The Anthropocene monument: on relating geological and human time

Bronislaw Szerszynski (Lancaster University)

To appear in *European Journal of Social Theory*. Author final version, August 2016.

Abstract
In the Parthenon frieze, the time of mortals and the time of gods seem to merge. Dipesh Chakrabarty has argued that with the advent of the Anthropocene the times of human history and of the Earth are similarly coming together. Are humans entering the 'monumental time' of the Earth, to stand alongside the Olympian gods of the other geological forces? In this paper I first look at the cultural shifts leading to the modern idea of separate human and Earth histories. I examine the changing use of monuments to mediate between human and other temporalities. I explore the use of 'stratigraphic sections' as natural monuments to mark transitions between the major time units of Earth history, and the erection of intentional monuments nearby. I suggest that the Anthropocene, as a geological epoch-in-the-making, may challenge the whole system of monumental semiotics used to stabilise our way of thinking about deep time.

Keywords
Anthropocene, geology, stratigraphy, monuments, time, cultural memory

With the completion of the Parthenon frieze around 440 BCE, arguably the culmination of the High Classical style of Attic sculpture, two times that had hitherto been seen as utterly separate seemed to have been brought together: the time of the gods and the time of humans. The bas-relief frieze, one meter tall and originally 160 meters long, ran around the exterior of the *cella*, the interior structure of the new temple built, under Pericles' leadership, to Athena Parthenon, the primary goddess of the city of Athens. The Parthenon was one of a number of new ritual structures built in the citadel known as the Acropolis, literally 'upper city', on one of the fabled seven hills of Athens, around the preserved ruins of the old temple to Athena that had been destroyed in the Persian war.

The hill that forms the Acropolis is itself a clash of times: in violation of the geological rule of superposition, in which newer layers are formed on top of older layers so that the deeper past is below the more recent past, the top half of the hill is older than the bottom. The base of the hill is part of the general Athens layer of 70 million-year-old 'Athens schist', a lightly metamorphosed mixture of marl and sandstone that is autochthonous, formed locally. However, the main, top part of the hill is composed of a limestone that was formed around 100 million years ago (Mya), and is allochthonous: originating from elsewhere. The rock was formed 120 km to the south, from the shells of marine creatures settling on the floor of what was then the Tethys Ocean; but around 40 Mya it was thrust

northwards over the local schist by the tectonic forces that drove Africa and Europe together, closing the Tethys Ocean into the Mediterranean Sea and driving up the Alps and other European mountain ranges (Regueiro et al., 2014). Along the horizontal fault between the two rock formations that make up the hill lies a thin layer of cataclastic limestone, crushed rock that both resulted from and facilitated the sliding of the upper formation over the lower. By the time that Pericles started to construct the grand new temple complex around 460 BCE, the summit of the Acropolis had also been levelled, the tallest deposits having been truncated and the removed limestone and local soil used to fill the gaps, creating an artificial layer up to 14m thick that was held in place by the citadel walls.

The frieze itself, and much of the temple, was made from marble that had been quarried 19 km away at Mount Pentelikon, brought down the mountain on sleds, transported along the road to Athens on ox-drawn carts and then hauled up the Acropolis on wagons pulled by mules. The marble had started out as another area of Tethys limestone which had been subducted to around 50 km depth by the same orogenic events that had moved the limestone, and was thereby transformed metamorphically under high pressure into white, semi-translucent Pentelic marble (Pike, 2000: 28). The Ionic frieze, probably designed by the sculptor and architect Phidias, was carved *in situ* at the temple across 114 deep-relief sculpted sections, and shows the people of Athens processing in two lines, both beginning on the western section of the frieze. What is being depicted is generally understood to be a Panathenaic procession, an annual sacrificial ritual which focused on the presentation of the *peplos*, a giant garment made for the ancient olive-wood statue of Athena Polias that was by then housed in the Erechtheion, another new temple constructed on the North side of the citadel. Also present in the procession are cavalry, elders, musicians, people carrying water vessels and sacrificial animals, and many ordinary members of Athenian society. The two arms of the procession meet on the Eastern section of the frieze, where are seated the twelve Olympian Gods in two groups of six giant figures. The gods are represented with their backs to the arriving procession, and are being presented with the *peplos* by a group of mortals, including three children (Mark, 1984).

After a mortar bombardment during the Viennese campaign against the Ottoman Empire in 1687 only 80% of the frieze survived; and most of it is now in London, forming part of the contested Elgin Marbles held at the British Museum. Thus to the clashing geological times of the Acropolis hill and its crowning anthropogenic ‘made ground’, we can add the clashing times of empire and colonial rule. But what I want to focus on here is the clash of times that occurs *within the frieze itself*. It is difficult for us today to appreciate how astoundingly novel it was at this time to represent gods and mortals in the same frame, a novelty the meaning of which is still the subject of much scholarly debate. The ancient Greeks seem up till this moment to have made an absolute distinction between what Lin Foxhall (1995) calls ‘human time’ and 'monumental time', corresponding broadly to the distinction made by Jan and Aleida Assmann between ‘communicative’ and ‘cultural’ memory (e.g. Assman, 2008), and what the historian of Africa Jan Vansina (1985) calls the ‘floating gap’ between informal

and formal shared memory. In classical Greece, human time was about kinship – or more exactly *angkhisteia* (bilateral kindred), spanning generations and households. Human, communicative time constituted a 'stratum' of four generations, slowly moving not sideways like the early-Cretaceous limestone of the Acropolis, but (to follow the geological metaphor) 'up' through time, reforming as one new generation emerged and an old one dropped out of memory. On the other hand, what Foxhall calls 'monumental time' stretched forwards and backwards beyond the living, communicative memory of this four-generation extended kinship, and was a time in which mortal humans did not really belong. This realm of permanent, 'timeless' time could be accessed 'only through the channels by which men talk to gods': magic, divination and ritual (Foxhall, 1995: 136).

How should we interpret the Parthenon frieze? Is it a depiction of a Panathenaia that occurred at a particular moment in human, historical time? Is it an idealised version of the Panathenaia that was intended to present a paradigmatic image of Athens and its distinctive cosmopolitics to non-Athenians? Or is it a moment in mythic time, the time of the gods? What is the meaning of its positioning around the top of the *cella*, neither clear to view on the sun-bathed, Doric exterior of the building, nor concealed as a mystery in the inner temple? And why are gods and mortals represented as physically co-present? Were the designers of the frieze deifying the ordinary Athenian mortal, humanising the gods – or something else altogether?

The separating and bringing together of human and inhuman times is a common cultural dynamic, one in which the process of mediating between the different kinds of time can only occur through cultural forms which escape the limits of individual witnessing and recollection. In oral societies, human time and the time of mythic origins are continually braided together through collective mnemonic *practises*: ritual, enactment, narrative, and song; in more literary societies, canonical *texts* come to be seen as the timeless product of unique and privileged moments of revelation in which the temporalities of individuals and of world or cosmic history mesh together (Assmann, 2012). But the act of at once separating and relating ontologically distinct modes of time is also often done through *monuments* – edifices, whether found or made, in which it is felt that different spatial and temporal registers come together in a privileged way. It is the monument as a cultural form that mediates between radically different temporal registers that I will use to interrogate the Anthropocene as a historical moment in which human beings are being said to have become a geological force (Crutzen, 2002).

For Dipesh Chakrabarty (2009) has argued that the proposal that the Earth has entered a new geological epoch, the Anthropocene, means that the time of the earth and the time of history are coming together. Are humans entering the monumental time of the Earth, to stand alongside the Olympian gods of the other geological forces? In this paper I will explore this question, first by looking at the complex set of shifts which leads from the 'temporal gestalt' (Luhmann, 1976) of ancient Greece with its bifurcated human and divine times, to that of modernity with its separate human and Earth histories – histories which

are now being brought together. I then look at the changing role in Western history of monuments – intentional and unintentional, human-made and natural – as physical edifices which mediate between human and other temporalities. I explain the important role played by a specific kind of monumental semiotics in stabilising relations between human and deep, geological time, in which certain rock faces or 'stratigraphic sections' are turned into 'natural monuments' that mark transitions in the major time units of Earth history, and intentional monuments and plaques are erected nearby as part of a wider 'monumental system'. I then draw on a collaborative project with artists, scientists and scholars held in Toulouse in 2014 which debated the idea and form of a monument to the Anthropocene, in order to explore the challenges that a geological epoch-in-the-making poses to conventional monumental aesthetics and modes of address – and perhaps to the whole system of monumental semiotics used to stabilise our way of thinking about deep time. It may be that the Anthropocene signifies not that humans and their works are entering the deep, 'timeless' time of the Earth, but that the Olympian geological forces and events that have shaped our planet are becoming a more lively presence in the here and now.

Modernity and the discovery of deep time

The apparent fusion of mortal and immortal time in the Parthenon frieze did not constitute an irreversible change. Indeed, with the arrival in Europe of Christianity a few centuries later an even greater distinction opened up between human and divine time. Everyday life in the European Middle Ages was governed by the repetitive but never fully predictable annual seasons, and the unpredictable irruptive time of storms, drought, pestilence and war. It was a time regime characterised by slowness, waiting and starting again, combined with moments of huge disruption (Le Goff, 1991: 174-83). But coexisting with, and arguably dominating, this *natural time* was *divine time*, in which all moments of time were understood as simultaneously present to God's mind, making historical time fundamentally unreal, and concrete events merely symbolic of a timeless, 'petrified eternity'. The appearance of Christ had both given cosmic time a deictic centre, and somehow also abolished it, since the Second Coming was certain and had in a sense already begun – hence the popularity of millenarianism with almost all social groups (Le Goff, 1980:31-3). This was a temporal regime in which past, present and future were not clearly distinguished (Le Goff, 1991: 174), and in which unexpected events were seen as temporary divergences in a basically unchanging world (Luhmann, 1998: 64).

In what Reinhart Koselleck calls *Sattelzeit* or saddle time, a period of transition that straddled the end of the eighteenth and beginning of the nineteenth century, the increasing differentiation of society led to a new experience of time. Koselleck traces the move in German-speaking cultures to new ways of talking about history, whether *Historien* (accounts) or *Geschichten* (events). Previously, history had been understood as a mere collection of individual reports, which collectively could provide a way of learning about the timeless truths of human nature. But from the 'saddle time' onwards, history became seen as a new and unique kind of agent; behind individual accounts

(*Historien*), and joining up individual events (*Geschichten*), is the force of history (Koselleck, 2004). In this new, historical time, the future is seen a contingent and open space which may be very different to the present (Luhmann, 1976).

It is surely not a coincidence that at around the same time that a European notion of human historical time was constituted, a new monumental time also opened up: that of deep, geological time. In order to understand this correlation we can make use of Michel Foucault's account of a shift from classical to modern 'epistemes' or modes of thought around the beginning of the nineteenth century, which in many ways complements Koselleck's diagnosis of the *Sattelzeit*. The classical episteme that had emerged in the seventeenth century was based on classifying entities using visible similarities and differences, and processes of analysis and recombination (Foucault, 1970: 81). Crucially, the 'classical' way of thinking was not fully historical; there may be change, but this is only against the background of a timeless grid of potential identities and oppositions. According to Foucault the new 'modern episteme' that took shape around the time of Koselleck's *Sattelzeit* employed a very different spatial metaphor: not a flat table that arranged entities according to their visible characteristics, but a new language of surfaces and depths. Beneath the surface separateness and complexity of visible things, such as different animals or different languages, lie hidden unities of function. It was also historical, studying phenomena not as examples of timeless universals but as the product of contingent and irreversible histories. Examining the emergence of the new sciences of economics, biology and linguistics, Foucault showed how the existence and knowledge of 'man' became seen for the first time as conditioned by a number of historical positivities — of organic life, of language and of economic production — which could not be subordinated to human chronology or will.

Given how well the emergence of modern geology in the early nineteenth century fits Foucault's overall schema (and how much archaeological and geological metaphors pervade his thought – see Simonetti, 2015: 153), the omission of geological science from his account is a striking lacuna. Late-eighteenth-century candidate sciences of the earth had ranged from the typological 'mineralogy' and 'geognosy', modelled on Linnaean natural history, to the more rationalist and speculative '*physique de la terre*' and 'geotheory', modelled on Newtonian mechanics (Rudwick, 2005). To apply Foucauldian language, these were all 'classical-episteme' sciences. But the geology established by Cuvier and others in the early nineteenth century very much belonged to the modern episteme (Szerszynski, 2012). The new geology progressively gathered the Earth together as a system, the diversity of its visible, surface features now understood as the result of slow, invisible unifying forces such as sedimentation, erosion, volcanism and eventually tectonics. It drew on the practices of erudite and antiquarian history, which used textual and non-textual artefacts to reconstruct human history as a contingent, intrinsically unpredictable sequence. Applied to the Earth, this made possible a new reading of the Earth's 'anatomy', producing not a taxonomy, nor an understanding of universal causal laws, but a *history of the Earth*.

The key concepts of the new geology illustrate how far we have travelled from the 'classical' sciences of the Earth. For the earlier taxonomic and causal earth sciences, the key entities to be identified were 'natural kinds' such as basalt; for geohistorical geology, by contrast, the crucial entities were the events of geohistory, and specific unique 'formations', each to be understood in terms of its own contingent, situated history (Laudan, 1987: 6). Thus, just as the time of humans was becoming historical in a new way, the Earth too became historical — the subject of a history that extends in deep time, independent of, subtending and radically conditioning human history. Whereas antiquarian archaeology had been based on Roman scholar Varro's distinction in the first century BCE between human and divine time, the new distinction was between human and *geological* time (Schnapp, 1995). Enter a new 'monumental time'.

There are complex ironies and twists here. The study of human history was the basis for natural history – not the other way round; geology's roots in the human sciences means that the notion of the Anthropocene was already in some sense latent in the new science of the Earth. But it also means that the geological concept of 'deep' time – in which moving down into the body of the Earth is moving not just from the known to the unknown but from the present to the distant past – itself depends on specific kinds of intellectual, hermeneutic and representational practice (Simonetti, 2015). In the 1670s Robert Hooke had already set the trend of seeing the sciences of the Earth as based on antiquarian methods of inquiry and reasoning – fossils, he suggested, were the 'medals, urns or monuments of nature' to be uncovered and interpreted, as bearing information to allow reconstruction of natural history, just as artefactual monuments do civil history (Rossi, 1984: 15). Yet Hooke still tried to contain the story of the Earth within the official theological age of a six-thousand-year-old Earth. The naturalist Comte de Buffon in his 1778 book 'Des Époques de la Nature', reasoning that the Earth was far older, nevertheless also followed the antiquarian gaze in arguing that, just like in civil history 'so, in Natural History, one must excavate the archives of the world, recover ancient monuments from the depths of the earth, collect their remains, and assemble in one body of proofs all the evidence of physical changes that enable us to reach back to the different ages of Nature'. It was Alexander von Humboldt in 1814 who formalised the notion of 'natural monuments', *Naturdenkmäler*, a designation which combined the antiquarian approach to interpreting relics with a Romantic idea of protecting natural beauty.

As Chakrabarty argues, European thought held on to the idea of a separate human time that could not be collapsed into natural time, and indeed resisted the idea that the Earth had a history in any full sense. For Vico, Croce and Collingwood, human history had to be separate from nature, because nature has no 'inside', no history proper; the mature Croce and Collingwood even subsumed nature into human history (Chakrabarty, 2009). A similar division obtained in the new discipline of sociology, with Durkheim (1938) emphasising that social facts should be explained not by natural facts but by other social facts; twentieth-century sociology thus proceeded as if humans unlike other animals were exempt from nature laws (Catton and Dunlap, 1978). Even those writers who like Braudel

argued that non-human nature was no static backdrop still tended to treat nature as slow and repetitive; and environmental historians made the breach between nature and culture wider again by treating the human as a biological entity (Chakrabarty, 2009). And as we saw above, Foucault may have recognised the way that the finite existence of 'man' was conditioned in modern thought by historical positivities beyond 'his' control, including his biological nature, but made no reference to the geological determination of human existence by the material evolution of the earth.

During the nineteenth century there had been many voices who prefigured the notion of the Anthropocene by warning that something like the opposite was occurring – the human determination of geological processes (Bonneuil and Fressoz, 2016). But generally in the twentieth century the organisation of disciplines has kept apart human and 'deep' geological time. As Chakrabarty points out, it was only with the growing idea of anthropogenic climate change that an intellectual shift started to occur. Adding in other measures of human influence on the cycles of the Earth, Earth systems scientists have proposed that the Earth may be entering a new geological epoch, provisionally named the 'Anthropocene', in which human beings have become the main geological force. Chakrabarty argues that they and other scientists of Earth processes are thereby 'unwittingly destroying the artificial but time-honored distinction between natural and human histories' (Chakrabarty, 2009: 206). This apparent fusion of temporal registers can be seen as an 'Anthropocene moment' as significant as any officially designated start of the Anthropocene geological epoch.

But the notion of human beings becoming a geological force needs unpacking, and here it is useful to distinguish between different 'ways of knowing' (Pickstone, 2000) involved in Anthropocene science (see also Zalasiewicz et al., forthcoming). 'Anthropocene' may be a term modelled on naming conventions developed in the geological community but it was first proposed by Earth system scientists (Crutzen and Stoermer, 2000), and rapidly became an important organising framing for the Earth systems science community (e.g. Steffen et al., 2004). Much of Anthropocene science is still framed within Earth-system-science ways of thinking – e.g. the work on identifying 'planetary boundaries' (Rockstrom et al., 2009) and plotting the 'Great Acceleration' in human resource use since around 1950 (Steffen et al., 2007). Within this way of thinking, being a geological force would involve being an agent that could potentially tip Earth systems into a new metastable state or 'basin of attraction'.

But the Anthropocene Working Group which is gathering evidence for the process of considering the Anthropocene as a potential geochronological time unit is led by geologists, and will report to the International Commission on Stratigraphy (ICS) of the International Union of Geological Sciences (IUGS), which formally defines units of the geologic time scale. For geologists the emphasis is on posterity: becoming geological involves leaving coherent and significant changes in the rock layers that are being laid down. Thus the focus of the Working Group is the task of determining whether any changes to the Earth system that human activity is causing will result in an 'Anthropocene Series' (a 'series' is a subdivision

of a rock column corresponding to a particular geological epoch) that it will be possible to identify using chronostratigraphic methods (Zalasiewicz et al., 2014b). The language here is of identifying unique 'signals' in the rocks that are currently being laid down, whether lithostratigraphic (changing rock composition or character), chemostratigraphic (e.g. pollution and altered geochemical composition) or biostratigraphic (e.g. changing fossil content).

Later in the paper I will argue that geochronological units such as epochs and eras are stabilised using a particular form of monumental semiotics – that the notion of the monument as a material entity that mediates between different registers of time can help us understand the way that the deep time of the Earth and human historical time are brought into orderly relation. I will then go on to explore how this way of looking at the mediation between human time and Earth time can help us understand the significance of the 'Anthropocene moment'. But let us first look at the cultural history of monuments and the way that they mediate between times.

Monument and memory

In ancient Greece, private houses were the key location for the human, communicative time of the multi-generational extended kinship network, and were unadorned, designed to look not outwards but inwards. But, unlike the Spartans, the Athenians of the 5th and 4th century BCE made their public buildings monumental – especially the temples, which were now built not of wood like earlier temples to Athena that had been built on the Acropolis, but of durable, carefully chosen and elaborately fashioned stone (Foxhall, 1995: 138–9). How do such monumental structures, whether buildings or otherwise, carry meaning and value, and how has this changed over time?

In 1903, Alois Riegl published his famous essay 'The Modern Cult of Monuments', which quickly came to be seen as a defining modernist manifesto for the interpretation, evaluation and preservation of monuments of all kinds. The essay was written as the introduction to a draft preservation law, and in it Riegl, who was affiliated with the Vienna School of art history, takes a resolutely historicist approach: the values ascribed to monuments and other art objects are expressions of the particular time of their articulation (Riegl, 1996). In order to trace the changing place of monuments in western culture, Riegl firstly distinguished three kinds of 'memory values'. *Commemorative value* applies only to intentional monuments; echoing ancient Greek monumental time and Assmann's notion of cultural memory, Riegl says that 'the purpose of deliberate commemorative value is to keep a moment perpetually alive and present in the consciousness of future generations' (Riegl, 1996: 77). *Historical value*, which can be ascribed to all buildings and edifices, treats them as documents which reveal something about the time they were created. Finally, *age value* involves an affective pleasure in signs of natural processes of disintegration and decay. Riegl also talks about other, more contemporary non-memory-based values that might be used to assess the value of monuments – *use value* (that structures should serve a purpose), *relative art value* (which reflects changing tastes), and *newness value* (such as the modernist idea that artworks should minimise their reference

to earlier styles). Whereas age value was a product largely of the Baroque and Romantic periods, and historical value was more characteristic of the Renaissance, ancient Greece and Rome were more oriented to commemorative value (Lamprakos, 2014). As Riegl puts it, deliberate commemorative value 'makes a claim for immortality, an eternal present, an unceasing state of becoming' (Riegl, 1996: 78).

The sheer material durability of monuments is an important part of this 'claim for immortality'. In 'The origin of the work of art', Martin Heidegger argued that art is truth 'setting itself to work', a 'disclosure' of things, and that the very durability of monumental objects constituted a specific mode of disclosure (1971: 36). Heidegger used the example of a temple to a god, resting on rocky ground in a valley, and its 'firm towering' (Heidegger, 1971: 42). But because the temple of which Heidegger writes 'holds its ground', it makes 'the storm raging above it … manifest in its violence' … makes visible the invisible space of air … [and] the raging of the sea' (Heidegger, 1971: 42) The claim-to-truth of any work of art is always the opening of a world – but also reveals the Earth, *physis*, emerging and rising, as ground. 'The temple-work, standing there, opens up a world and at the same time sets this world back again on earth, which itself only thus emerges as native ground' (Heidegger, 1971: 42). Heidegger thus reverses conventional thinking: the presencing of timeless, monumental time in edifices like the Parthenon is not something *added to* human time or the time of singular natural events, but helps these other times to fully presence themselves.

The architectural character of monuments also means that they have to be understood, as Lefebvre (1991) puts it, not as *text* but as *texture*, not to be *read* but to be *acted*. Not all monuments are buildings and not all buildings are monuments, but monuments tend to be more massive than the human body and to dominate the felt space around them, and the dynamics of bodies and affects within that space. Monuments also typically seem to require a certain solemnity or seriousness appropriate to the encounter with other registers of time: the monumental 'scene' thus defines the 'obscene'; the presence of the monument determines what is prescribed and what is proscribed behaviour (Lefebvre, 1991: 224). Monuments are also typically placed as part of a wider material-semiotic 'monumental system', in which various structures, spaces and inscriptions are put in relation with each other, with the wider spatiotemporal patterns of social life and with the canonical narratives and values of cultural memory. For example, in Classical Athens the largest structures on the Acropolis – the Doric Parthenon, the Ionic Erechtheion and the gigantic statue of Athena Promachos between them – would normally have been visible as distant presences high above the city, but as the Panathenaic procession passed along the Sacred Way through the city and approached the Acropolis, both would disappear from view behind the citadel walls and other constructions on the summit. The procession would then ascend the steep stairs to the summit of the hill and pass through the Propylaeum, a monumental classical gateway, at which point the statue and the complex of temples on the summit would reappear as foreground objects of contrasting styles, sizes and orientation (Psarra, 2004: 83-90). The monumental features on the Acropolis thus worked with each other, and with the moving bodies of the

approaching Athenians, using both sculptural representation and architectural arrangement in order effectively to link the times of humans and gods.

From the Renaissance period onwards, ruination became an increasingly important aspect of monumentality. Although in many ways the dispersing effects of time could be seen as in tension with the timelessness of cultural memory (Young, 1992: 294), with the Renaissance cult of the ruin the ravages of time came to be seen as inherently monumentalising because of the way that age value turned the edifice into a reminder of the folly and impermanence of human endeavour. The ruin became a complex sign in which human intention and invention were at once elevated and degraded by being returned to nature. William Gilpin's 1782 formalization of the picturesque as an aesthetic ideal was just one stage in a much longer process of shifting cultural meanings being ascribed to decay (Pensky, 2011). But the nineteenth century would also see a flowering of the intentional monument. Access to cultural memory was increasingly seen as requiring travel to and experience of the appropriate physical monument. As Carpo puts it, playing on the common Latin etymological root *monere* ('to remind', 'to warn'), 'totemic catalysts and activators of memory expected and prompted the simultaneous presence of *the monument* and of *the admonished* (one, or more often many) in the same public place' (Carpo, 2007: 54 – emphasis added). Those addressed by the monuments may be 'reminded' of particular historical events, particularly those definitive of imperialist and nationalist histories; but the kind of memory triggered by monumental architecture might be more the sedimented body-memory of deeply held collective habits of thought and affect, such as those of liberal society that were monumentalised in the great public buildings built around Vienna's Ringstrasse (Schorske, 1981). Museums, in particular, became an established monumental building type in the nineteenth century, one which deployed spatial devices that had developed in classical temples in order to signal the movement from everyday time to timeless, monumental time (Tzortzi, 2015: 20-22).

But if, paraphrasing Latour (1991), a monument can be seen as 'a consensus made durable', in modern political thought it became more common to view this very durability of great edifices as itself an act of power. As Lefebvre expresses it, '[o]nly Will, in its more elaborated forms – the wish for mastery, the will to will – can overcome, or believe it can overcome death' (Lefebvre, 1991: 221). Georges Bataille suggested that 'great monuments are raised up like dams' by elites against the will of people, using the storming of the Bastille as an example, and suggesting that perhaps monuments are the true rulers of the land (Bataille, 1997: 21). The rise of commercial and industrial society in the nineteenth century had already meant a decisive shift in the balance between everyday life and festival, between buildings and monuments (Lefebvre, 1991: 223). As Adolf Loos, the great theorist of modern architecture, would insist in 1910, 'only a very small part of architecture belongs to art: the mausoleum and the monument' (Loos, 1987: 55). In the emergent industrial order, sculpted space was still used to stabilise a collective form of life, but the paradigmatic 'public' buildings were now factories, warehouses, depots, airports: buildings dedicated more to utility and function than symbol and collective memory.

But the late twentieth century experienced another revival in monumentalisation. As early as the 1940s, the architectural historian Sigfried Giedion called for a 'new monumentalism' that would enable modernism to connect with the emotional life of communities (Giedion, 1944). Yet it was only in the 1970s that Charles Jencks was able to label as 'post-modern' architecture what he saw as a growing move away from modernism, with its focus on formalism, utility and newness value, towards a 'radical eclecticism' that reintroduced to architecture ornament, symbolism and reference to earlier styles and periods (Jencks, 1977). However, whereas Jencks' pronouncement of architectural postmodernism seemed to open up a new space for a return of monumental architectural codes, just two years later Lyotard (1979) singled out as a defining feature of a wider 'postmodern condition' the end of metanarrative, implying the loss of any singular history that any monument might convincingly mark. After the earlier horrors of the twentieth century and a growing sense that the time of geopolitical centrality of the West was coming to an end, it was not surprising that monuments created since the mid-twentieth century tend to commemorate tragedies as much as successes, and victims as much as heroes (Carpo, 2007: 53-4; Savage, 2009). James Young captures the counter-monumental mood in a Germany recovering from the hyper-monumentalising Nazi period, as a young generation of artists sought to find ways of sustaining the presence of the Holocaust in what Assmann called 'communicative memory' rather than letting it be conventionally monumentalised and safely consigned to 'cultural memory'. For example, artists Jochen and Esther Gerz erected and eventually buried an inscribed black pillar in a suburb of Hamburg – a *Gegendenkmal* that broke with dominant memorial semiotics by being designed 'not to console but to provoke; not to remain fixed but to change; not to be everlasting but to disappear; not to be ignored by its passersby but to demand interaction; not to remain pristine but to invite its own violation and desecration; not to accept graciously the burden of memory but to throw it back at the town's feet' (Young, 1992: 277).

Later we shall see how the complex and shifting way that monuments have been used to mediate between different time registers can help us understand the 'Anthropocene moment' of the fusion of historical and geological times. But first we must look more closely at the use of monumentalising practices in geological science. For if geology like other sciences had to develop its own visualisation practices (Rudwick, 1976), these practices extended beyond the page to enrol rocks themselves into 'monumental systems' that serve to stabilise the periodisation of Earth history.

Geological monuments

Like the area that surrounds the Acropolis, much of the surface of the Earth is covered by geological strata that were formed during the most recent geological period, the Quaternary, which started 2.6 Mya. The young age of these strata means that they generally consist of soil or alluvium – unlithified sediments, deposited by the motion of water, maybe shaped by Quaternary glaciations, but not yet forming large volumes of consolidated rock. Where large areas of older,

solid rock like those of the Acropolis *do* protrude as 'outcrops' through the Quaternary formations, it is here that we are likely to be looking at the deep time of Earth history. Sometimes this is in the form of an 'exposed bedding plane', where a buried, originally horizontal stratum of rock or unconsolidated deposits has been tectonically uplifted to the surface or exposed by erosion; here the visible, more-or-less exposed surface may represent a single moment or brief interval in geological time. At other times, however, we may be confronted by a 'section', an exposed surface that cuts across different strata. Such geological sections, which might be seen in a cliff or a quarry face, are paradigmatically vertical – though they may have been tipped or folded by orogenic processes – and are geologically diachronic, arranging an often vast period of time to simultaneous view.

The sides of the Acropolis form such a geological 'section' across the different rock strata that make up the hill (although we have seen in the case of the Acropolis how strata can 'lie' in more than one sense of the word). Geological *Naturdenkmäler* or natural monuments will tend to be outcrops; in terms of Riegl's classification these are 'unintentional monuments' with 'age value': edifices which were not deliberately constructed as a memorial to an event or deeply held cultural values, but due to their appearance of vast age have come to carry meanings and values as reminders of the deep history of the Earth. But in the coming together of human and geological time it is perhaps the sections that are most interesting.

There are two ways of officially settling points of transition between the formal units of geological time. For transitions that occurred early in the history of the Earth, where few or no fossils were formed, absolute age is used (Global Standard Stratigraphic Age). But for more recent transition points the preference is to establish a Global Boundary Stratotype Section and Point (GSSP). For each transition between units of geological time, a particular well-preserved *section* is chosen somewhere on the Earth on which there is at least one *point* where there is a clearly recognisable manifestation of a *global boundary*. This particular section has thereby been designated a *stratotype*, which (following the pattern of the 'type-site' used in archaeology as the reference for a particular archaeological culture) will serve as the *locus typicus* or standard global instantiation of this geological phenomenon. At the chosen point on the section is placed a physical 'golden spike'; since the 1970s the ICS has placed more than 60 such spikes at GSSPs around the globe. By being designated as a stratotype, a section is granted a particularly distinguished kind of 'historical value': as a record of the geological past not just of that particular point on the Earth's surface, but for the planet as a whole. This exceptional status is reflected in their special preservation for example, two GSSPs are situated in Changxing Geopark near Zhejiang in China, and a GSSP in Newfoundland led to the creation of Fortune Head Ecological Reserve to help preserve it intact.

But near some of these 'natural' monuments, as part of a larger monumental system, have also been placed crafted, 'intentional' monuments, which add a commemorative dimension to further link geological and human time. The GSSPs that are marked with an intentional monument tend to be those

that mark the transition between major time units, rather than just a transition between stages or epochs. Thus the first GSSP, placed in 1972 at Klonk in the Czech Republic, marks the bottom or onset of the Devonian Period, which saw the first adaptive radiation of fish and the colonisation of the land by vascular plants and quadruped animals; a monument marking the GSSP was placed nearby in 1977. There is also a commemorative monument near the GSSP that was placed in the limestone strata of Meishan Section (*meishan* means 'coal mountain') which marks the beginning of the Triassic Period, and thus of the whole Mesozoic Era – a transition which coincided with a major extinction event. And the GSSP at Fortune Head, Newfoundland, which marks the bottom of the Cambrian System, and thus the beginning of the whole current Phanerozoic Eon of visible life, has a nearby plaque.

What do they look like? Let us take two monuments, both at GSSPs marking boundaries within the Palaeozoic Era, the one at Klonk for the base of the Devonian at 419 Mya, and that at Huangnitang section near Changshan, in Zhejiang, China, which marks the bottom of the Darriwilian Age within the Ordovician Period at 467 Mya. Geological boundaries require globality and ubiquity, so are more likely to be identified using small and common organisms (albeit ones with hard parts) rather than large and uncommon ones such as megafauna. Thus both of these boundaries are defined by the changing populations of different species of graptolite, a kind of extinct planktonic colonial animal. For the Klonk monument marking the beginning of the Devonian, the Czech sculptor Jiří Novotný chose to symbolise two strata using locally quarried marble that had been formed in the middle of the Devonian. The monument at Changshan, by contrast, is topped by a metal version of the particular graptolite whose appearance in the fossil record marks that particular geological boundary.

The text that appears on intentional geological monuments is also instructive; but before we turn to that we have to look at how even natural geological monuments such as sections can bring together different temporal and spatial registers: 'here', 'now', 'there' and 'then'. Firstly, as we have seen, the logic of modern geology is one where at any given point on the Earth's surface (and ignoring tectonically caused deformation), vertical *space* corresponds to planetary geological *time*. The geological time of the Earth is traditionally divided into four eons, each of which are subdivided into eras, and these into periods, then epochs and so on; these geochronologic (temporal) units of 'time' correspond to chronostratigraphic (material) units of 'time-rock' – respectively, each eon corresponds to an eonothem in the rock, and smaller units to erathems, systems, series and so on. In keeping with the modern-episteme character of geology, the conception of time that is central here is not mathematical, Newtonian, absolute time imagined as a pre-existing container for events, but Earth-system time, generated by the contingent self-organisation of the planet. Just as the time units of the Earth and every other planet are unique and of specific lengths, there is no simple way to translate the thickness of time-rock into a duration of rock-time. Nevertheless, a particular point or 'place' on the vertical scale stands in for a moment or brief interval of time.

But secondly, exactly *because* the units of geological time are *global* designations – hence the emphasis on small, widespread fossil species such as graptolites – they need a *local* standard instantiation or reference – hence the use of a golden spike. Stratigraphy, like archaeology, tends to treat vertical relations as purely temporal and horizontal relations as purely spatial (Simonetti, 2013). So on the horizontal plane it is *local place* and *global space* that are brought together; the 'stratotype section', the golden spike and any accompanying artificial monument or plaque constitute the core of a monumental system which is at the same time a specific, local material formation and a global standard. Thirdly, the character of geological science means that the naming and standardisation of the units of geological time, whether by GSSA or GSSP, require performative acts not of sacred ritual but of 'bureaucratic nominalism' (Lezaun, 2006). Such an authorised act of naming and site-selection requires the 'monumental' authority of a designated body, but also has to happen at a particular moment in human time, in order authoritatively to stabilise the changeless time of geological history.

The wording placed on the constructed monuments near GSSPs reveals different aspects of this complex bringing together of different spatial and temporal registers. For example, the monument at the GSSP for the Darriwilian at Changshan reads (when translated from the Chinese and tagged to mark the spatial and temporal registers):

> Here **<horizontal place>** is the Darriwilian (Ordovician) **<geological time>** Global **<global space>** Stratotype Section and Point **<vertical place>** (GSSP).

The plaque at the Fortune Head further brings together geological time and the human time of bureaucratic nomination. In a more prosaic echo of the presentation of the *peplos* to the statue of Athena as recorded on the Parthenon frieze, the plaque records the date on which the ICS figuratively 'draped' the section at Fortune Head with the status of global stratotype:

> In 1992 **<human time>** the global **<global space>** stratotype **<vertical space>** for the Precambrian–Cambrian boundary **<geological time>** was defined by the International Commission of Stratigraphy as being here **<horizontal place>** at Fortune Head.

We have now seen how, just as was in the case of the monumental system that sat on top of the Acropolis, in constellations of 'natural' and 'intentional' geological monuments the monumental semiotics at play needs to be carefully interpreted in order to see which kinds of time are being distinguished and how they are being brought together. Specific monumental codes are used to tell the story of the Earth: to connect the everyday times of geological fieldwork, analysis and committee decision-making with the 'timeless' time of the Earth's ongoing formation; to enable rock formations to signify not just spatially distributed matter but also deep, geological time; and to make this deep time of local geological processes stand as a synecdoche of the deep time of the Earth as a whole. So how easily might the Anthropocene epoch find a stable location within this set of conventions? We shall turn to this question in the next section.

Monumentalising the Anthropocene

As a physical phenomenon involving the accelerating movement and exploitation of matter and energy, and one which many associate closely with the capitalist economy (Malm and Hornborg, 2014), the Anthropocene could be seen as an intensification of the modernist move away from monumental signification towards mere physical function. However, the attempt to elevate the accelerating appropriation of Earth's productivity by human society to the status of an event within the geological history of the Earth ironically brings monumental codes to bear on the edifices and discarded remains of the Anthroposphere. For the time being, let us consider a conventional response to the question at the end of the previous section. If the Anthropocene is indeed ratified by the ICS as a new formal unit of geochronology, what might an Anthropocene monumental system consist of?

Let us start by asking, given the conventions of stratigraphy, what could stand as a 'natural' or at least 'unintentional' geological memorial to the Anthropocene: what kind of geological section might be chosen in which to place a 'golden spike' marking the onset of the 'epoch of humanity'? It would seem to make sense first to decide which precise changes in the Earth signified the start of the epoch before trying to find where they are likely to be most clearly laid down in the geological record. Candidate beginnings for the new epoch include the start of forest clearances by humans 5000–8000 years ago (Ruddiman et al., 2015), the invasion and colonisation of the New World by Europeans in the sixteenth and seventeenth centuries (Lewis and Maslin, 2015), the invention of steam power and the onset of the Industrial Revolution in the late eighteenth century (Crutzen, 2002) and the 'Great Acceleration' in global human resource use from around 1950 (Steffen et al., 2007).

However, within different disciplinary ways of thinking the task of determining the date of onset of the Anthropocene will always be entangled with other considerations. For Earth system scientists, who are not without influence on the Anthropocene Working Group, a change in geological time would require the evidence not just of human influence but that humans have caused a dramatic shift in the dynamics of Earth systems (Hamilton, 2016). Social scientists, by contrast, are more likely to point to the socio-political implications of choosing one onset date over another, because of the way that this might either *naturalise* the Anthropocene as the inevitable side-effect of the collective ingenuity of the human species, or *politicise* it as the results of one social group seeking to enrich themselves at the expense of another (Swanson, 2016). But for geologists, who are the final arbiters of its formal designation, the primary consideration is that the Anthropocene's official onset date has to be able to provide a GSSP, so should be associated with a material expression that is 'stratigraphically sharp … and globally widespread' (Zalasiewicz et al., 2014b: 40).

In sheer mass and volume, the most significant lasting trace of human influence on the planet will likely be the 'trace fossil system' left by human activity: the cities, buildings, roads, airports and associated altered landscapes on the Earth's surface, the 'burrowings' and 'intrusions' of human mining and construction activities underground, and the various deposits of new

'anthropogenic minerals' such as pure metals and alloys, bricks, concrete, slags, polymers and plastics (Zalasiewicz et al., 2014b: 44-5; Zalasiewicz et al., 2014a). However, the creation of such 'artificial ground' (Price et al., 2004) around the Earth has been spatially and temporally highly uneven, and its vertical boundaries also disrupted by the very activities which create the Anthropocene Series in the first place. In their quest for a material expression that is vertically (i.e. temporally) 'sharp' and horizontally (i.e. globally) 'widepread', the Working Group is currently looking more towards sedimentary layers that are laid down in orderly fashion in lakes and deltas, pointing out that those formed from the 1950s onwards will display a sharp jump in artificial radionuclides released from atom bomb tests, and shifting nitrogen isotopes due to accelerating artificial fertiliser use (Zalasiewicz et al., 2014b: 43). That the mid-twentieth century also coincides with the start of the 'Great Acceleration', and thus a possible systemic change in Earth processes, is only a secondary consideration when placed alongside the need for a sharp and widespread signal. Thus, if the new epoch is formalised, and a GSSP is established as a global reference, it may well be situated in a mid-twentieth-century sequence of lake sediment strata – or perhaps, like that for the Holocene epoch, in an ice core stored in a freezer.

So what about an associated intentional monument to the Anthropocene? What might that look like, and what inscription if any might it bear? These questions were explored in *Anthropocène Monument*, a project that was conducted in 2014 at Les Abattoirs Museum of Contemporary Art, Toulouse, in the form of an exhibition and colloquium, devised by the author in collaboration with Bruno Latour of Sciences Po, Paris and Olivier Michelon, the Director of Les Abattoirs. For the exhibition, twenty artists from around the world were commissioned to supply designs for a 'monument to the Anthropocene'. The way that the artists responded to the call ranged widely, though in the context of a contemporary art exhibition, 'newness value' and 'relative art value' were unsurprisingly to the fore. Some incorporated as emblematic features in their monument designs imagined geological markers for the Anthropocene Series such as novel minerals derived from plastic, or contemporary artefacts that might be disinterred and interpreted by future archaeologists. Others, mindful of the way that the Anthropocene Series would blur the distinction between natural and cultural entities, and playing on the monumentalising effects of decay and ruination, proposed to repurpose existing iconic edifices as intentional monuments. But rather than focus on specific designs, I want to draw on the designs and debates in Toulouse in order to make some general points about the ways in which the 'Anthropocene moment' might unsettle the semiotic conventions of geological monumentalisation.

Firstly, at the same time that the Earth sciences were making huge strides in the late twentieth century towards a unified theory of the whole Earth, and using monumental semiotics to stabilise its chronology, as we saw above there was a reaction within many Western societies against traditional monumental codes. In keeping with this, rather than suggesting geological versions of what Pierre Nora (1984-1992) called *lieux de mémoirs*, canonical 'sites of memory', the artists in our exhibition seemed to intuit that what was needed to mark the

Anthropocene was more like what Michael Rothberg calls *noeuds de mémoire*, multisited 'nodes' or 'knots' of memory, actively made and remade by heterogeneous networks of remembering, engaged in 'encounters between diverse pasts and a conflictual present … but also between different agents or catalysts of memory' (Rothberg, 2010: 9). Most of the exhibiting artists therefore produced designs for *Gegendenkmäler,* counter-monuments, which were variously mobile, dispersed, transient, or demanded interaction, and that thus served not to consolidate cultural memory but to provoke communicative memory, debate and action.

Secondly, however, this drive to counter-monumentalisation was not just a product of social-historical context, but was also related to the unusual character of the Anthropocene as a geological epoch that is being inaugurated in the present moment, and (at least partly) by conscious, human agents. Previous geological time periods (apart perhaps from the officially still-current Holocene epoch) could perhaps plausibly be consigned to the 'timeless' deep time of the distant geological past, since, using Foucault's language, in these cases the human as a representing being simply plays the role of observer and coherer of the Earth as a unified, historical body. But the Anthropocene epoch cannot be safely consigned to timeless geological time, since it is highly 'timely', in the sense of being still in process, indeterminate, and characterised not merely by actuality but also by potentiality. Given such an object for memorialisation, it seems fitting to do so, not in the indicative mood of 'here is', but in the subjunctive or conditional mood of 'perhaps' or 'unless'. Any monument to the Anthropocene would thus have to bring together not just the time of the Earth as a self-organising body and that of the human knower of nature, but also the time of human ethico-political agency – and this may even involve resistance to the formal process by which the nomenclature of the Anthropocene might pass into 'timeless' geological time, removed from the 'timeliness' of contestation, debate and struggle (Crist, 2013).

Thirdly – and here I am being more speculative – it may well be that the Anthropocene will not just resist easy incorporation into the settled monumental semiotics of geological stratigraphy but will destabilise the whole machinery by which the Earth and its deep history is given coherent meaning. Geology of course has never been a wholly retrospective science; in its more applied forms it has been closely linked to the extractive industries and to civil engineering, so is involved not just in understanding the Earth's past but also in imagining and making its future. But up till now, while these two geological modes interact in mutual interdependence, their respective logics have been insulated from each other: however much we 'write' on the Earth of today by recomposing its surface, we do not think that we can change the deep history that we 'read' in its buried strata as we do so. But just as the Anthropocene as an epoch-in-the-making disrupts the role of the human as the detached knower and coherer of the Earth, so it may also disrupt the very idea of the Earth as a singular body, and of the 'timeless', distanced understanding of geological time. The attempt to tell a singular story of the Anthropocene has already been challenged as a colonialist projection of European experience as a master-narrative to which hugely divergent patterns of anthropogenic environmental change must be subordinated

(Morrison, 2015). Could this unsettling spread to units of geochronology that are currently seen as safely consigned to the changeless, 'timeless' past? If the body of the Earth as seen by modern geology can be likened to a great stone book which records its own history (Szerszynski, 2012), then what happens when we start to see that book not as being 'read' but also being 'written' (Szerszynski, 2010)? To adapt Barthes' (1975) terms, perhaps the Earth will pass from being seen as a *lisible* ('readerly') book of settled meanings to being a *scriptibile*, ('writerly') one, a book in which it is not just the last chapter that is relevant to us, is as yet unfinished, and thus is available to new meanings and possibilities. If stratigraphic modes of reading the Earth depend on semiotic conventions which could be otherwise, perhaps the 'Anthropocene moment' will make possible a new semiotics of the Earth in which there is no 'floating' geological gap that separates the time of human history and the deep time of the Earth's formation (Szerszynski, 2010), in which, like the depths of the human psyche, the vistas of 'deep' geological time are also operative in the 'here' and 'now'.

Conclusion

If one had approached the completed Parthenon in the time of Pericles, the first representational features one would have seen on the temple itself would have been some of the 92 sculpted, rectangular metopes, positioned high around the structure. Consistent with the style of the exterior, these were carved in a muscular, Doric style, and represented the triumphs of the Athenians over their regional rivals, and those of their gods over animal passions and chaotic chthonic forces. Here already, on the Doric exterior, the Greeks and their achievements are being placed cosmopolitically almost on a par with those of the gods that they worshipped (Tiverios, 1982; Rhodes, 2016). However, as one passed into the shadowy interior, but before entering the sacred space of the cella, one would have seen overhead the brightly painted frieze, which was sculpted in the Ionic style, more subtle and complex in its presentation of humans, gods and the relations between them (Mark, 1984).

One day there may well be an Anthropocene 'golden spike' in a sediment layer somewhere on the Earth, but this can only form part of a wider monumental system – and one from which tension and contention will be difficult to banish. A succinct way to sum up the argument of this paper would be to say that, if the Anthropocene is to be accepted as a unit of Earth time, it will need its own monumental system to mediate the different temporal and spatial registers involved – and that this should be less Doric than Ionic. That is, rather than presenting the sheer power of geological forces and simply including human agency amongst them, and rather than presenting a singular story of civilisational progress (or disaster), an Anthropocene monumental system would surely have to challenge the viewer to wrestle with the paradoxes and responsibilities involved in being a member of a species that, albeit unevenly, is achieving geological consequentiality. But to go further, to turn Ionic reflexivity against its own assumptions – to ionise the Ionic, as it were – rather than the 'monumental system' of the Anthropocene being perched like the Parthenon and Erechtheion on a single 'high city' at the centre of the 'civilised' world, approached by a

unified, orderly procession, and revealing and reproducing a single, timeless truth, any monumental system for the Anthropocene would need to signify that this epoch-in-the-making will be actively woven from multiple stories and diverse imagined futures distributed around the globe. To simplify, 'the Anthropocene' is a concept that was coined by Earth system scientists, is being formally assessed by geologists, but can only really be completed with the cooperation of wider society, as it reimagines relations across the planet amongst humans and non-humans (Swanson et al., 2015; Harrison, 2015), and as it recomposes the relations between the lived time of human history and the deep time of our home planet.

Acknowledgements

Many thanks are first due to Bruno Latour and Olivier Michelon, with whom the Anthropocene Monument project at Les Abattoirs, Toulouse was conceived and realised, but also to all the artists who contributed monument designs for the exhibition (3 October 2014 – 4 January 2015), to the participants in the colloquium held at Les Abattoirs on 10-12 October 2014, and to Toulouse Métropole and Les Abattoirs for their generous financial support for the project. I am deeply thankful to Bruno Latour, Patrick Hagopian, Greg Myers, Cristián Simonetti, Jan Zalasiewicz, and members of the Rachel Carson Centre, Munich – Saskia Beudel, Veit Braun, Carrick Eggleston, Arnab Dey, Helen Gilbert, Bernhard Gill, Martin Meiske, Salma Monani, Ursula Münster, Cindy Ott, Lisa Sedrez, Sarah Strauss and Allen Thompson – for very helpful comments on earlier drafts. I am also grateful to Lancaster University's Faculty of Arts and Social Sciences for providing sabbatical leave, which made researching and writing this paper possible.

References

Assman J. (2008) Communicative and cultural memory. In: Erll A, Nünning A and Young SB (eds) *Cultural Memory Studies: An International and Interdisciplinary Handbook.* Berlin: Walter de Gruyter, 109–118.

Assmann J. (2012) Cultural memory and the myth of the Axial Age. In: Bellah RN and Joas H (eds) *The Axial Age and Its Consequences.* Cambridge, MA: Harvard University Press, 366–408.

Barthes R. (1975) *S-Z,* London: Jonathan Cape.

Bataille G. (1997) Architecture. In: Leach N (ed) *Rethinking Architecture: A Reader in Cultural Theory.* London: Routledge, 21.

Bonneuil C and Fressoz J-B. (2016) *The Shock of the Anthropocene: The Earth, History, and Us,* London: Verso.

Carpo M. (2007) The postmodern cult of monuments. *Future Anterior* 4: 50–60.

Catton W, Jr. and Dunlap RE. (1978) Environmental sociology: a new paradigm. *The American Sociologist* 13: 41-49.

Chakrabarty D. (2009) The climate of history: four theses. *Critical Inquiry* 35: 197-222.

Crist E. (2013) On the poverty of our nomenclature. *Environmental Humanities* 3: 129-147.

Crutzen PJ. (2002) The anthropocene: geology of mankind. *Nature* 415: 23.

Crutzen PJ and Stoermer EF. (2000) The "Anthropocene". *IGBP Newsletter* 41: 17-18.

Durkheim Em. (1938) The Rules of Sociological Method. *The University of Chicago sociological series.* 8th ed. Chicago, IL: University of Chicago Press, lx, 146 p.

Foucault M. (1970) *The Order of Things: An Archaeology of the Human Sciences,* London: Tavistock.

Foxhall L. (1995) Monumental ambitions: the significance of posterity in ancient Greece. In: Spencer N (ed) *Time, Tradition, and Society in Greek Archaeology: Bridging the 'Great Divide'.* London: Routledge, 132-149.

Giedion S. (1944) The need for a new monumentality. In: Zucker P (ed) *New Architecture and City Planning: A Symposium.* New York: Philosophical Library, 549-568.

Hamilton C. (2016) The Anthropocene as rupture. *Anthropocene Review* 3: 93-106.

Harrison R. (2015) Beyond “natural” and “cultural” heritage: toward an ontological politics of heritage in the age of Anthropocene. *Heritage & Society* 8: 24–42.

Heidegger M. (1971) The origin of the work of art. *Poetry, Language, Thought.* New York: Harper and Row, 17-87.

Jencks C. (1977) *The Language of Post-Modern Architecture,* New York: Rizzoli.

Koselleck R. (2004) *Futures Past: On the Semantics of Historical Time,* New York: Columbia University Press.

Lamprakos M. (2014) Riegl’s ‘‘modern cult of monuments’’ and the problem of value. *Change Over Time* 4.2: 418-435.

Latour B. (1991) Technology is society made durable. In: Law J (ed) *A Sociology of Monsters: Essays on Power, Technology, and Domination.* London: Routledge, 103–132.

Laudan R. (1987) *From Mineralogy to Geology: The Foundations of a Science, 1650-1830,* Chicago: University of Chicago Press.

Le Goff J. (1980) *Time, Work & Culture in the Middle Ages,* Chicago: University of Chicago Press.

Le Goff J. (1991) *Medieval Civilization 400 - 1500,* Oxford: Blackwell.

Lefebvre H. (1991) *The Production of Space,* Oxford: Blackwell.

Lewis SL and Maslin MA. (2015) Defining the Anthropocene. *Nature* 519: 171-180.

Lezaun J. (2006) Creating a new object of government: making Genetically Modified Organisms traceable *Social Studies of Science* 36: 499-531.

Loos A. (1987) Architecture. *Midgard Journal of Architectural Theory and Criticism* 1: 49–56.

Luhmann N. (1976) The future cannot begin: temporal structures in modern society *Social Research* 43: 130-152.

Luhmann N. (1998) *Observations on Modernity,* Stanford, CA: Stanford University Press.

Lyotard J-Fo. (1979) *La Condition Postmoderne: Rapport Sur Le Savoir,* Paris: Éditions de Minuit.

Malm A and Hornborg A. (2014) The geology of mankind? A critique of the Anthropocene narrative. *The Anthropocene Review* 1: 62-69.

Mark IS. (1984) The gods on the east frieze of the Parthenon. *Hesperia: The Journal of the American School of Classical Studies at Athens* 53: 289-342.
Morrison KD. (2015) Provincializing the Anthropocene. *Seminar* 673: 75-80.
Nora P. (1984-1992) Les Lieux de Mémoire. Paris: Gallimard.
Pensky M. (2011) Three kinds of ruin: Heidegger, Benjamin, and Sebald. *Poligrafi* 16: 43–64.
Pickstone JV. (2000) *Ways of Knowing: A New History of Science, Technology and Medicine,* Manchester: Manchester University Press.
Pike SH. (2000) *Archaeological Geology and Geochemistry of Pentelic Marble, Mount Pentelikon, Attica, Greece,* PhD, Athens, GA: University of Georgia.
Price S, Ford J, Kessler H, et al. (2004) Artificial ground: mapping our impact on the surface of the Earth. *Earthwise* 20: 30-31.
Psarra S. (2004) The Parthenon and the Erechtheion: the architectural formation of place, politics and myth. *The Journal of Architecture* 9: 77-104.
Regueiro M, Stamatakis M and Laskaridis K. (2014) The geology of the Acropolis (Athens, Greece). *European Geologist* 38: 45-52.
Rhodes RF. (2016) The Periclean Acropolis. In: Miles MM (ed) *A Companion to Greek Architecture.* Chichester: Wiley-Blackwell, 147–163.
Riegl A. (1996) The modern cult of monuments: its character and origin. In: Stanley-Price N, Talley MK and Melucco Vaccaro A (eds) *Historical and Philosophical Issues in the Conservation of Cultural Heritage.* Los Angeles: Getty Conservation Institute, 69-83.
Rockstrom J, Steffen W, Noone K, et al. (2009) A safe operating space for humanity. *Nature* 461: 472-475.
Rossi P. (1984) *The Dark Abyss of Time: The History of the Earth & the History of Nations from Hooke to Vico,* Chicago: University of Chicago Press.
Rothberg M. (2010) Introduction: Between memory and memory: from *lieux de mémoire* to *noeuds de mémoire*. *Yale French Studies* 118/119, : 3-12.
Ruddiman WF, Ellis EC, Kaplan JO, et al. (2015) Defining the epoch we live in. *Science* 348: 38-39.
Rudwick MJS. (1976) The emergence of a visual language for geological science 1760–1840. *History of Science* 14: 149–195.
Rudwick MJS. (2005) *Bursting the Limits of Time: The Reconstruction of Geohistory in the Age of Revolution,* Chicago: University of Chicago Press.
Savage K. (2009) *Monument Wars: Washington, D.C., the National Mall, and the Transformation of the Memorial Landscape,* Berkeley: University of California Press.
Schnapp A. (1995) The relations between human and natural history in the construction of archaeology. In: Hodder I, Shanks M, Alexandri A, et al. (eds) *Interpreting Archaeology: Finding Meaning in the Past.* London: Routledge, 162-163.
Schorske CE. (1981) *Fin-de-siècle Vienna: Politics and Culture,* Cambridge: Cambridge University Press.
Simonetti C. (2013) Between the vertical and the horizontal: time and space in archaeology. *History of the Human Sciences* 26: 90–110.
Simonetti C. (2015) The stratification of time. *Time & Society* 24: 139–162.

Steffen W, Crutzen PJ and McNeill JR. (2007) The Anthropocene: are humans now overwhelming the great forces of nature? *Ambio* 36.

Steffen W, Jäger J, Matson P, et al. (2004) Global Change and the Earth System: A Planet Under Pressure. *The IGBP Series,*. Berlin: Springer-Verlag.

Swanson HA. (2016) Anthropocene as political geology: current debates over how to tell time. *Science as Culture* 25: 157-163.

Swanson HA, Bubandt N and Tsing A. (2015) Less than one but more than many: Anthropocene as science fiction and scholarship-in-the-making. *Environment and Society: Advances in Research* 6: 149–166.

Szerszynski B. (2010) Reading and writing the weather: climate technics and the moment of responsibility. *Theory, Culture & Society* 27: 9-30.

Szerszynski B. (2012) The end of the end of nature: the Anthropocene and the fate of the human. *Oxford Literary Review* 34: 165–184.

Tiverios MA. (1982) Observations on the East metopes of the Parthenon. *American Journal of Archaeology* 86: 227-229.

Tzortzi K. (2015) *Museum Space: Where Architecture Meets Museology,* London: Routledge.

Vansina J. (1985) *Oral Tradition as History,* Madison: University of Wisconsin Press.

Young JE. (1992) The counter-monument: memory against itself in Germany today. *Critical Inquiry* 18: 267-296.

Zalasiewicz J, Kryza R and Williams M. (2014a) The mineral signature of the Anthropocene in its deep-time context. *Geological Society, London, Special Publications* 395: 109-117.

Zalasiewicz J, Steffen W, Leinfelder R, et al. (forthcoming) Petrifying Earth process: the stratigraphic imprint of key Earth system parameters in the Anthropocene. *Theory, Culture & Society*.

Zalasiewicz J, Williams M and Waters CN. (2014b) Can an Anthropocene Series be defined and recognized? *Geological Society, London, Special Publications* 395: 39–53.