

I would propose to think about the anthropocene as a platform to rethink what archaeology, understood as a particular future-oriented knowledge of the past and the contemporary past, might be. As such, anthropocene archaeology would not only be a critical discourse and a transformative discipline but also a space of cross-epistemological research and advocacy of alternative ways of thinking about heritage, subjectivity, personhood, identity, relations between humans and non-humans, materiality, environment, non-intentional agency, indigeneity, the sacred, tradition, etc.

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□ "The Anthropocene," or, Gaia Shrugs

■ Bruce Clarke

Texas Tech University, USA

brunoclarke@gmail.com

I have placed "the anthropocene" in scare quotes. I hope these markers will remind my reader that I do not mean to demean any of the actual scientific work that has placed itself under the banner of "the anthropocene." The worth of that work, whatever it is, has little to do with "the anthropocene." I do mean these markers to remind my reader that at the moment, "the anthropocene" is a slogan. It has been invented and presented to our attention for a cluster of reasons that are significantly other than scientific. Modernity is full of slogans purporting to demarcate the new and forge a radical break with the old—for instance, "modernity." Thus, "the anthropocene" could always be otherwise. Before we set the thing into textbook concrete for the next half a century, before non-geologists decide to get on the bandwagon of "the anthropocene," we might consider whether we need this term at all. Perhaps better terms already exist but have been pushed aside. Or perhaps another term would marshal disciplinary and popular attention in a manner more appropriate to what the science being performed, under the banner of "the anthropocene" or not, actually turns up.

My opening complaint, then, is that the notion of "the anthropocene" is too entirely overdetermined. It is intrinsically prejudicial. It is a concept literally determined to prejudge the issue between humanity and the Earth, to appropriate the modern Earth system not just for humanity in general, but also for "scientific truth" altogether. If "science" says that we have entered the era of "the anthropocene," then how could any good scientific citizen deny that we humans have put our big feet down upon on the neck of the Earth for all time? Sarcasm aside, can good science really be done over the long term under a banner that prejudices its outcome?

The article "Anthropocene: An Epoch of Our Making" informs us that, to culminate human possibilities opened by the Holocene epoch, an entirely new geological epoch named just for us has come into existence at last: "No longer constrained by the ice age, humans were free to finally make their mark. And make their mark they did... At some point, we graduated from adapting to our environment to making it adapt to us" (Syvitski 2012). Its venue, *Global Change*, is the monthly magazine of the International Geosphere-Biosphere Programme (IGBP), the globalized administrative superstructure

coordinating governmental and academic activities relating to its primary scientific expression, Earth System Science. But for all the international scientific weight being tossed around in *Global Change*, this article is essentially a puff piece. Its aim is certainly to proclaim the importance of the IGBP, but it does so not in any direct manner of organizational self-promotion. Rather, the IGBP is promoting itself through the programmatic triumphalism of “the anthropocene.”

The “Global Change” page of the IGBP website declares: “Earth behaves as a complex system. Complex systems can respond abruptly to changes within the system—these abrupt changes can be highly non-linear. There is strong evidence that the Earth system is prone to such abrupt changes” (IGBP n.d.). Who can argue with the basic importance of this mainstreamed and sanitized paraphrase of some key, albeit hoary, fundamentals of Gaian science? In *Gaia: A New Look at Life on Earth*, the chapter “Cybernetics” applies systems theory as a heuristic in a “search for Gaia.” Still unsettled then was the overriding issue whether there actually was an Earth system. If found, what Gaia would be is precisely a planetary system, an entity with some significant level of operational closure, as opposed to merely an Earth object, a hunk of traditional geology with an overlay of living beings but without closed systematicity. Let’s recall some of his discussion there:

Cybernetic systems employ a circular logic which may be unfamiliar and alien to those of us who have been accustomed to think in terms of the traditional linear logic of cause and effect... The key to understanding cybernetic systems is that, like life itself, they are always more than the mere assembly of constituent parts. They can only be considered and understood as operating systems... The greater part of our search for Gaia is concerned with discovering whether a property of the Earth such as its surface temperature is determined by chance in the open loop fashion, or whether Gaia exists to apply negative or positive feedback with a controlling hand. (Lovelock 1979, 50, 52, 61)

There does now seem to be a consensus that Lovelock’s search for Gaia—or something so close to Lovelock’s description of it as to be its co-evolutionary twin—has been successful. The Earth has indeed been found to be an Earth system with a panoply of feedbacks interconnecting biotic and abiotic systems into metabiotic ecosystems whose sum effects at ever-larger scales are arguably regulatory at the planetary level. And yet, that the Earth, as it supports a planet full of systemic complexities, is itself the system that arises as the sum effect of the operations of all those variegated subsystems—this recognition now fades into a commonplace. The full force and profound implications of a biosphere operationally integrated for over three billion years with its atmosphere, hydrosphere, and geosphere under the fall of solar energy—in relation to which the emergence of *Homo sapiens* is a rather minor detail—is allowed to dissipate, while human self-importance pushes its way back to the front of the line. The simple truth Lynn Margulis and Dorion Sagan state at the conclusion of *What is Life?*—“humans do not dominate but are deeply embedded within nature”—is brushed aside (Margulis and Sagan 2000, 242).

The current publicists of Earth System Science tend to forget where their science comes from and what the point of it is supposed to be—not the glorification of humanity rising above the rest of the system but the reintegration of humanity into the Earth

system. By and large, the seminal contributions of Lovelock, not to mention his essential American collaborator Margulis, are buried in silence, or relegated to obscure endnotes and sidebars. Too often, Earth System Science does Gaia theory without Gaia, cybernetics without cybernetics, and systems theory without systems theory. Too much of Earth System Science, despite its “integrative” program, compromises on the fully planetary geobiological implications of the integrated systematicities of the Earth. What makes this situation glaringly obvious and that much more disheartening is this sudden vogue for “the anthropocene.” After over a decade of IGBP hyping, its meme, as they say, has begun to go viral.

To speak to the immediate audience for this particular Forum, in a modest way “the anthropocene” is certainly conceivable as a concept indicating a potential threshold for archaeological stratigraphy. Still, I would suggest keeping one’s distance and coming up with something detached from the IGBP milieu. For, as the geological concept the Geology part of the IGBP would have it represent, the notion of “the anthropocene” is a dubious instance of conceptual retrenchment as well as of the contentious disciplinary politics of the academy. Note that the notion of “the anthropocene” detaches the Geology from the Biology component of the IGBP, except insofar as human beings are to stand for the whole of Biology. This particular anthropocentric absurdity dissolves once again the integrative aims this scientific consortium is purportedly working toward.

The vogue for “the anthropocene” is driven not so much by the sheer science of the matter as by the business of doing science under globalization. As I suggested at the beginning, it is largely a nominal issue, an exercise in rebranding. As such, it is also an advertising slogan for particular constituencies doing the usual scientific fundraising. Its most important contribution may be in “raising the alarm” about anthropogenic global change. But if so, it is going about it all wrong. The proper alarm has to do not with the planetary effects so much as with the anthropogenic causes. These are precisely the ill consequences of human self-conceit and presumption of mastery and control over the foundations of the viability of the biosphere. Until and unless we humans become ourselves integrated members of the microbial guilds, we will never have definitive control over the viability of the biosphere. Moreover, “the anthropocene” deflects Earth System Science from its Gaian inspiration and renders it safe for institutionalized anthropocentrism in the form of globalized Big Science as usual. “The anthropocene” is a last-ditch firewall against the hard truth that humanity does not possess any “controlling hand” over the Earth system. The Earth system is the emergent deep evolutionary sum of the biota altogether in its ecosystemic integration into the planetary environment. Big Science in the service of globalization is simply not going to send the word upstairs—the word that Margulis sent to Lovelock in 1971, confirming his hunches (see Clarke 2012)—that the biosphere is run by the microbes, and their concession is not co-optable.

Expounding the paleobiology of Gaia theory, Margulis and Sagan note that oxygen “was only released into the atmosphere once blue-green bacteria evolved a way to use energy from sunlight to break apart water molecules (H₂O) to grab their precious hydrogen... Earth’s atmosphere thus became an extension of the metabolism of evolving bacteria” (Margulis and Sagan 2000, 89). Throughout the eons, the evolution of Gaia has been driven hardest and longest by the ongoing evolution of bacteria, whose lateral

gene transferability and other natural genetic-engineering tricks need no neo-Darwinian mutations to rearrange themselves or the outcomes of their interpenetration with an evolving environment (see Shapiro 2011). After all, it was the bacteria that “mastered nanotechnology... We humans do not ‘invent’ patentable microbes through genetic recombination; rather, we have learned to exploit and manipulate bacteria’s ancient propensity to trade genes” (Margulis and Sagan 2000, 92–93). Here again, unable to control ourselves, let alone Gaia, we humans give ourselves way too much credit. We may of course take most of the credit for the current spate of global warming and other pestiferous environmental indignities. However, the potential destruction of the viability of the biosphere for legions of species along with ourselves is not really to our credit.

I will desist with a last word from Margulis on this topic of human self-delusion: “The Gaia hypothesis is a biological idea, but it’s not human-centered. Those who want Gaia to be an Earth goddess for a cuddly, furry human environment find no solace in it” (Margulis 1995, 140). She was reacting of course to certain eco-feminist or New Age responses to scientific Gaia discourse. Attracted by the anthropomorphism of Lovelock’s appropriation of “Gaia” from the Greek, they wanted “Gaia” to conform to ideological agendas for which it was entirely inappropriate. That was then. What is “the anthropocene” right now if not the masculinist obverse of the Earth Mother? Witness “the anthropocene”—a neo-patriarchal, equally inappropriate all-powerful geo-engineering father figure making Earth System Science safe for (hu)man-centeredness. Under the banner of “the anthropocene,” Earth System Science bids to submerge the extra-human planetary cybernetics of Gaia—its proper object—under an all-too-human fantasy of control theory.

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□ Archaeological Stratigraphy: A Paradigm for the Anthropocene

■ Edward Cecil Harris

National Museum of Bermuda, Bermuda

scaurbda@me.com

It may be of interest to geologists that since the 1970s archaeologists have elucidated their own science of stratigraphy, which has necessitated major developments from basic principles borrowed from geology in the nineteenth century. Thus *Principles of Archaeological Stratigraphy* (Harris 1979) could well underpin the call for the “anthropocene” and provide a major paradigm for its justification as an era in the geological record, albeit of anthropogenic origins.

In many places on the Earth, an unconformity, or dividing line (surface), can be observed between stratification formed by Nature and, usually superimposed, that which is largely the result of human interaction. Such *archaeological stratification* should be a profound reason for the recognition of an anthropocene era, as stratification otherwise is central to the definition of all geological periods. In the 1970s, the recognition of a distinctive *archaeological* stratigraphy changed the paradigm of the science in archaeology and has provided the means by which the anthropogenic stratification of an anthropocene era can be competently studied.

Archaeological stratification had its beginnings when humans entered the geological arena and brought about a revolution in the process of “earth-building” that had previously been carried out only by natural agencies. That great change in the stratification of the Earth had several significant aspects that serve to define archaeological from geological stratification. First, people began to manufacture artificial objects that did not conform to evolution through natural selection; second, by their building works, humans defined preferential areas of use and thus a new type of stratification was born, not of natural forces, but of cultural proclivities; third, such building included the excavation of pre-existing stratification, not by processes of erosion but by cultural preferences, thus altering geological deposits and surfaces in the creation of new forms of stratification.

That revolution, which occurred in different times in different places, separates geological from archaeological stratification, the natural from the cultural. When humans began to excavate and build, features would eventually be found in the stratigraphic record that have no geological basis or equivalent. That revolution and its continuing results in the ground should be central to the discussion of a proposed anthropocene era.

In archaeology, the primary task of the gatherer of evidence from stratification is to place the surfaces and deposits of such physical remnants of the past into a sequence in relative time. To determine such relative sequences, archaeologists took a fundamental axiom, the Law of Superposition, from geology and applied it in a general way to answer the central question of relative time, namely, “which came first?” of any two stratigraphic units. That axiom was wedded to the concept of the section, or column of

stratification, used in geology to show the stratigraphic sequence, or rather the sequence of stratification, at a particular spot. The representation of “stratigraphic sequences” on archaeological sites came to rely on the section, which continued as the main stratigraphic paradigm into the 1970s. However, sections have only a single dimension, being the physical one of height, or depth of stratification, and only at one particular plane of a site where the section was cut. Sections are only one part of a stratigraphic end, namely the compilation of the stratigraphic sequence of a site. From the evidence of the deposits *and surfaces* in a section, in combination with all other stratigraphic data of a site, a sequential sequence in relative time can be compiled.

As time is not manifestly visible, unlike the features of a section, it must be “seen” in a diagram. Since 1973, such illustrations became possible through the use of the Harris Matrix, arranged with due regard to new principles of archaeological stratigraphy, developed over the next five years (Harris 1979). The key to compiling such sequences is the recording and analyses of surfaces, rather than sectional data, as surfaces define the entirety of deposits and on all sites there will be more surfaces than deposits. The overlooking of the value of surfaces in stratigraphic analysis was a disaster for archaeology, for much stratigraphic data was destroyed without record, as the importance of surfaces only began to dawn on archaeologists in the 1950s and was only stated to be of unequivocal importance in stratigraphic analyses in the 1970s.

The deficiency in the recording of surfaces led to “single-context” planning, or as might be more correctly stated stratigraphically, “single-surface” recording. By this method, every surface on an archaeological site is recorded individually, with a hard line on a plan indicating its boundary and some spot-heights placed on the drawing as relevant to mark the topography. Many surfaces demarcate the upper, or outer, boundary of a deposit, but many surfaces are only surfaces, as they are stratigraphic units that result from the destruction of pre-existing deposits, not the deposition of new ones. Unlike a composite (“open-area”) plan, which presupposes a surface phase in a site before the analyses of artifacts, no such subjective judgment has to be made in the recording of single-surfaces. Without the recording of single-surface plans, the construction of a stratigraphic sequence for a site could be almost impossible, especially if it is attempted after an excavation is completed.

The Harris Matrix changed the paradigm of stratigraphy in archaeology in several ways (see Lucas 2001 for an historical overview). The first shift was to change the emphasis from geological axioms to archaeological ones, for the Matrix and its associated concepts called for a science of archaeological stratigraphy, independent from geology. Secondly, it compelled the change in the analytical paradigm from the section to the plan, from that of the one-dimensional paradigm to that of the two dimensions of the plan or map record. Lastly, the major change to the stratigraphic paradigm in archaeology came with the addition of *time*, for the Harris Matrix drawings (stratigraphic sequences) represent all four dimensions of the stratification of an archaeological site.

The Matrix also ushered in the general use of the phrase “stratigraphic sequence,” for that is what its diagrams represent. Prior to that, sections were considered to represent the stratigraphic sequences of sites. However, sections must be translated into stratigraphic sequences, for they are but the physical manifestation of relative time. As time is not manifestly visible, it must be viewed in a diagram of relative time, such as a

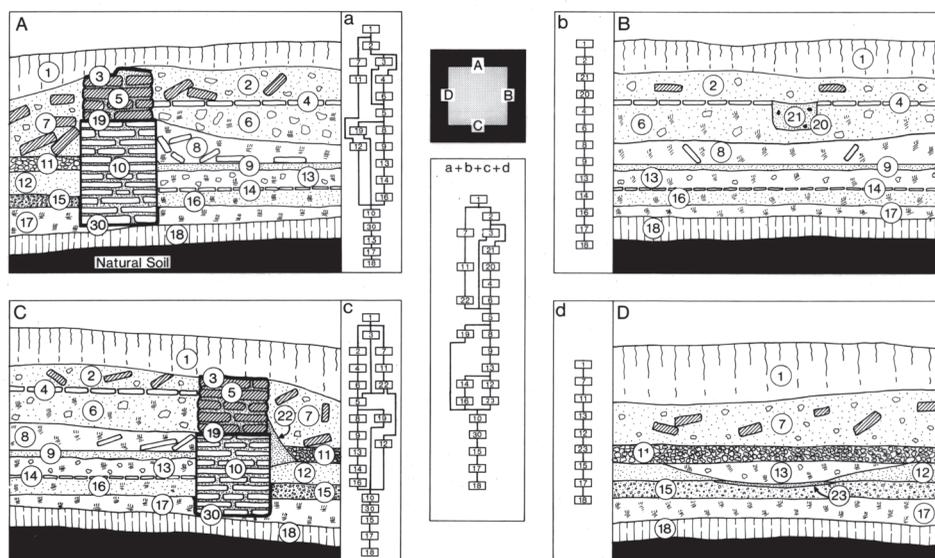


FIGURE 1. Illustrating the paradigm shift from the section to stratigraphic sequence (Harris Matrix diagram), four sections, usually treated in isolation are in fact a single entity: from each a stratigraphic sequence is produced, but then combined into the single stratigraphic sequence for this 'site' of four sections.

clock face or a Gregorian calendar. The Harris Matrix is the only way to see time on an archaeological site and therein resides its central value to archaeology. Every site has a unique stratigraphic sequence and that is a major part of its value to the understanding of past events, as encapsulated in anthropogenic stratification. As the Harris Matrix initially works only with regard to stratigraphic principles in the construction of such sequences, it is of universal application, for the making of a stratigraphic sequence can be done with regard only to the stratification and without regard to the cultural or historical import represented in, or by, the stratification.

The development of the Harris Matrix system and single-surface planning culminated, with other factors, in the call for, and definition, of an *archaeological*, rather than geological stratigraphy. While some might argue for various later dates for the beginning of the anthropocene, it is here suggested that a fixed date is irrelevant or changeable in the first instance, when considering what should be one of the fundamental facets of the evidence of such a new era, namely the change in the nature of the stratification of the Earth. The start of the anthropocene should thus perhaps be defined by the stratification made by people that is superimposed upon, or destroys, pre-existing geological surfaces and strata. Such a date for the start of the anthropocene would be diachronous, as the boundary between fully geological stratification and that made by people changes from place to place. However, it is suggested that the anthropocene should be defined in large measure by reference to the human stratigraphic record, much of which is easy to distinguish from geological stratification, even if there is other evidence of change that might suggest different periods within the era, such as climate change.

This discussion may not sit conformably with some present definitions proposed for the new era, as, for example, defined by the "Working Group for the Anthropocene." Those

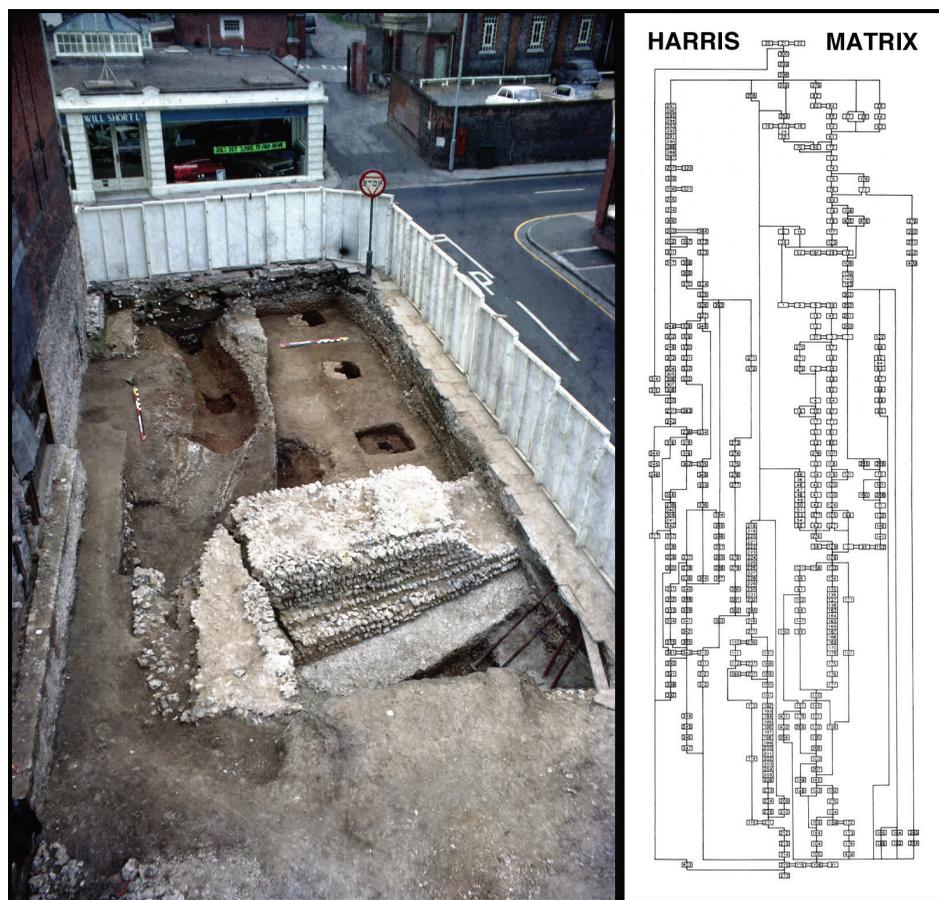


FIGURE 2. The first stratigraphic sequence (Harris Matrix) ever made for an archaeological site was compiled in 1974 by Edward C. Harris.

concentrate largely on the human effects on the (largely non-stratigraphic) environment, especially as ushered in around 1800CE, dating the start of the Industrial Revolution in Europe. The geological emphasis is partly encapsulated in the “current definition and status,” as stated on the website of the Working Group for the Anthropocene (n.d.): “to be accepted as a formal term the ‘Anthropocene’ needs to be (a) scientifically justified (i.e. the ‘geological signal’ currently being produced in strata now forming must be sufficiently large, clear and distinctive).” The assumption seems to be that such signals have the same starting date around the world, although captured in strata of a diverse nature, and that such “signals” will survive the passage of millennia, to become part of a largely enduring geological stratification.

If such signals are being captured in geological strata, they are very likely to appear in archaeological stratification as well. Anthropogenic strata are, it is suggested, some of the more recent expressions of the stratification of the Earth and therefore might be considered as a new type of geological phenomena. Others think of the anthropocene as the effect that humans are having on “biological, physical and chemical process at and around the Earth’s surface,” or on the “Earth System” (Zalasiewicz *et al.* 2011,

1036–1037). Yet surely when the dust has settled, the greatest signature of a new dawn in the stratigraphic composition of the Earth will be the actual stratification made by humans around the globe, long before any industrial or nuclear ages and relentless in its continuation of anthropogenic “erosion” and “deposit.” That stratification, so evident in numerous places around the globe, would surely be enough scientific justification to declare a new geological age, based upon such stratigraphic records, the human species being undeniably with Nature the other major creator of stratification on Earth.

The presence of such archaeological stratification should be included in any definition of an anthropocene era and would in no way undermine other concepts for sub-periods within that period. Rather, archaeological stratification would define the overall era and would have different starting dates in different places, while sub-periods would be defined by evidence of the introduction of new agents of changes, as those wrought, say, in the nineteenth-century Industrial Revolution. If we are discussing a “-cene” related to humans since the beginning of their time, rather than, say, a later “nuclearcene,” then the fundamental role of archaeological stratification should not be left out of the equation in the call for definitions of an anthropocene era.

The foregoing leads to the assertion that archaeology had already started to define the anthropocene era before geologists and others decided to name it so. By staking a claim to the necessary independence of archaeological stratigraphy from geological stratigraphy, it may be suggested that the concepts defined in *Principles of Archaeological Stratigraphy* in 1979 began to outline such a new era and defined the methods by which the stratification of it can be studied and archived. Simply put, an anthropocene should be synonymous in part with archaeology, from the very dawn of the first digging, deposition and surfacing made by humans, such as survives in the record of archaeological stratification. The associated principles of archaeological stratigraphy should thus provide a major paradigm for the study and elucidation of many aspects of the proposed new anthropocene era.

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▣ Archaeology and Anthropocene Discourses

■ Victor Joaquin Paz
University of the Philippines
victorpaz67@gmail.com

The coining of the anthropocene was a clear attempt to further highlight the effect of humans on Earth's history. Specifically the proposal is for a refinement of the current accepted geological periodization. Its advocates have the objective of integrating the formulation as a geological epoch (Steffen *et al.* 2011), and as a concrete strategy for the public to appreciate the extent humans have transformed/destroyed the world (Balter 2013, 262). Proponents aim to have the epoch universally accepted within the Quaternary Period of the Cenozoic Era. The body that decides on geological periodization, the International Commission on Stratigraphy (ICS), is considering the concept, but wants more substantial proof of where the "golden spike" to mark the start of the anthropocene should be placed stratigraphically. The arguments are strong for its validity, and as discussions unravel, the most serious point of debate is the question of beginnings.

It is a complicated discourse with advocates agreeing that there is a need to be aware of the devastating, or at least, radical affect our species is having on the planet. Some within the nature and wildlife conservation community are wary of the anthropocene campaign. They think that it may lead to an attitude of indifference, or at least complacency, in the part of policy-makers and institutions. Proponents of this view fear that, if we accept that the Earth has already been totally transformed by human agency, there is no serious necessity for conservation (see Caro *et al.* 2012); while accepting that humans have greatly transformed the planet, there are still places on Earth relatively unaffected by human agency which are worth conserving.

We in archaeology are trying to situate ourselves in relation to this potential change to geological periodization. In the present forum we would like to see how the archaeological discipline/method engages with the idea of an anthropocene, and to ask if it is possible for archaeology to contribute to substantiating, critiquing, or reworking the idea.

It is not really the place for people outside the Earth sciences, such as archaeologists, to independently re-formulate the existing definition of the anthropocene, nor to challenge its formulation. The coining of the term came from the Geosciences, and therefore they set the parameters. It was argued by Crutzen (2002) that the anthropocene started at the beginning of the European Industrial Revolution—the analysis of polar ice cores showed the start of a growing global concentration of carbon dioxide and methane. This was substantiated with a long list of indicators showing sudden increases in value, such as urbanization, damming of rivers, number of motor vehicles, and so on, though most of the indicators mentioned have dramatically increased only since the 1950s, during what is called the "the great acceleration" (Steffen *et al.* 2011, 851). It is further argued that we cannot definitely push the anthropocene further back in time to the origins of

agriculture or the Pleistocene megafaunal extinction for the simple reason that the impact of these markers for global change did not involve the functioning of Earth's system as a whole (Steffen and Grinevald *et al.* 2011, 847; Steffen, Crutzen and McNeil 2007, 614).

However, there are those who argue that the stratigraphy of the anthropocene can be investigated through the study of artificial ground, especially if the start of the epoch is seen as diachronous, which they argue may also be the case for most other epochs and periods in geology (Price *et al.* 2011). This emphasizes regional rather than the global bench-marks for establishing the start of the epoch.

From the standpoint of archaeology the smaller-scale approach is attractive for it fits the archaeological scale of study. Having said this, the discourse is not profoundly relevant given that we already locate human history, in its totality, as a central concern of our study of the past. From our perspective, everything must have a certain amount of anthropogenic agency. Nevertheless we can expect discussion on these points within the Working Group set up by the ICS, composed mainly of Earth scientists but now with some contributions coming from archaeologists too (Balter 2013; ICS Working Group 2013).

If the Earth sciences are understood to have set the agenda and parameters, then the 1800s can be taken as the start of the anthropocene. In this matter, archaeology's contribution is to substantiate what has been defined. We could present data, mainly through proxy evidence, for conditions that may have helped usher in the anthropocene, such as an increase in greenhouse gases.

In Island Southeast Asia a good focus of study would be the plantation systems that were established throughout the colonial era. Each system of plantation had particularities depending on the mono-crop under propagation, and its impact was undeniably strong on the societies as well as the environment (see John and Jackson 1973). The tobacco monopoly that started in the late sixteenth century in large parts of Luzon, Philippines, was the general model for the various applications of plantation systems by the nineteenth century across the region (De Jesus 1980, 105–107). Tobacco, together with corn, sugar, oil palm, and other cash-crops were transforming the landscape via the plantation system in places such as Java, Borneo, and the Malay Peninsula (see Tate and Berhad 1996; Port Numbay International 2013).

We could therefore easily develop research strategies that involve looking for evidence of forest clearing in specific landscapes through pollen records, crop-remains identification, phytolith and plant macro remains studies. This is especially useful for places where the written records are silent or ambiguous. The presence of these archaeological assemblages in secured stratigraphic horizons from the eighteenth and nineteenth centuries could help support the argument for human-induced biospheric change. The study of urban centres, former colonial settlements and their corresponding human remains assemblages could help substantiate but not re-define the anthropocene.

The issue, again, goes back to the scale of study. For the anthropocene-related changes to be recognized, geographic patterns must be demonstrated at a geological scale. It is not like archaeology adopting stratigraphic principles from geology where we redefined stratigraphy in both scale and matrix composition—in this case we truly managed to make it our own. But what is the use of adopting the anthropocene when human

agency is inherently central to everything we study? We would be better off improving our own periodization and applying geological time scales only when the subject is truly relevant for such a reference. If we are studying human history purely as part of an ecosystem, then yes, it is appropriate to use the anthropocene as a time-period marker. It is moot to say that we do not just study the past in these terms.

From the scale of direct archaeological interest, this question about the anthropocene reminds me of the attempt to use the human geography model of Ester Boserup (1965). Boserup defined intensification of agriculture as an increase in agricultural productivity per unit land/labour. Attempts to see intensification of agriculture in archaeology became a focus of interest in Southeast Asia and the Pacific (Kirch 1994; Bodner 1986). Archaeologists were trying to understand what fuelled dispersals and eventual social stratifications, which may have led to the development of different social classes in antiquity. Extensive reviews and critiques of this discourse were put forward from an archaeological perspective and from geography. Central to the debates was the question of whether intensification could actually be measured from archaeological data. A consensus eventually emerged in which it was agreed that the original definition from geography should be maintained. Rather than agricultural intensification, agricultural transformation has come to be seen as a more appropriate description when looking at the phenomenon archaeologically (see Leach 1999; Bayliss-Smith 1985). By the late 1990s, the interest in applying agricultural intensification in archaeology based on Boserup's formulation had largely died out. I sense that the archaeological angle concerning the beginnings of the anthropocene may take the same path.

I think that there is no serious point of critique, or need to re-formulate, the concept of the anthropocene. And as already mentioned, it is a more productive exercise, I believe, for us to improve archaeology's own periodizations rather than adopt/claim a geological period or epoch. The question begs to be answered: are we simply users of geological/environmental science periodizations rather than formulators of our own way of organizing our data and knowledge of the human past? Indeed there are some overlaps in our respective periodizations, but nevertheless they are not the same. The internal logic of the geological periodization is different from an archaeological one, which gives clarity to the appropriateness of use of labels from one or the other periodization. As a negative example, many in our discipline use the term "Holocene" to refer to their period of study even when their study has nothing to do with climate-change or related ecological/environmental effects. Could this be due to a quiet distrust of the Three Age System and an associated preference for a periodization which they think is less problematic? Or could it be an outright ploy to sound more technical to the general readers?

In our part of the world, we have serious problems with the Three Age System; equally, adopting a hybrid geological-archaeological periodization is not the way to go. We must start developing more contextual time-period concepts based on confidence in our own archaeological data. We must be clear, like our Geoscience colleagues, on the reasoning behind our organization of knowledge, which I sense, all the expanded/modified periodization coming from the nineteenth century (including the geological periodization) as yet fails to do. This may be mainly due to the universalizing tendency of these time-organizing approaches, and may also be due to the appeal of the universal

nature of the geological periodization that entices some of us to adopt it.

We may witness the formal acceptance of the anthropocene, as a geological epoch, by the year 2016. I argue against the thinking that this new geological epoch is how archaeologists should label this period of time. Nevertheless, there is room for the use of the label in archaeology for specific studies of the human past. Archaeology can use the anthropocene when relevant, but as defined by geology and nothing more. We must celebrate the fact that more data and synthesis are coming out from various communities of archaeologists that are rooted in various regions of the world, and that it is just a matter of time before we would be able to have a better periodization more relevant to the questions we are addressing, and to the general history of humans—whether with direct relations to ecology and geology or not.

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□ The “Wild” Continent? Some Discussions on the Anthropocene in Antarctica

■ Andrés Zarankin

Universidade Federal de Minas Gerais, Brazil

zarankin@yahoo.com

■ Melisa Anabella Salerno

Consejo Nacional de Investigaciones Científicas y Técnicas,
Argentina

melisa_salerno@yahoo.com.ar

As members of an international research project investigating the historical archaeology of the first human settlements in Antarctica, we are interested in the distinguishing features of the anthropocene in the last continent to be known by human beings. We would like to start the discussion by presenting the ways in which some works (frequently cited by researchers studying the anthropocene in different world contexts) define the situation of Antarctica. In “A Reconnaissance-Level Inventory of the Amount of Wilderness Remaining in the World,” McCloskey and Spalding (1989) held that Antarctica was part of the territory still being mostly shaped by the forces of nature. In “The Human Footprint and the Last of the Wild,” Sanderson *et al.* (2002) regretted not having enough information and excluding the territory from their global map of human influence on Earth. In “Putting People in the Map,” Ellis and Ramankutty (2008) separated Antarctica from other biomes they defined as anthropogenic.

Even though some studies understand human action as responsible for causing the reduction of the ice sheet, the decline of animal colonies, etc. (here it is worth considering the debates on global warming and climate change—Rodger 2013), much of the literature provides an image of Antarctica as a territory on the fringes of what is usually called the anthropocene. Antarctica is associated with nature and wilderness, a reality which is considered almost opposite to culture and human action. This representation helps essentialize the continent, transforming it into a relict of an era when our species had not yet reached all the corners of the world. We argue that the parameters frequently used to “measure” the anthropocene (such as population density, the presence of industries, road and communication networks) end up making invisible a lot of human action in Antarctica. We start from the idea that these parameters are analytical constructions. Therefore, we believe that there is no particular reason to avoid analyzing some other aspects of the interactions between our species and the surrounding world.

The concept of the anthropocene brings human beings center stage. However, it is also true that many researchers using the idea have resorted to the opposition between nature and culture. At least in social sciences and for some years now, the supposedly objective division of reality in binary pairs has been widely discussed (see, for instance,

Latour 1993). Approaching the anthropocene in the context of the irreducibility of nature and culture hinders the debate that the concept should encourage. The anthropocene is frequently defined as a result of the process of human expansion and interaction with different regions of the world, especially during modernity, when there was a change towards systematic and large-scale predation against nature and society (González-Ruibal in Solli *et al.* 2011). This process of expansion and interaction can depend on a series of strategies, including specific ways of perceiving, representing, living in, exploiting, and controlling a given territory. It is worth considering that human beings are not the only active component of the formula: the surrounding world—also shaped by our own actions—offers possibilities and sets limits to what we do.

Antarctica can be certainly defined by some features that distinguish it from other world contexts. On the one hand, it has the largest freshwater reserve in the planet; it is considered to have a substantial amount of unexploited resources beneath the ice sheet (including both coal and oil); and it is home to colonies of several species. On the other hand, Antarctica is an international territory; and it is intended to be primarily used for scientific research. Our project understands that, despite what is commonly said, the distinctive features of Antarctica do not rest on its “wilderness” or in its return to a certain “state of wilderness” (considering that the human history of the continent could have started differently). From our standpoint, its present distinctive features are nothing but a product of the historical strategies defining the human expansion and interaction with the continent.

In general terms, the history of the anthropocene in Antarctica can be divided into two periods:

1. Nineteenth century: It is possible that the relationship that our species has established with Antarctica predated the effective presence of human beings in the region. For instance, we believe that the remains of shipwrecks and other materials created by human action could have reached the shores of the continent prior to the arrival and landing of seafarers. Setting this aside, Antarctica was officially discovered in the early nineteenth century, and archaeologists have not found evidence of previous human visits. The discovery of the territory was the result of an attempt to expand the boundaries of modernity and capitalism (Zarankin and Senatore 2005). Starting in 1819, and at various times throughout the century, Antarctica bore witness to several cycles of sealing and whaling. The exploitation was in charge of companies from different countries. The cycles responded to changes in supply/demand and the availability of animals, considering that once the colonies were brought to the limit of extinction, it was necessary to wait for them to recover.

2. Twentieth and twenty-first centuries: With the advent of the twentieth century, there was a significant change in the strategies used to interact with Antarctica. This paved the way to the scientific exploration of the continent. In the 1950s, several countries agreed to a new plan of management. The Antarctic Treaty (Conference on Antarctica 1959) considered that the territory was of interest to the entire world, and that it should not become the focus of disputes among nations. The plan of management prohibited the development of military exercises, and it set a limit to the economic exploitation of resources. Antarctica transformed itself into an international territory connected to scientific and cooperative research. The population of the continent (that is, the people living in the territory for a given period of time) was concentrated in research stations. Starting with

the Treaty, steps were taken to ensure a responsible management of the environment. For instance, the Madrid Protocol on Environmental Protection was established in 1991, setting forth specific principles to regulate human activity (Protocol on Environmental Protection to the Antarctic Treaty 1991). The intention was that, as far as possible, visitors should only act as spectators (reducing human “disturbance” on nature). The “conservationist” trend persists in the twenty-first century, and today some protocols are being adjusted.

The history of the anthropocene in Antarctica, and the particular transformations in the human interaction with the territory, can be discussed in relation to the case of the South Shetlands. These islands are the closest archipelago to South America, and were the first region of Antarctica to be discovered. Next, we will present some of the results obtained by the international project in historical archaeology “Landscapes in White” (made up of Brazilian, Argentinean and Chilean researchers). We focus on the case of Byers Peninsula in Livingston Island. Livingston is the largest island of the South Shetlands, while Byers represents an area well known for its shores and its history of human exploitation. Starting in 1995, and thanks to several fieldwork seasons, the project was able to survey the three shores of the peninsula (the center is occupied by a glacier). The analysis of material remains and documentary evidence shows:

1. Nineteenth century: Most archaeological remains found in Byers Peninsula correspond with nineteenth century camps for economic exploitation. The project identified a total of 27 settlements, making up the greatest number of archaeological sites on the South Shetlands (Zarankin and Senatore 2007; Zarankin *et al.* 2011). From the time of the discovery until the late nineteenth and early twentieth centuries, the region was the primary focus for sealing in Antarctica. Documentary sources reveal that a single vessel could take thousands of seal skins and tons of oil (Headland 1989). Captains distributed small gangs of workers on the shores. According to archaeological evidence, the hunters



FIGURE 1. Excavation of a nineteenth-century sealers' shelter on Byers Peninsula (Photograph by Zarankin 2011).



FIGURE 2. Members of the archaeological project leaving the research camp (any trace of their presence must be taken away) (Photograph by Zarankin 2010).

built their shelters using local materials. Furthermore, they ate the meat of the animals they killed for the market. Large amounts of animal bones were found in the hunting camps, as well as textile, wooden, metal and glass remains. The stratigraphic distribution of these findings coincided with the dark and clayey sediments which were identified as the human occupation level.

2. Twentieth and twenty-first centuries: The archaeological survey of Byers Peninsula detected very few traces of human presence from the twentieth and twenty-first centuries. Setting aside the areas showing an accumulation of materials brought by sea currents, it is worth considering the remains of a visit conducted by a British research group in the 1950s (including pieces of a sleigh), and the scarce remains of some other scientific camps. The invisibility of twentieth and twenty-first century traces is mainly associated with the application of specific standards for “conservation.” These standards urge scientists to remove every single item they have brought into the territory (including human waste). Many scientists visited Byers Peninsula in the twentieth and twenty-first centuries. However, it is hard to materially recognize their presence. Once a research camp is abandoned, everything should look as “natural” as possible, as if human beings have never been there.

Final remarks

Historical archaeology resorts to the study of material and documentary evidence. It was only through the integration of both sources of evidence that we could approach the distinctive features of the anthropocene in Antarctica (including the South Shetland Islands). Over the course of time, people visiting the continent moved from uncontrolled exploitation of animal resources, to scientific research and a persistent concern for environmental conservation. In the twentieth and twenty-first centuries, the physical presence of human beings intends to be deleted or reduced to the very minimum. We should not

interpret this situation as an absence of human intervention. Maps, photographs, satellite images, research stations, and scientific groups prove that human action continues to be expanded. Hidden under the name of “nature,” the anthropocene intensifies in the region without leaving visible traces. On a global stage, there is widespread concern for the negative consequences of human interaction with the environment. For many years now, Antarctica has served as a laboratory to create specific strategies for sustainability (even though, it is not completely outside the impact of certain phenomena).

The reflection on Antarctica provides interesting tools to critically approach the concept of the anthropocene. As it has been frequently used, the idea seems to equate the history of the interactions between human beings and the environment with increasing physical impact on the latter; and the apparent lack, or the decrease in the abundance, of certain material traces (including the objects, structures, etc. making up the “archaeological record”) with “nature,” or a certain “return to wilderness.” We argue that excluding other variables and standpoints from the analysis ends up creating a generalizing model which masks the multiple trajectories of the anthropocene in different scenarios. It is worth not forgetting two basic ideas in contemporary human sciences: that history does not follow a unique path, and that “cultural” action is clearly diverse in “nature.” The concept of the anthropocene has the potential to shed light on the interactions between human beings and the surrounding world, but it is necessary to make it more flexible in order to grasp the past, present and future of these interactions in its full heterogeneity and complexity.

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□ The Industrial Sonifact and the Soundscape of the Anthropocene

■ Jeffrey Benjamin

Michigan Technological University, USA

jeffreybenjamin@gmail.com

Gnōthi seauton. (Ancient Greek: “Know thyself”)

I should begin with a quick note regarding the re-emergence of the seventeen year—or “periodical”—cicadas into upstate New York, because it is within the fully immersive drone produced by these insects that I am writing this essay. While Schafer has observed that the keynote sound of industrialization is the flat-line drone of electric motors and internal combustion engines (Schafer 1977, 78), these species of cicada (magicicada), calling in mass, offer a heaving and swelling response, surpassing in volume and intensity the sound of automobile traffic nearby, and anything else humans may have to offer. This sound can be so penetrating and powerful, in fact, that some people have been driven from their homes in search of quieter locales. Bernard Krause has presciently discussed the role of human-produced sound in disturbing and displacing the sonic communication of other species, terming these sonic categories “anthrophony” and “biophony” respectively (Krause 1987). As I sit in the woods and listen to these airborne creatures who have been quietly feasting underground since Hong Kong was delivered back to China, I muse that every now and then, biophony can still offer a potent and disruptive response.

Since one of the tasks before us is the formation of an archaeological definition of the anthropocene—its characteristics, distinguishing features and parameters—I would like to suggest that its culmination (and perhaps conclusion) largely coincides with the event of industrialization. It is generally observed that the Industrial Revolution was accompanied by sudden and dramatic environmental degradation (Gordon and Malone 1994, 49) and changes to the Earth. The discipline of industrial archaeology, if approached from an interpretive stance that privileges the preservation of a habitable planet, can be quite helpful in the task of defining the anthropocene. A fundamental challenge for all archaeologists studying historic or contemporary time periods is that an examination of the recent past is tantamount to self-examination; perhaps the most difficult task. It is not too far-fetched to suggest that an archaeology of industry, or the anthropocene, is an archaeology of the self.

The mining engineer turned philosopher Henri Poincaré once observed that “Uniformity is death” (Poincaré 1963, 116) and I would contend that this observation casts a long shadow over the patterns—visible and audible—in the anthropocene, where the disciplined knowledge of geological stratigraphy arguably concedes authority to the stratigraphy of archaeology (see Harris, this forum). While natural non-human creatures, forms and processes can certainly exhibit patterns and tendencies toward repetition, human beings have a demonstrable predisposition towards it, and looking around for

a brief moment one could safely state that human beings live their lives entirely surrounded, directed and defined within fields of repeated forms (Benjamin 2013b). This includes sound forms, for it is the persistence (through repetition) of sound through time that allows us to claim sound as artifact.

While “industrial sound” may initially seem to be a narrow topic for discussion, it should be noted that urban dwellers are generally immersed in it at all times. The imposition of unwanted sound, or “noise,” upon all creatures, human and non-human, and the concomitant sound abatement efforts of the past hundred years, is a distinguishing aspect of the anthropocene. In *The Soundscape of Modernity*, Emily Thompson traces technological efforts to harness and control sound, and suggests that the fundamental sonic transition of the recent past is one of sound to signal (Thompson 2002, 3). This is echoed in an introduction to a recent collection of articles where it is observed that “what changed musical culture most profoundly was electricity” (Hui *et al.* 2013, 4). The resulting ubiquity of music is lamented by one of the characters in Thomas Bernhard’s *Old Masters*:

Our age has witnessed the eruption of total music, anywhere between the North Pole and the South Pole you are forced to hear music, in the city or out in the country, on the high seas or in the desert, Reger said... The music industry is the murderer of human beings, the music industry is the real mass murderer of humanity which, if the music industry continues on its present lines, will have no hope whatever within a few decades... (Bernhard 1992, 59)

Other artists have turned toward the contemporary pantheon of sound forms with interest and curiosity. Composer John Cage’s seminal “4’33” (1952) can be seen as the first Museum of Industrial Sound, for by directing the pianist to remain motionless during the entire performance, Cage has invited all subsequent audiences to listen carefully to the sounds emanating from the nearby environment. As with most forms of perception, an awareness of environmental sound and a capacity for listening stems from individual predisposition. Sound is not a required category of information to be included in archaeological field notes (yet), but individual sounds do have particular qualities, just as distinctive and informative as soil texture and color.

There is a growing understanding that individual sounds themselves, including spoken words, are enduring material entities—“things” if you will, and sounds of the past commingle with “new” sounds (Deetz 1967; Rath 2003; Witmore 2006). When presented with a familiar song, phrase, or sound, we say “I’ve heard that before” for a reason! Up to this point, the discipline of archaeoacoustics has been preoccupied with an investigation of sound-producing spaces and objects (Scarre and Lawson 2006) but has not laid claim to the materiality of sounds themselves.

A sonic artifact, or sonifact as I am terming it, is a cultural or ecological sound form produced by and contextually dependent upon tangible, or “host” artifacts. It is a recognizable, repeatable, reproducible sound, made by people, other life forms or the environment, one that endures through time, with negligible variability (Benjamin 2013a). The term sound form is the actual physical entity of a particular sound. This is directly analogous to Pierre Schaeffer’s “sound object:” an objective thing to be considered separately from both its source and perceiver (Schaeffer 2012).

To apply this concept to the archaeological record of the anthropocene, we may examine one particularly influential sonifact: the bell tone. The tone of a bell strike is a sonifact, while the bell itself, the clapper, and the physical spaces that form the extent and particular characteristics of the sound form constitute the host-artifacts. The importance of the bell's peal in social formation cannot be understated. In *How Early America Sounded*, historian Richard Rath states that for the early American settlers of Jamestown, living within "earshot" of the village bell was a social mandate tantamount to law (Rath 2003, 55). In other words, Jamestown was built within the physical borders of a sonifact. Sound is therefore a structural component of the built environment, and an attentiveness to past sounds (which requires an appreciation of hearing as a primary mode of perception) can help to explain particular aspects of tangible artifacts and features.

Historically, the purpose of the bell tone sound-form extends well beyond the communication of ritual gatherings or alarm. Coded bell-tone patterns regulated industrial and social activity, and their effectiveness in doing so initially provided a powerful impetus for large-scale mineral extraction—aimed towards the production of bell metal (three parts copper, one part tin). The copper-mining region of the upper peninsula of Michigan drew immigrants from all over Europe in the mid-nineteenth century, with the population increasing from 750 to 88,098 over a time span of sixty years in one county alone (Thurner 1994, 64, 158). The first productive copper mines of the region produced ore that was specifically used for the production of church bells in Boston as early as 1849 (Thurner 1994, 45). The extractive industries continue to remove minerals such as copper for the specific use of sound production and electronic transmission of sound. An attendance to and acceptance of sound as artifact in and of itself can help demystify much of what we see in the archaeological record of the anthropocene, although it needs to be asserted that sonifacts do not need visual or tangible validation in order to be seriously considered. An important example for this can be found in the work of archaeoacoustician Iegor Reznikoff, who was able to predictably locate (visible) palaeolithic cave paintings by vocalizing and listening in the complete darkness (Reznikoff 2006, 77). The singular brilliance to this approach points to the lack of sensory and sonic awareness in other investigations. If the archaeology of the industrial era, or the anthropocene, is the archaeology of the self, then it is incumbent upon us as practitioners to drop our cell phones, digital recorders and listen. An over-reliance upon "sensory prostheses" (Witmore 2006, 288) has coupled with a contemporary soundscape characterized by a fully-developed "schizophonia," or "the split between an original sound and its electroacoustical transmission or reproduction" (Schafer 1977, 90), resulting in a lamentable perpetuation of the "starvation of the senses" (Mumford 1934, 180). Reznikoff has observed that "human sound perception...is of unequalled precision" (Devereux 2001, 109) and while the sounds produced by and through the plethora of electronic devices now available merit serious consideration as sonifacts of the anthropocene, recording devices cannot replace the sensitivity and refinement of human audition.

The totality and extent of human produced sound that now envelops a contemporary urban dweller has led to a state where the notion of "silence" is interchangeable with the absence of anthrophony. Prehistoric sonifacts, like the sound of wind in the trees, rainfall, waves, crickets, cicadas are now a sought-after rarity, to the extent that an effort is currently underway to carve out a no-fly zone for the creation of "One Square

Inch of Silence” in the Hoh rainforest in Washington State (Goodman 2010). Tangible artifacts and features of the anthropocene therefore need to be investigated from the point of view of sound production as well as sound abatement. This is, of course, true for prehistoric structures and spaces as well, as the need for privacy and “peace and quiet” is not likely an exclusively modern phenomenon.

Of all of the sonifacts of the anthropocene, perhaps the most powerful and ubiquitous (surpassing even the repeated bell tone) is the spoken word. To quote Poincaré once again:

Men are different; some are rebellious; they can be moved by a single word and remain indifferent to everything else. I have no way of knowing if this decisive word is not the one which you are about to say, and I would forbid you to say it! (Poincaré 1963, 116)

Individual vocal sonifacts (words) still hold court, they maintain a kind of trance-like power, for, although we have heard them over and over and over, it is difficult to recognize them as “old” whenever they appear, for they are generally not co-temporal with each other in a linear sense. They emerge then disappear, then re-emerge, seemingly as a new thing. Husserl specifically uses sound to illustrate the perception of the passage of time:

Every tone has a temporal extension: with the actual sounding I hear it as now. With its continued sounding, however, it has an ever new now, and the tone actually preceding is changing into something past. Therefore, I hear at any instant only the actual phase of the tone, and the objectivity of the whole enduring tone is constituted in an act-continuum which in part is memory, in the smallest punctual part is perception, and in a more extensive part expectation. (Husserl 1964, 43)

This challenge, this unreasonable requirement of sound’s co-temporality with visible and tangible forms, is the main source of difficulty in accepting sounds themselves as enduring and artifactual. Once the challenge of co-temporality is surmounted, what we generally think of as “the present moment” can be seen largely as the kinetic past. This observation should carry no particular shock or novelty for archaeologists or historians, accustomed to “living in the past.” However, in conjunction with mass transmission through electronic signal and an innate human capacity for repetition, vocal sonifacts enjoy a curious authority that seems unabating, and human susceptibility to vocal sonifacts is a defining dynamic that forms and perpetuates the visible and audible patterns of the anthropocene.

The opening scene of the film “Kuhle Wampe,” or “Who Owns the World” (1932), depicts a young man bicycling around Berlin searching for work during a severe depression. His return home is preceded by the ethereal melodic sounds of a pair of musicians playing in his building’s courtyard: one musician plays an organ while another plays a doleful melody with a bow and a handsaw. Having been rendered useless as a tool of work, the saw is creatively transformed into a tool of music and sound production. Theorist Jacques Attali has suggested that the future is heard before it is seen (Attali 1985). Insofar as archaeology is concerned with the future, and as the scale and scope of heavy industrial activity wanes, archaeologists investigating the sonifactual remains of industrial spaces and objects will have a unique perspective into the soundscape of the anthropocene and its audible transformation.

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▣ Anthropocene: Locating Agency, Imagining the Future

■ Zoe Crossland
Columbia University, USA
zc2149@columbia.edu

What work does the image of the anthropocene do; what kind of interventions does it foster, and what does it preclude? As the debates over the term make clear there is some tension between the geological criteria for assessing evidence for anthropogenically wrought change, and the more popular conception of the anthropocene as marking the start of discernible and deleterious human effects on nature (Autin and Holbrook 2012; Brown *et al.* 2013; Gale and Hoare 2012). Geologists search for a stratigraphic

marker visible in the sedimentary history of the Earth, whereas the popular media seize upon signs of human-driven environmental and climatic change that are meaningful in terms of human generations, but not necessarily at a geological time scale. It is not that the two discourses are entirely separable, but rather that they encompass different temporal dimensions. The anthropocene is a contested, complex, and ambivalent terrain for debate, precisely because it works both as a geological marker of change in a discipline oriented toward the study of the present and past, and based on the same processes visible in the present, as a prognostication of potential future worlds. These divergent discourses center on closely related environmental signs, but they have very different temporal emphases. In this piece I would like to explore archaeology's location within the debate, suggesting alternative ways to conceptualize future imaginaries through the juxtaposition of past and present in the material trace.

The early articles by Paul J. Crutzen and Eugene F. Stoermer (Crutzen and Stoermer 2000; Crutzen 2002) were a powerful rallying call. The concept of the anthropocene inserts humanity not just into nature, but into the very bedrock of the Earth itself, that hard and durable nature that is recurrently summoned as a metaphor for things that can stand up to and against human constructions, representational or otherwise. To forcefully reimagine the relationship of humans to what is often imagined as inert matter is a radical act, in tune with the current intellectual emphasis on hybridization and post-humanism or non-anthropocentric humanities (Domanska 2010). There are therefore two issues here; on the one hand the where and the when of the anthropocene, as discussed by Paul Graves-Brown in this forum, and on the other the implications for how history is understood and written.

In his 2002 position piece, "Geology of Mankind," Crutzen put forward the late eighteenth century as the moment when the anthropocene began, even going so far as to pinpoint James Watt's steam engine as a key driver in the process. This located the where and the when firmly in Britain, and within a particular moment of the Industrial Revolution. In locating the anthropocene in the late eighteenth century Crutzen reworked the history of industrial progress, in a well-trodden trope that imagines technology as either the savior of humankind or as a road to ruination. The anthropocene, at least in this instantiation, is a refiguring of the narrative of progress, an inversion that promises an unlivable world (if only for humans and the animals they care about). The narrative is not altered significantly by Crutzen's later preference for atomic evidence, which substitutes 1950 for 1784. It remains a story of disillusionment with progress and horror at modernity's effects (and of course 1950 is also the archaeological date for modernity in terms of C14 dating). This simple inversion is familiar from the very many dystopian narratives about the changes of modernity (Dawdy 2010; González-Ruibal 2006). It locates the impetus for change in Western Europe or the USA, situating the rest of the world as recipients, willing or not, of technological innovations that start in the industrialized metropole and move outwards.

In a recent article Paul Robbins urges us to think carefully about the metaphors that are caught up in the anthropocene concept (2013). This is imagery with a political edge that works to "invert our perspective about human life and environmental order" (307). In its very inversion the concept affirms a Western European and North American tradition of imagining history, haunted as Robbins suggests by the "specter of evolutionism and determinism" (309). The assertion of a recent date for the anthropocene insists on

its origination within the technological centers of Europe and the US, and in this sense articulates a certain denial of coevalness for the rest of humanity, in Fabian's terms (2002). This is expressed in the uneven distribution of human impact as it moves outward from the centre; in the sense of inevitability that the rest of the world must be on the same path, simply further back and with a more murky view of the future; and in the suggestion that if things are to be fixed, then the fix will come again from the same centers of historical change. As Wendy Brown has observed, the loss of confidence in the notion of progress has left no real political substitute (2001, 3). Agency for change remains located in the west, and in masculinized technological innovation; the anthropocene becomes a new way of articulating this, within a well-established trope of dystopia or technological renewal. This fits comfortably within intellectual traditions that view history with a sense of inevitability and direction. This time, however, it is not history at the level of people and culture alone, but rather a history that is written in the sediments of the earth, the currents of the sea, and the gases of the atmosphere, not to mention in orbital space, the Moon, and nearby planets (Gorman, this forum).

Agency as imagined for the anthropocene remains located within a particular place-time, played out through a flickering binary of progress and dystopia. This conservative orientation is, I think, why archaeologists often seem to be uncomfortable with the anthropocene as currently imagined. Critiques of the shallowness of its historical vision articulate an unease with narratives of modernity that privilege particular historical actors and moments. Gavin Lucas suggests that the concept is "retrograde" (Solli *et al.* 2011, 68), and getting to the heart of the issue, Brit Solli notes the irony of using Enlightenment imagery of scientific progress "to solve the problem of global warming with the same mind-set that got us into the problem in the first place" (Solli *et al.* 2011, 43). Archaeological critique has centered on the event-focused orientation of geology's search for the place to drive in the golden spike (albeit events that are not conceived of within the time scales of individual human lives). Instead archaeologists emphasize the longer term history of interactions between humans and the environment (Balter 2013; Smith and Zeder 2013, also see Ruddiman 2003, 2005). Key interventions that have been put forward include the extinction of palaeo-fauna, and the development of farming. This is to recognize human agency in the deep past and in other parts of the world, in an effort to decenter the role of industrialized societies as the somewhat literal engine of history. It is also to position the changes of the anthropocene as continuous with all human history, rather than as a recent rupture congruent with modernity. However, the anthropocene is a political project as much as a scientific one, and to embed its origins in the long history of the Holocene is to spread its genesis, and the responsibility for it, across many different human societies. In shifting the anthropocene out of modernity and into the rest of human history the power of the imagery is undercut, and the ability of the concept to shock people and governments into change seems to be weakened.

The effort to conceptualize anthropogenically-wrought change in more inclusive terms seems then to offer even more problems. On the one hand it undercuts the political efficacy of the image of dramatic environmental change, and on the other it risks scooping up the history of others in the service of our own. How to present a coherent and compelling narrative without endowing history with a direction that ends up again in

the industrialized west? This tension is also present in the recent move toward writing “deep history.” Just as the anthropocene summons a specific future, so these accounts struggle against a teleological account of the present that embeds the current concerns and desires of particular privileged societies and actors far back into the past.

Perhaps the precarious strangeness of archaeological pasts can offer more than closed narratives that end with where we are now, or where we will be in the future. Archaeological traces constitute a vertiginous collapse of past and present (see Olivier 2011), and can push back against the narrative framework of progress and dystopia (Brown 2001; Dawdy 2010). What interests me are the vague and unformed future possibilities that archaeological traces evoke. Archaeology has always already been thinking about the future. Such an archaeological reflection on future worlds can be seen even in the first antiquarian glimmerings of an archaeological project. In his dedication to *Urn Burial*, published in 1658, Thomas Browne wrote,

When the general pyre was out, and the last valediction over, men took a lasting adieu of their interred friends, little expecting the curiosity of future ages should comment upon their ashes; and, having no old experience of the duration of their relicks, held no opinion of such after-considerations.

As the field of archaeology crystallized over the next two centuries, Alain Schnapp (1996) and others (e.g. Lucas 2004; Shanks *et al.* 2004; Thomas 2004) have shown how it grew to be embedded in a vision of progress, in which a particular future was anticipated, and another feared. This is articulated clearly in a stirring report made by John Merewether, the Dean of Hereford at an 1847 meeting of the Cambrian Archaeological Association. Earlier that day some of the members had visited the ruined Cistercian monastery at Strata Florida in Cardiganshire. The Dean gave an after dinner account of the excursion, of which it was reported:

A spot, such as they had that day visited, also raised in his mind thoughts of the most exalted nature... When they looked around them at the wonders of the creation, and the immense progress man had made...they could not fail to be struck with admiration and awe, lest their ruins might in after ages be the only remains of the greatness we once possessed.

(Archaeologia Cambrensis 1847, 359)

In the work of archaeology the traces of a past are encountered and an anticipated future is evoked. This need not be imagined in terms of linear directionality. The gap between a future imaginary that is laid out on a grid of progress, and one that situates the present as one of many possible futures, can be seen in the chasm that stretches over almost 200 years between the Dean of Hereford’s statement and that of Thomas Browne. Browne gestures toward the impossibility of the urn-buriers imagining his future comments “upon their ashes.” The Dean in contrast, dwells not upon the thoughts of the monks and artisans who designed and built Strata Florida, but rather on how future archaeologists would look back and reflect upon the “greatness” of the nineteenth century.

I argue here for an effort to recapture those evanescent moods, those feelings of possibility that cannot be articulated fully in words and that can evaporate within changed circumstances. This is not to make a call for a return to an antiquarian imagination, but

rather to foreground the way in which archaeological traces act as an augury of the future. Like the ruins of Strata Florida, the geological markers of the anthropocene are portents. They are traces that evoke a feeling of potential, material signs deployed to cultivate a disposition toward the future, building upon that feeling as a way to effect change. The efforts made to embed humanly-wrought change in science and geology just illustrate the importance of these dimensions for effective prognostication within Europe and America. The fact remains that whether one analyzes viscera or geological formations, the future can never be known, only anticipated or not, as Browne realized. This is not to deny the veracity of claims about climate change, but rather to understand why some continue to deny its reality. In order to make forecasts and project the direction of change, past patterns must be established and understood. Forecasts rely on careful attention being paid to the relationship of the signs of the future to those of the past that exist in the present. However, no matter how much care is taken in understanding and extrapolating from the signs of the past, conditions can always change and disrupt any perceived configuration.

The traces of the past therefore provide the ground for imagining the future. Change has to be situated in the constellation of material conditions that is handed down to us. This then is to see historical change not as purposeful, but as emergent and full of unspecified potential. Certainly we may recognize material–human patterns retrospectively that were not apparent at the time (cf. Short 2007, 117–150). Equally, however, tendencies can be identified in the present, and projections made, but every intervention changes the web of established relationships that connect us and which underwrite the future. Although new patterns of practice can be established in the hope of shaping the future, history cannot be driven. From this perspective the potential for change is not situated in the technological innovations of those economies with funds for high-tech research and development, or indeed in humans alone, but rather in the interconnected nature of “the mesh” that Timothy Morton describes (2010, 28). Morton argues for the radical openness of what he terms “the ecological thought.” If we are more attentive to the openness of the future, as much as to the way in which it is shaped by initial conditions, we can perhaps drag the focus of our gaze away from the projected dystopia that awaits to the present and past conditions that underwrite its potential unfurling. Because as those archaeologists who emphasize the long-term continuities in human relationships with the world are pointing out, it is these conditions that need to be engaged with in order to ensure a healthy future for humanity and our co-inhabitants on planet Earth.

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□ Archaeology, the Anthropocene, and the Hypanthropocene

■ Christopher Witmore
Texas Tech University, USA
christopher.witmore@ttu.edu

From CO₂ levels at 400 parts per million to biodiversity losses now spiraling into mass extinctions, from the physiological transformations in jumbo squid to coral bleaching, from the hard pollution of heavy metals in aquifers to the soft pollution of incessant advertising pervading the airwaves—remnants, residues, vestiges of the actions of humanity are present everywhere, or thus it would seem. Possessing a collective agency comparable to that of oceans, volcanoes or tectonic plates, this humanity beyond Leviathan has become a geological force whose memories, most geologists now agree, will stand out

in the 4.5 billion year archive of Earth history. The term “anthropocene” was introduced to signal this uncanny transformation in what it is to be human; to mark this weird change in the character of our rapports with our fellow Earthlings, or, as Ewa Domanska suggests in her contribution to this forum, our fellow “Terrans.” And such transformations, such memories, such vestiges, are precisely the matters with which archaeology is concerned. So, what role for archaeology in the anthropocene?

The participants in this forum explore this question and others. Let us here consider their responses to the questions posed by Matt Edgeworth without becoming mired in a bog of redundant commentary. What are the markers of the anthropocene? Paul Graves-Brown warns of the pitfalls associated with staking out the beginnings for this proposed epoch—the invention of the steam engine, the closure of the map in 1500, the initial domestication of species, all succumb to what Foucault called the “chimera of origins”; when pushed hard enough each beginning will give way to other times and other spaces, each just as arbitrary a marker as the last.

Does the anthropocene have a unique stratigraphy? Arguing for a radical distinction between geological and archaeological stratigraphy, Edward Harris makes a strong claim to the surfaces of the anthropocene, which for him are all archaeological. I feel a temptation to challenge Harris for characterizing this distinction as one built upon that parochial divide of nature and culture—a rift that patently fails to provide adequate bearings in the midst of the present catastrophe, as Andrés Zarankin and Melisa Salerno observe in their discussion of Antarctica. It is not the natural stuff then the human stuff, in the sense of that overindulged drama between these two protagonists; a drama which vastly oversimplifies a far more heterogeneous and varied ecology of entities and rapports as argued by Bruce Clarke in his contribution. Indeed, from Harris, among others, we have learned that it is a fallacy to regard humans as a primary agency behind archaeological stratification; microbes, earthworms, wind, frost, rain, ground-water saturation, soil composition—all play a role. What becomes of the past results from the collective contribution of these multifarious entities (Olsen *et al.* 2012), but it would be unfair to Harris to leave it at that. We need to separate Harris’s emphasis on the human and geological as the two fundamental components, from that material difference that lies at the bottom of every archaeological site, a difference that signals to every archaeologist that they have reached the terminus of their extractive endeavors. For Harris, this is the surface of the anthropocene.

Still, there is a political dimension to hammering the beginning of the anthropocene onto the dawn of modern humans—an argument supported by many archaeologists (Balter 2013). To embed the anthropocene in the deep time of the Holocene, as Zoe Crossland points out, “is to spread its genesis, and the responsibility for it, across many different human societies.” While past societies generated their share of waste, poison, and pollution, while long-term perspectives on environmental change and degradation provide depth and nuance to matters of environmental concern (e.g. Redman 1999), the anthropocene was not an inevitable outcome of human becoming. By distributing the blame Crossland also suggests that we fail to capitalize upon the shock of the realization that we now live in the midst of a catastrophe of planetary proportion. By raising the alarm, and thus doing away with those protective efficacies of not knowing, one aims to, one hopes to, work towards viable alternatives to the way we currently live.

Before us lie challenges for which no science, no discipline, no community is tooled to address alone. Thus, Jason Kelly appropriately raises the issue of effective trans-disciplinarity, suggesting that humanities and social sciences are more than ancillary to matters of planetary concern (compare van der Leeuw and Redman 2002). Here Domanska elicits the challenge of an inclusive, integrative knowledge as a guide to finding different bearings in the future.

Is the term “anthropocene” an appropriate label? Taking a discursive line, Victor Paz situates the anthropocene as a purely geological concept formulated to address questions of geological interest. While archaeology can contribute to geological research, for Paz, any terminological debate would prove tedious and detract from more relevant problems. And yet for better or worse, the anthropocene has caught the attention of the media and by passing into this milieu it gains new significance and potentially rouses new dangers. Crossland, moreover, regards the anthropocene as a prognosis of possible collective futures. Given these wider worries, to say that Clarke has his reservations about the concept is a vast understatement. For him, the anthropocene unabashedly singles out *humankind as the primary agent*.

Calling attention to the work of James Lovelock and Lynn Margulis, Clarke reminds us how in both life and death biota always have been geological forces (also see Westbrook 1991)—just look to the fossilized skeletons of coral and other microorganisms that comprise so many mountains. Just take a deep breath of air. Toxic to the life that developed on an oxygen-free earth, a holocaust of planetary proportion accompanied oxygen when it was first released by Archæan *cyanobacteria* (Margulis 1998, 121). Is it not strange that the moment “humanity” joins its fellow species in leaving a geological trace, we, and we alone, deserve to be named as such? Here, Clarke questions the pragmatics and politics of scientific nomenclature. What indeed are we to make of the fact that geology has worked through seven epochs from the Paleocene to the Holocene with a litany of Greek roots which remained non-specified in “old,” “dawn,” “few,” “less,” “few,” “more,” “most,” and “whole,” only to be presented with “anthropos”? The door is left ajar as to whether or not we encounter yet again that narcissistic obsession with the uniqueness of our species. And yet, nineteenth-century nomenclature is an anachronistic guide. Perhaps geology has come up with different ways to label epochs, with different ways to conceive of time other than as a series of laminar events and successive replacements. Nonetheless, Clarke raises a longstanding concern, academic and otherwise, with groping at mastery and possession with an oppressive corpulence.

Others, however, do not share this anxiety over nomenclature. Domanska skillfully underlines that bizarre irony that the anthropocene registers the recognition that while the wonderful diversity of the world is no longer derivative of an ontologically privileged entity, humanity has nonetheless collectively spurred our planet to protest. Try claiming domination and control, in paraphrasing Bruno Latour, over something that can dominate and control us “without attaching any importance to our survival” (Latour 2013, 485; compare Margulis 1998, 128). The world will no longer be taken as an indifferent background.

And in addition to the more than seven billion humans alive today, we should credit the trillions of things and their rapports. Listen, as Jeff Benjamin reminds us, to the lorries, sirens and whirling turbines; listen to the cicadas, tornadoes and tsunamis

that challenge them for sonic supremacy. The way we live gives rise to new objects of archaeological concern: space garbage, nuclear waste, toxins in the soil, dead zones in the Chesapeake, the very air we breathe.

What objects are unique to the anthropocene? Here Mark Hudson offers a fascinating discussion of Timothy Morton's concept of "hyperobject," things such as plutonium or Styrofoam which endure across enormous swaths of time and space. After putting Morton's molten, sticky, massively distributed, transdimensional and interobjective hyperobjects through an archaeological trial of strength, Hudson concludes that "hyperobjects possess an unusual combination of indifference and danger," which may give credence to them as distinctive objects of the anthropocene. We may have to wait millennia for an answer. However, given sufficient time, as Sagan and Margulis have observed, future bacteria, strangers yet to come, will co-evolve with an appetite for the "dark artifacts," the abject excrement of other species, just as they have always done; and plastics, even Styrofoam and plutonium, will be digested and transformed into new waste to the benefit or detriment of other species (1995, 86).

There will be a lot for them to eat. Between 1999 and 2011, in the time it took to add another billion humans to the planet, the automobile population increased by well over 600 million, while those hoards of commercial vehicles (including lorries, buses and coaches) increased by nearly 250 million (these statistics are available at www.oica.net). An internal-combustion engine is born almost as often as a human being. Barrels of bunker oil and container ships, melting permafrost and escaping stores of methane (pollution generated by microbes), all do their part and all are enmeshed in some small way. Appropriately, Crossland evokes Morton's notion of the "mesh," a vast, sprawling interconnectedness of strangers without center, without edge (Morton 2010, 28, 47). This mesh, as Alice Gorman reminds us, is not limited to the Mesopause—the edge of the Mesosphere. Don't ignore the crowded zones of orbital flotsom, the 1000 elephants worth of space junk, in near-earth orbit or other areas of the solar system.

To be sure, this *anthropos* beyond Leviathan is an *anthropos* unlike any *anthropos* known to our "un-accelerated" forebears. Here, I am not referring to that fossil-fuel-burning quad-wheeler that now spends ninety percent of his life in contrived, air-conditioned atmospheres, which are immunized to the outside. Looking on from where Gorman takes us, looking at an image so well described by Michel Serres (1995), the colossal herd of concrete monsters is better seen at night. Dense illumination shows forth an unbroken megalopolis stretching from Montreal to Washington DC; London, Paris, and Berlin, that metropolis of Europe, is now connected in a salvo of luminosity; the outlines of the green gift of the Nile Valley are better discerned as an continuous river of light (a transformation of those life-giving waters); and the fiery dragon of Japan appears to leap off into the dark waters of the Pacific at the head of Seoul, Shanghai, Taiwan, and Hong Kong.

This is not *anthropos*; this is *hypanthropos*. The "hyp" of this neologism holds onto the double meaning of both *hyper* and *hypo*. Signaling something that is beyond *anthropos*, the Greek word "hyper" (uper) evokes something over much or above measure. It carries connotations of largess, of excess, of overwhelming being; it also denotes crossing or passing over something. The Greek word *hypo* (*upo*) relates to a sense of under, beneath, below something, which differentiates it from "superhumanity" (Margulis and

Sagan 1995, 234–235). The “hyp” suggests that we are simultaneously more and less. While *hypanthropos* evokes Nietzsche’s *Übermensch*, there are significant differences. *Hypanthropos* is an outrageous, collective monstrosity; it is a “we” that can no longer trust the soil, the water, the air, or itself. It is a “we” that is both suspended above and below, without ground. But this “we” is not more than the sum of its parts. This *hypanthropos* differs from other entities in its material weight and spatio-temporal vastness, but not in ontological status. “Hypanthropocene” may not have the same ring, but it is more faithful in signaling the strange, disturbing irony of what it is to be part of humanity at this moment without enshrining us in the temple of pomposity.

Our portents lag behind and the memories of *hypanthropos* amass everywhere, marking the lateness of our realization. Indeed, the issue of geology looking forward to a future with a geologically indelible past seems far removed from the realities that will confront archaeologists in the coming decades. With sea levels projected to rise between 20 and 200 centimeters by the end of the century sealers’ shelters in the South Shetlands (Zarankin and Salerno), along with hundreds of millions of other archaeological sites in low-lying coastal regions, will be claimed by Styrofoam-suffused waves and sand, pebbles and *hypanthropic* malfeasance. Those lights across southern Florida will dim as the city of Miami, with its cargo port and shipping containers (Graves-Brown), is devoured by the Atlantic—there is no amount of geo-engineering that can save a city built on the porous, skeletal vestiges of erstwhile life forms. New York will become New Venice. Dhaka and the lowlands of Bangladesh will become part of the Bay of Bengal. In the face of such horrors, there is cause for pleasure and joy, there is cause for seeing a brighter, utopian future in order to find our bearings and to live well (Domanska), and there are memories in the stuff of archaeology that can help in these endeavors (Crossland; also Witmore 2013). Meanwhile, new pasts, new objects, new things, new diasporas, new heritages, new injustices, new controversies proliferate everywhere; and archaeology, as a future-oriented discipline, will have more work than it can handle.

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