Archaeology, Climate-Change and Environmental Ethics:

Diachronic Perspectives on Human:Non-Human:Environment Worldviews, Activism and Care

Julia Shaw (UCL Institute of Archaeology)

2 May 2017

Abstract

This paper calls for archaeological engagement with the ethical dimension of past:present:future global environmental discourse and Anthropocene studies. In contrast to the recent chronological focus of archaeology's engagement with Anthropocene studies, and its often rather generalised call for recognising the relevance of historically attested adaptive responses to climate change to current challenges, it highlights the need to examine the individual contributing and resulting factors of climate change and extreme environmental events. It advocates an approach that combines archaeology's traditional focus on the practical and material elements of disaster management, with one that explores historical epistemologies of human:non-human care and entanglement, and socio-religious and collective ideological movements as driving forces behind historically specific environmental ethics. In relation to the 'non-human' element of the human:non-human:environment configuration there is special emphasis not only on non-human animals, but also conceptualisations of divine, 'supra-human', and numinous entities and spheres such as gods, spirits, and sacred places which are essential for attaining fully syncretic perspectives on diachronic environmental ethics. A key argument is that recognition of the multi-directional dynamics of human: environment entanglement, drawing on developments within religious studies, the environmental and medical humanities, as well as environmental health discourse, is crucial for achieving more widespread engagement with environmental activism, and movement towards long term behavioural changes that ultimately reduce global suffering and increase environmental, economic and human wellbeing.

Keywords

Anthropocene studies; Archaeology as environmental humanities; Climate change; Religion and Ecology; Archaeology and environmental medicine; Environmental ethics

Introduction

This volume brings together papers on archaeology's engagement with the ethical dimension of past:present:future global environmental discourse, arguing that the study of historically specific human:non-human:environment worldviews and epistemologies, particularly those in which religio-cultural constructs regarding humans' place in the world are shaping forces in economic, socio-political and environmental action, should be key to building long-term perspectives on the current global environmental crisis. Its publication is timely given the growing cross-disciplinary interest in Anthropocene studies with which archaeology has only recently begun to engage, albeit generally with the rather restricted aim of promoting its capacity to deepen temporal perspectives on the social-construction-of-

'nature' theme that permeates Anthropocene discussions, and to provide empirical evidence for practical and material responses to climate-change and extreme environmental events, as relevant models for present:future challenges. Further, the related human:environmental 'entanglement' discourse has with recent exceptions (Lane 2015) tended to focus on agrarian and technological agents of change, rather than on underlying ethical frameworks whether driven by explicit religious theologies and epistemologies, or through more broadly applicable ideological 'worldviews' akin to Latour's (2013b) 'secular religion'. Finally, archaeology's growing interest in the generalised term 'climate-change', itself a symptom of deeper human:environment imbalance, tends to overlook the diversity and variation of impact in terms of both causal contributing factors, and individualised impact at a human level.

This volume arose from the need therefore to address these problems through examination of historical concepts of human:non-human care in relation to environmental ethics and historical socio-ecology, and assessment of how particular social, religious, or political groups responded to new environmental challenges in antiquity. The socio-economic, medical and religious dimensions of environmental and climate change are key topics in the social sciences against the backdrop of the contemporary global crisis: the degree to which environmental challenges have impacted on human wellbeing, health and economic stability has generated significant discussion within the fields of anthropology, environmental humanities, and environmental health. Similar concerns wich also inform United Nations' (2015) 'Sustainable Development Goals', and related 'One Health' (Watts et al 2017) and 'Planetary Health' (Whitmee et al 2015) initiatives, which focus on the impact of climate change on human-animal-environment health and wellbeing. In religious studies there is growing interest in the ecological motif within specific religious traditions and how religious attitudes towards environmental ethics might inform future 'green' policy making. By contrast although there have been a number of agenda-setting papers in recent years on the interface between heritage, archaeological conservation and landscape ethics (Dalglish 2012), there is a paucity of archaeologically-oriented studies of the ethical dimensions of Anthropocene discourse, and in particular, the religion-ecology-environmental change interface.

This volume seeks to fill some of these gaps through an exploration of archaeology's contribution to debates on human:non-human epistemologies, entanglements and intergenerational duties of care and activism. Key themes include the socio-ecological, cultural and medical outcomes of changing attitudes towards 'wild' v. 'domesticated' spaces, together with new forms of land and water management; and strategies for dealing with the economic and human fallout of environmental stress, including climate change as well as its individual contributing and resultant factors such as urbanisation, pollution, unsustainable agrarian and forest management policies, droughts and floods. Other themes include the ecological focus of socio-cultural and religio-philosophical movements in the past as models for collective modes of environmental activism in the present, and the degree to which contemporary attitudes towards archaeological sites, particularly those with perceived religious significance, can inform archaeological and environmental conservation. In this respect, the 'non-human' element of the human:non-human:environment configuration

includes not only non-human animals, but also conceptualisations of divine, 'supra-human', and numinous entities and spheres such as gods, spirits, and sacred places. In many contexts these supra, or 'more-than-human' dimensions constitute key elements of the empirical world, and for archaeologists to ignore them is to do so at the expense of gaining a fully syncretic perspective on diachronic environmental ethics.

Archaeology, Environmental Humanities, and Anthropocene Studies

Archaeology has hitherto had limited engagement with environmental humanities discourse, including associated research forums and university centres whose numbers have proliferated in recent years. A panel on Archaeology as Environmental Humanity at the Royal Anthropological Institute's 2016 conference on Anthropology, Weather and Climate Change represents a recent exception to this trend (Riede 2016; see also Davies and M'Mobogori, Ed. 2013). This lacuna is the focus of detailed historiographic consideration by Riede et al (this volume), who lament archaeology's scant presence within discussions of contemporary climate change, including both those that call for more interdisciplinary engagement between the physical sciences and the humanities (Hulme 2010), and broader theoretical discussions of environmental ethics (Palmer et al 2014, Nolt 2015). This is a double irony given archaeology's long-standing focus on the environmental sciences, Riede et al stressing (8) that 'the environment features all too rarely in standard narratives of human prehistory and history, other than as a broad canvas or a wilderness to be tamed from Neolithic times onwards'.

Further, archaeology has only recently begun to engage with the Anthropocene concept, which as discussed by Riede et al (8, drawing on Chakrabarty 2009 and Dukes 2013), 'collapses the once foundational distinctions between environmental, economic and political histories'. As a late attempt to redress this balance, there has been a recent flurry of position statements calling for recognition of archaeology's relevance to Anthropocene discourse (e.g., Ellis et al 2016; Murphy and Fuller 2017), particularly its framing by earth scientists as a largely post-Industrial Revolution phenomenon (Crutzen and Stoermer 2000). Murphy and Fuller (2017, 8) in a historiographic overview of environmental archaeology's relevance to current concerns, see the current scholarly milieu as the latest of four phases of environmental archaeology, 'one in which it has a key role to play not just in holistic archaeological investigation but also in making archaeological results relevant to research on climate change, landscape ecology and conservation, human diet, and, more broadly Anthropocene studies'. They call for a 'forward-looking environmental archaeology' with greater interdisciplinary engagement with conservation biology and modern climate change studies. However, as reflected by the themes covered in this volume, just as crucial points of convergence are offered by religious studies (Pillatt; Shaw; Zhuang et al), anthropology (Damon; Fredengren; Shaw), comparative literature and poetry (Fredengren), post-human humanities and heritage studies (Frendengren), agrarian history records (Pillatt), ancient textual analysis (Shaw; Zhuang et al), the medical humanities (Shaw); and environmental health (Shaw). By restricting the focus of archaeology's interdisciplinary links with the physical sciences, and on technological and agrarian modalities of human:environment interaction, key questions regarding the ethical, socio-cultural and political dimensions of

environmental stress, as well as its highly individualised impact on human livelihoods and wellbeing, are overlooked.

A key concern of archaeology's recent engagement with Anthropocene studies has been to stress the deep history of human:non-human entanglement in the form of agricultural domestication from the mid-Holocene transition c. 6000 BP (Hodder 2012, 75–6; Edgeworth 2014; Braje 2016; Dalby 2016), highlighting the socially constructed quality of geology (Ruddiman 2013), and challenges to entrenched notions of natural 'laws' of sedimentology and hydrology. Deeper chronologies extending to c. 10,000 BP are posited for parts of Asia and the Near East (Morrison 2015; Boivin et al. 2016), while recent evidence for the long-term history of forest exploitation (Morrison and Lycett 2014; Clement et al. 2015; Evans 2016) challenges received narratives of deforestation as a largely post-Industrial phenomenon. As discussed by Damon (this volume), Anthropocene discourse tends to overemphasise the impact of post-Industrial Revolution methane and carbon dioxide emissions, despite ice-core evidence attesting to such problems from at least 7000 BP, with prehistoric rice production and deforestation being major contributors to methane and carbon dioxide production respectively (Ruddiman 2003, 2010; Ruddiman et al 2016).

This human-environmental entanglement theme which now permeates archaeology and related social sciences (e.g., Hodder 2012; Latour 2013a, b; Lorimer 2015), is reflected in all of the papers in this volume. Ertsen (13), drawing on Mesopotamian irrigation systems, highlights the socially constructed dimension of water balance. He critiques received notions of water and landscapes (e.g., Solomon 2010) as neutral entities which form passive, static backdrops to human management and agency, as opposed to integrated agents in the production of social practice and ethics. Similarly, Fredengren refers to Irish crannogs as 'hybrid "natureculture" constructs' which not only 'reveal humans as geological and hydrological actors, […but] also develop their own, quite radically new materialities and environmental trajectories.'

However, despite the crucial deep-temporal perspective offered by archaeology's engagement with Anthropocene studies, it is important not to underplay the particular gravity and uniqueness of our current environmental crisis, whose close link with the petrochemical and agro-pharmaceutical industries, and associated use of synthetic, and often toxic, chemicals on an unprecedented scale, set it apart from pre-industrial examples of human-nature entanglements. Given recent developments in environmental medicine which demonstrate how our synthetically altered environment is changing human and non-human animals at an intergenerational level through epigenetic, genetic and endocrine disruption (Genuis 2012; Dupre 2013), the message of Rachel Carson's (1962) ecological canon is as urgent as ever. Shaw (this volume) highlights this imbalance in much of archaeology's recent 'entanglement' discourse which emphasises human-constructed environments largely through the prism of agricultural 'domestication' and forest exploitation, at the expense of viewing humans as an integral part and product of this very same environment. Related questions as to how collective religio-philosophical or political-ideological responded to changing dynamics between perceptions of 'domesticated' v. 'wild'

spaces, or regarding specific geological or ecological impacts on human health, wellbeing and suffering, are generally less discussed.

The multi-directional workings of human:non-human engagement are well illustrated by dynamics of riverine action which as discussed by Ertsen (13) connect human and non-human agents upstream with those downstream, and past with present. An additional and crucial linking mechanism that would benefit also from archaeological enquiry is of course water *quality* which brings with it important ethical considerations regarding human:non-human duties of care and responsibility (Steingraber 1997). The interconnectivity of rivers, oceans and climatic systems bound together through water flow, oceanic tides, as well as hydrological and climatic action, acts as a forceful reminder of the diachronic, global consequences of localised human action, and illustrates the need also to look beyond our regional and methodological specialisations when it comes to archaeological assessments of human:environment entanglements.

The environmental paradigm of illness (Genuis 2012) offered by Environmental Medicine, and its sub-branch of 'Ecological Medicine' - together with the more recent 'One Health' (Watts et al 2017; UK Health Alliance on Climate Change 2016; Royal College of Physicians and Royal College of Paediatrics and Child Health 2016) and 'Planetary Health' (Whitmee et al 2015) initiatives, both of which reflect closely the United Nation's (2015) 'Sustainable Development Goals' - which highlights the multi-directional dynamic of nature:culture and human:non-human entanglement, holds potential for encouraging environmental activism by those with less than altruistic interests. Similarly by emphasising a human-centric approach to suffering and the means of its alleviation as in examples of early Indian Buddhist engagement with environmental control, one might better draw on convergences between past, present and future environmental ethics, and encourage a more holistic and intergenerational approach to human:non-human care (Shaw). This perspective sits well with arguments within contemporary / future disaster management discourse which place engagement with religion high on the agenda for tackling climate change and extreme environmental events (Chester 2005; Chester et al 2008; Hulme 2010).

Past:Present:Future Adaptation to Climate Change, and Weather Stress

Climate-based models are increasingly prevalent in archaeological narratives of urban decline and 'collapse' (e.g., Dixit et al. 2014), and their potential relevance for 'present and future environmental problems and solutions' (Murphy and Fuller 2017) feature prominently in such accounts. Climate change is also a major theme in recent accounts of agrarian (d'Alpoim Guedes et al 2015), cultural (d'Alpoim Guedes et al 2016) and socio-ecological change (Boivin et al 2016). However, as illustrated by arguments regarding the weakening of the summer monsoon in 4.1 ky BP/2100 BC in South Asia, and the transformation of Harappan urbanism after c. 1900 BC (Dixit et al. 2014), which focus primarily on land-use and settlement data, there is generally less emphasis on how such posited outcomes were digested by religio-philosophical traditions, especially those concerned with human health and well-being. Shaw (this volume) discusses the interface between environmental change, transformations of material culture and religion-based intellectual and practical responses to

related phenomena such as rapid urbanization, by various orthodox and heterodox religio-philosophical factions during the ensuing centuries. Early Indian Buddhism, for example, acts as both a catalyst and an outcome of urbanism, offering solutions to a range of negative side-effects such as poverty, pollution, and new illnesses, paralleling those associated with rapid urbanisation in the modern 'developing' world (Shaw). Buddhism's special interest in the causes and means of alleviation of human suffering, including steps for correcting 'erroneous' modes of human thought and behaviour, but also practical solutions such as irrigation water provision (albeit modulated via 'ritual' frameworks of environmental control as provided by localised rainmaking cults) for tackling regionally specific environmental challenges posed by the seasonal monsoon, has very real relevance for ongoing problems of drought and flood control in many parts of Asia.

Riede et al (this volume) assess the cultural element of 'natural' disasters, through examination of historical volcano eruptions and their local and global impact on climate change. Pillatt (this volume) examines the impact of weather on the development of a Quaker environmental perspective in 18th century northern England. In contrast to the global, and long-term focus of much of climate-change archaeology (Van de Noort 2011), Pillatt focuses on localised, short-term rhythms of weather fluctuations, and the relationships between weather and landscape. Drawing on Ingold's (2015) 'weather-world', and the idea of 'weatherscape' as a fundamental component of the landscape through which local identity, human agency and social practice are mediated, he uses Quaker farmers' diary entries to reconstruct connections between weather and sense of place.

Water management as response to climatic-environmental stress

The role of water within archaeologically attested environmental ethics features prominently in this volume. A key theme in the last half century has been the questioning of centralised, Wittfogelian (1957) models of water administration. Ertsen (4; see also Davies 2009 for a related critique) argues that recent 'grand narratives' of water resource systems in antiquity (Solomon 2010; Fagan 2011; Mithen 2012) help to perpetuate some of Wittfogel's more obvious shortcomings by treating water as static, overarching categories, rather than as constantly changing entities. Even in contexts with assumed centralised irrigation administrations such as the Mesopotamian Neo-Assyrian state, technological and administrative conditions would have varied enormously through time and space, necessitating localised, temporally focussed modes of archaeological investigation. Similar arguments which have relevance for contemporary 'indigenous' v. World-Bank 'Big Dam' development models (Agarwal and Narain 1997), are proposed by Shaw (this volume) for the highly localized design of many pre-modern dam traditions and codified rules governing reciprocal community access to irrigation supplies. Further, evidence for the management of water resources by monastic organisations and temple councils in South Asia challenges both Wittfogelian models of water control and traditional models of the centralised Indian state. Zhuang et al (this volume, 12) make a similar argument for the superior agrarian

functionality of small v large scale water resource systems in Han China due to the former's higher level of customisation to localised hydrological conditions.

Environmental Archaeology's Ethical Responsibility?

Despite environmental archaeologists' recently expressed eagerness to have their voices heard within Anthropocene studies discourse, there are still important ethical questions regarding what one might call the 'environmental positionality' of archaeology and its practitioners. Riede et al (4) stress that 'current debates on climate change and climate catastrophe – including especially the conception of the Anthropocene and the notion that human history and environmental history cannot meaningfully be separated […] - make it an urgent matter to embed ethical concerns in, at the very least, environmental archaeological practice.' They argue that on the one hand archaeologists working on 'environmental impacts in the past should – or rather must – engage with the implications that their research has for potential futures', but that they should also be considering the ethical implications for archaeological practice itself, in keeping with the 'activist' orientation of much of environmental humanities and ecocriticism dialogue. An important question therefore is how archaeologists might best engage with this discourse and position (and possibly change) their practices accordingly? In this respect, Riede et al consider the need for an ethical framework along lines similar to those proposed for a Geoethical Promise (Matteucci et al 2014), itself framed on the 'doing no harm' premise of the medical Hypocratic oath. Whilst they reject the need for a formalised 'Environmental Archaeological Promise', they conclude that the very idea of an ethical promise is important for making archaeologists reflect on their ethical stance, arguing that geologists [and archaeologists] should also be environmentalists – indeed, they should almost be activists' (4).

For archaeology, these considerations can be taken in several directions, the first being that our special long-term insights into the causes and impacts of unsustainable human-environment relationships, and respective human adaptive responses in the past give us a responsibility to engage with environmental matters in the present and future (Mitchell 2008; Van de Noort 2011). Riede et al (9) argue that this should include ethical engagement with disaster response and disaster risk assessment, using for example past evidence for earthquakes and volcano eruption as predictive tools for mitigating future disasters. On the other hand, Ertsen (4), drawing on Mesopotamian irrigation technologies, cautions against using the past for understanding the present / future: 'while the past can point us to certain directions of change, its lessons are rarely directly applicable to present concerns', arguing that the primacy given to such direct linkages in recent grand-narrative 'water-histories' (e.g., Fagan 2011; Solomon 2010) help to perpetuate the biases and simplifications of Wittfogel's (1957) much contested models of centralised water control ((cf. Lane's 2015 critique of using generalised examples of disaster responses in the past as solutions for the present, highlighting the highly variable impact, at an individualized level, of the current environmental/climate-change crisis).

Fredengren, drawing on Bennett's (2001) notion of culture as a meshwork of both human and non-human agencies, and Braidotti's (2013) ethics of 'flourishing', argues that politics also needs to be treated as a 'political ecology' consisting of both human and non-human collective action and in which archaeology and archaeological sites can play a crucial role in

encouraging 'more-than-human relations and intergenerational commitments to justice and care'.

Shaw, drawing on examples of early Buddhist 'monastic governmentality', describes a form of 'passive environmental action' whereby monks, who in order to conform to canonical ideals of detachment whilst also generating patronage necessary for sustaining a non-producing monastic population and tackle human suffering in wider society, disguised their direct engagement with, and transformation of, natural resources. Forming parallels with later forms of non-violent political resistance whereby outward passivity matters less than the end result, such collective responses to environmental, climatic and social stress, are relevant to current problems, especially in political contexts where environmental activism is treated as 'subversive civil disobedience', a threat to national economic security, and the increasing focus of covert surveillance-based policing (Luke 1999; Taylor 2017).

Pillatt (3) also highlights archaeology's relevance to current debates through examples of 'socio-ecological resilience' and adaptive strategies of 18th century, northern English Quaker communities. Zhuang et al (10) draw on Han Chinese examples of unsustainable agricultural practices, forest clearance, mass migration and political instability, which collectively led to soil erosion, increased river sedimentation, high flood risks, and ultimately a state of socio-economic 'tribulation'. They highlight the irony that despite agriculture's association with developed, state-level society, it often 'loses its robustness and adaptability when dealing with crises'. These examples of human-mediated environmental challenges coincided with the development of small-scale irrigation facilities geared partly towards managing flood risk as well as mitigating water-supply problems. Further, the introduction of water-dependent crops such as wheat, soybean and rice were more vulnerable to drought and crop failure than millet, the staple of the preceding Bronze age.

Similar narratives emerge from global contexts where shifts from hunter-gatherer lifeways to domesticated agriculture left people more susceptible to climatic instability and crop failure. The health impact of resulting famine:feast cycles in India, for example, is well documented in skeletal records (Walimbe 1998), with additional negative health consequences associated with the shift from hunter-gatherer protein-rich diets to carbohydrate-rich, protein-deficient cereal-based diets of Chalcolithic agriculturalists (Cohen 1977; Kajale 1991; Mummert et al 2011). The long-term health outcomes of archaeologically attested environmental and dietary change are of increasing relevance to contemporary medical research areas such as diachronic diabetes epidemiology (Wells et al 2016), and gut microbiome health (Schnorr et al 2016).

Shaw (this volume) touches upon the health outcomes of similar socio-ecological shifts in early-historic India as expressed through tensions between the perceived high ritual status of Indian rice within Buddhist and certain Hindu contexts, and its rejection by ascetic and medical groups due to irrigated rice and cultivated cereals in general being associated with harmful (*hiṃsic*) human:non-human dynamics, and new 'urban' illnesses arguably connected with the birth of the Indian *Ayurvedic* medical system. Such contradictions demonstrate that individual health needs, and the basic quest for survival (*Ayurveda* meaning literally 'the science of longevity'), can take priority over ritual dispensations, emphasising the

importance of keeping human-centric preoccupations at the forefront of our understanding of Indic attitudes towards ecology.

Riede et al (4), drawing on historical volcanism data, argue that 'the narrative quality of archaeological accounts concerning past vulnerability and resilience can […] provide important input not only for the historically informed evidence-based formulation and parameterization of future impact scenarios, but also for subsequent outreach that can affect people's behaviour.' This leads to the third dimension of environmental archaeology's ethical responsibility: just as the aforementioned proposed Geo-ethical Promise must contend with new challenges presented by, for example, geological fracking, we as archaeologists should also be mindful of our own collective and individual environmental footprint. This includes ethical considerations regarding the environmental impact of certain archaeological field methods (Dalglish 2012), as well as materials used in archaeological analysis and conservation. There are obvious contradictions, for example, in conservationist usage of toxic biocides in Indian temples still in use by practitioners whose worldview is shaped by religio-cultural notions of non-violence (*ahiṃsā*), and purity and pollution (Shaw). There is also irony in proclamations of scholarly commitment to environmental activism unless accompanied by 'off the page' individual and institutional commitment to sustainable lifestyle and consumption habits. Standard 'environmentally-friendly' measures such as recycling or low-energy lightbulbs are increasingly superficial against the epigenetic model of inter-generationally entwined human-environment relationships (Dupre 2013).

Shaw (this volume) discusses how the environmental paradigm of illness provides a much-needed multi-directional perspective on the 'entanglement' theme that now permeates the social sciences (Hodder 2012; Latour 2013a, b). In this respect it is important to view climate change as a (human-driven) symptom rather than a causal factor in itself, and to highlight the individual contributing factors to climate change, each of which is associated with specific environmental and human health outcomes . Whilst agrochemicals and industrial pollutants are major contributors to Greenhouse gases, they are also health hazards, whether mediated via acute industrial disasters, or long-term air pollution (Genuis 2012). And whilst Carson's (1962) influential study on the detrimental environmental and health impact of synthetic pesticides, adapted from their original function as World War II human-targeted chemical arson, instigated legislative improvements on the short-term, its message remains crucially relevant today given the worsening environmental and climate crisis and the increasingly acknowledged, and yet largely unremediated aetiological link between air pollution and human illness (Genuis 2012; Mostafalou and Abdollahi 2013; Goodson et al. 2015). More broadly, the links between climate-change, extreme environmentalevents and heightened risk of communicated and non-communicated human-animal disease are of increasing interest within emerging development and medical directives (United Nations 2015; Whitmee et al. 2015; Wells et al. 2016).

Religion and Environmental ethics

Whilst Riede et al's (this volume) 'ethical' concerns are with environmental archaeology's ethical responsibility, and (with Ertsen) the applicability of past examples of environmental stress and resilience to contemporary challenges, the remaining five (Damon; Fredengren; Pillatt; Shaw; Zhuang et al) deal to some degree with the relevance of religio-philosophical traditions for the development of historically specific environmental ethics. This is significant against the recognition of religion as 'worldview' which in many cultural contexts is the primary modulator of empirical knowledge about humans' place in the world, and for codifying frameworks of purity or cleanliness v pollution or dirt, or of harmful v. safe human:non-human relationships. This may be contrasted to secular contexts where scientifically-driven government legislation is often the last word for determining beliefs about climate change, environmental health, disease aetiology, and related consumption and lifestyle choices that impact on global climate patterns (Holm et al.2015). However, when it comes to purity v. pollution, it is important not to overstress the distinction between 'ritual' v. empirical / 'rational' dispensations, as is common within anthropological discourse since Douglas' (1966) seminal work on the topic. Whilst such 'ritual' v 'real' contradictions have been highlighted for Hindu conceptualisations of 'purifying' rivers such as the Ganges (Alley 2002), similar ironies exist also within so-called 'rational / scientific' frameworks of dirt and cleanliness, reflecting the socially constructed, fluid nature of such categorisations. For example, modern standards of 'cleanliness' and hygiene may be achieved with the aid of environmental pollutants such as pesticides and solvents, whilst gardens often reflect urban aesthetics of tidiness, order and the control of 'nature' maintained through the application of biocides and synthetic fertilisers (Robbins 2007), in contrast to ideals promoted in recent 'nature'-and-wellbeing / 'eco-therapy' discourse (Burls 2007). Similar ideals of environmental control, even without the agrochemical industry, are expressed in ancient garden traditions (Shaw this volume). Further, received narratives regarding the role of 'dirt' in supporting healthy immune systems, particularly in children, tends to overlook the element of anthropogenically driven soil and ground pollution.

In addition to discourse on specific religious engagements with ecology then, it is important to acknowledge that certain environmentalist positions are akin to forms of 'secular religion' (Latour 2013a), not only because of near-religious experiences at past:present:future 'portals' in the human:non-human landscape (Fredengren, this volume), but because, taking religion as 'worldview', certain environmentalist positions border on the realm of belief systems, as demonstrated by those who continue to deny climate change, or the environmental basis of specific disease aetiologies, in the face of robust empirical evidence. A similar argument can be made for those forms of vegetarianism that are not driven explicitly by formal religio-ethical frameworks (Shaw), and even for those that are, as demonstrated by recent legislation concerning cow protection in India (Safi 2017a), such 'religious' justification often belies hidden political agendas. Further, much has been made of Arne Næss's (2003, 271) self-professed alignment with the later (and largely Chinese) Buddhist doctrine of the origination in dependence as an overt influence on the development of his 'deep ecology', even if this has led to anachronistic and often historically inaccurate associations being applied between western environmentalism and Buddhist thought in general (Shaw).

Just as archaeology has been late to engage with Anthropocene studies and the Environmental Humanities, archaeology has hitherto remained similarly aloof from the fast-developing religion, ecology and climate-change discourse. The interest in religion and ecology has developed partly in response to World Religious leaders' own engagement with the global environmental / climate crisis (Dorje 2006; Grim and Tucker 2014; Hulme 2016; also http://fore.yale.edu/; http://www.hf.ntnu.no/relnateur/). However, archaeology has barely figured in these discussions, or related publications (Tucker, Jenkins and Grim 2016; Hulme 2016).

Archaeology with its uniquely deep temporal, and broad spatial perspective, offers a crucial means for testing idealised, utopian models of religiously oriented environmental ethics, particularly those that perpetuate myths regarding the primordial sacred order of ancient forests, disrupted only by colonial or industrial developers, with the forest viewed as the epitome of 'nature', in contrast to the agricultural field as signifier of 'culture' and human action (Shaw this volume; Morrison and Lycett 2014, 150). Advances in archaeobotany, geoarchaeology and remote-sensing have supported more nuanced views regarding the social construction of 'wild' spaces including Cambodian (Evans 2016) and Amazonian (Clement et al. 2015) evidence for large agro-urban development of zones previously designated as 'virgin' forest.

Nevertheless, this is not to belittle the potency of individual ecological concepts within specific religious traditions, especially given that archaeology's conceptualisation of the empirical world is all too often arranged according to human:animal:environment designations, with little acknowledgement of the crucial importance of other non-human categories such as gods and spirits within many cosmological worldviews and epistemological frameworks. It is important to consider the long-term histories of intergenerational human:non-human (including animals, gods and 'productive' matter) engagement, out of which individual religio-philosophical, socio-ecological and agrarian-based economic models emerge. Furthermore, focussed collaboration between archaeology, textual analysis, and religious studies is an inevitable requirement for attaining such aims, together with explicit acknowledgement of the theoretical and methodological challenges posed by our respective sources.

Illustrated by case-studies of the ecology of horticulture and boat building in the Kula ring of Austronesia, Damon (this volume) argues for the reproduction and transformation of older Asian religio-ecological models as it spread into the Indo-Pacific: 'the Austronesian expansion represents a movement out of the Asias across the Indo-Pacific, creating self-similar versions of the Asias. Drawing on Lansing's (1991; 2006) socio-ecological model of irrigated rice agriculture in Bali, based on a system of interdependence between temple organisation, water distribution and pests, which he views as a 'complex combination of Indic and Austronesian cultural practices', Damon argues that Austronesians moved into different conditions, ultimately producing social systems which, if they became self-sustaining, did so by becoming much smaller' (10). He (13) sets up an opposition between a 'Western European' model whereby sources of power are sought in 'external […] non-

human processes […], and an Asian–Australian mode of action that learned how to build its conditions of existence more rather than less in situ', and which emphasizes individual 'self-cultivation'.

Meanwhile Pillatt (this volume) questions the applicability of a specifically Quaker 'ecological perspective' in distinction to broader 18th century philosophical thought with regards 'nature'. Pillatt describes the 'stark' landscape of north-west Cumberland, which combined with a difficult 'weatherscape' characterised by high rainfall and exposure to westerly winds 'at the margins of profitable crop cultivation', caused very particular agricultural challenges. Such conditions, whereby agricultural yields were interdependent with 'societal health, wellbeing, and weather', encouraged a worldview 'in which societal ills and natural phenomena were linked within an encompassing religious ethos'. Pillatt argues that the Quaker's reputed concern with collective wellbeing was expressed in 'ideologies of conservation, stewardship and mutual profit' which would have clashed with emerging mainstream ideologies of 'individual ownership, commercial enterprise and environmental control'. However, whilst this 'ecological perspective' is expressed in Quaker farmers' diary entries which in themselves can be taken as material evidence of Quaker 'commitment to self-improvement through disciplined documentation', it is less evident in the archaeological record in the form of, for instance, specifically Quaker land-use practices, or better care of farm animals.

Shaw (this volume) considers how Buddhist and Hindu religious-philosophical traditions responded to new environmental challenges in early-historic India alongside growing dissatisfaction with established Vedic worldviews, rising urbanism, and changing socio-political structures. She assesses the degree to which changes in land use, food culture and land tenure, especially as illustrated by the widespread adoption of non-violent (*ahiṃsic*) dietary practices such as vegetarianism, and the changing dynamics between irrigated rice and non-irrigated wheat (and millet) as urbanism and related phenomna spread westwards from the Gangetic valley, were connected to religious change and transmission. Archaeologically documented water-resource structures in central India are arguably central to monastically governed landscapes in which newly introduced rice reflects socio-ecological realities of the Buddhist heartland in the east, and by catering to increased dietary needs, also conforms to Buddhism's wider concern for the alleviation of suffering.

By contrast, Zhuang et al stress that in Han China and Three Kingdoms period Korea, the increased use of rice and its perception as a luxury food predated the emergence of Buddhism as a state religion in the mid first millennium AD, with the increased use of rice and other irrigation-dependent crops being closely related to the eventual development of a Confucian environmental ethics. They argue that Confucian articulations of 'human-heaven induction idealism' were shaped largely by rapid population growth, agricultural intensification, land-clearance, and imperial expansion, coupled with related environmental instability. The new Han Emperor Wu, self-styled as the 'son of heaven', drew on heaven-human induction idealism in order to legitimise the idea of heavenly ordained imperial expansionism. 'Natural' disasters, viewed as the result of unsustainable agricultural practices, were seen as punishment from heaven, leading to forms of imperial penitence including suspended or reduced rituals an displays of imperial wealth, with ensuing savings

diverted into disaster relief, and agrarian projects. This situation is contrasted with the earlier Daoist idealism of quietism which was unsuited to rapid imperial expansion, and to earlier Korean responses to 'natural' disasters in the form of *increased* investment in rituals aimed at 'pacify[ing] spiritual beings'. Zhuang et al argue that a new Confucian environmental ethics influenced novel disaster-response and flood management strategies such as those which allowed rivers to follow their natural course, coinciding also with later advances in geomorphological knowledge in the Tang and Song periods (around the tenth century AD). Whether the eventual disuse of historical irrigation systems in India was also related to the long-term unsustainability of intensive rice agriculture as suggested by the Chinese evidence, or to changing patronage and land-tenure frameworks (Shaw), warrants further inter-regional investigation (Gilliland et al 2013; Lucero et al 2015).

Environmental Ethics as Secular Religion: Archaeologies of Enchantment and Sacred Landscapes

Fredengren (this volume) examines the degree to which contemporary folklore and religious beliefs in Ireland affect understandings of archaeological traces and their role in conservation. Drawing on wider discourse on the interface between 'deep-time' and history in relation to environmental engagement, spirituality and religion (White 1967; Berry 1988; Northcott 2015), and Barad's (2010) use of Derrida's (1994) 'hauntology', to address the poetics of the 'past-present-futures' / 'natureculture' meeting, she focusses on near-religious or spiritual experience, 'as in experiences of the otherworld, in enchantments, hierophanies or hauntings', produced by engagement with archaeological places and things. She argues that by encouraging relationships with 'naturecultures' (Haraway 2008) and 'deep-time materialities' which break down past:present:future boundaries, archaeological 'deep-time enchantment', akin to 'secular religious experience', can be a powerful tool for informing ecological ethics and for challenging negative models of environmental action (Neimanis, Åsberg, and Hedrén 2015). Further, the emotional nature of such engagement (Smith 2014) is a forceful aid for transforming ethical thinking into ethical action and thus enabling more concerted environmentalist activism (Bennett 2001). Archaeology in this respect 'has more to contribute to the Anthropocene predicament than mere facts and figures which chart trends or trajectories; instead, encounter can stimulate engagement' (Fredengren, 3). Drawing on local beliefs of archaeological places as 'living' forces, hierophany-type portals which link living populations with past ancestors, she describes locals' fears of becoming 'haunted' as punishment for being disrespectful towards ancient places (particularly crannogs) and past populations in ways that conflate with contemporary environmental concerns such as lake pollution, presenting therefore models for intergenerational responsibilities of care, and environmental activism. Drawing on Northcott's (2015) rejection of science and technology's 'mechanistic' vision of the world, and his argument that places with perceived religious or sacred status are more likely to be respected and cared for, Fredengren highlights the importance of embracing local religious beliefs or 'spiritualism' when it comes to heritage conservation practices and tackling problems of sustainability.

Such approaches, paralleled by Johnston's (2017) work on healing stones in the Scottish Highlands as linking agents between humans, non-human animals, the landscape and the

metaphysical realms, presuppose beliefs regarding the perceived inherent sacredness, healing qualities or what Otto (1923) called the *numen loci* or *mysterium tremendum* at particular places, especially those which are considered to have supra-natural or hierophany-type qualities. In India, many such places are connected with tutelary spirits believed to continue to reside at ancient sites long after their abandonment, and irrespective of the presence or absence of supporting archaeological 'evidence', are closely connected with local ancestral memory, attachment to place, and intergenerational identity (see Front Cover). The strong level of continued human engagement with these past 'traces' play a powerful role not only in archaeological and environmental conservation practices but also in the development of regionally specific survey methods (Shaw 2007; Forthcoming; cf Di Castro 2012).

Conclusion

Those regions whose physical landscapes are perceived to be 'divinely' charged provide fertile ground for a blurring of secular / 'human' v. religious frameworks of land custodianship and tenure. Whilst in India (Shaw) legislation in the mid' first millennium AD ensured that gods, via their temple images, were accorded legal jurisdiction that enabled them, like humans, to own and manage land and water-resources, to the economic benefit of associated religious and political elites past and present, more recent developments in New Zealand (Roy 2017) have provided the legal precedent for the Indian Ganges and Yamuna rivers, envisaged as Hindu goddesses, to also be granted human legal rights (Safi 2017b). Sanctions for causing these environments harm through pollution or mis-management are the same as if inflicted on a human-being. Scholarly recognition of such contexts in which the empirical world is made up not only of humans, animals and material matter, but also gods and conceptions of the 'numinous', helps to blur clear-cut nature:culture categorisations, and to highlight the ethical dimension of the human:environment entanglement theme in archaeology with its predominant focus hitherto on the socio-economic or physical manifestation of this configuration.

Further, studies that consider the health outcomes of diachronic human:non-human entanglements have obvious points of intersection with the growing 'environmental paradigm' of human illness (Genuis 2012), together with new sustainable development models (United Nations 2015), and related medical initiatives (Watts et al 2016; Whitmee et al 2015), all unified by a concern for the interconnected human-animal-environment dimension of current global health challenges, particularly those presented by climate change. This area of research would benefit from greater interaction with archaeology, given its deep temporal perspective and available bioarchaeological and geoarchaeological datasets for modelling the health outcomes of intergenerational human-animal-environmental engagement (Sykes and Shaw Forthcoming). Other key themes discussed in this volume include long-term, global consequences of localised human:environment decisions, the social quality of 'natural' disasters, collective responses to environmental stress, including religio-ideological remedies for unsustainable human-environment practices, and the identification of the causes and means of alleviation of related human suffering. Examples of specific community attempts to grapple with, understand, justify, or adjust

collective behaviour in relation to periods of environmental stress and uncertainty, and often set within established religio-ethical and epistemological frameworks, have relevance to our current socio-ecological and climate-oriented crisis, mainstream solutions to which generally lack a guiding ethical or philosophical stance.

A final but important point is that in addition to researching and publishing on these issues, archaeologists need also to be thinking about how to incorporate new interdisciplinary approaches to diachronic human-environment engagement into teaching curriculums, museology and heritage agendas, public outreach, and lobbying activities. By moving away from standard historical narratives that perpetuate the notion of economic progress based on inevitable human exploitation of the non-human environment (Riede et al 2016), or from token 'green' initiatives and 'environmentally friendly' activities in the present that fail to acknowledge the multi-directional, inter-generational and inter-regional impact of individual, localised actions, consumption practices and engagements with the human:non-human:geological world, we may help to encourage longer term behavioural changes. As illustrated by the recent wrangle over the safety of Monsanto-manufactured glyphosate products, ensuring that scientific consensus on these matters is translated into necessary legislative reforms is not always straightforward, against the vested interests of corporate power and profit (Downs 2016). As demonstrated by major ideology-driven socio-ecological changes in the past, concerted behavioural change requires equally the momentum of a critical mass bound by shared worldviews. Whether shaped by 'secular religious' sentiment (Latour 2013a), or more explicitly religious ideologies, what is clear is that in order to contribute towards Anthropocene studies in ways which encourage present:future behavioural change, archaeologists will need to align themselves not only with agrarian and technological preoccupations of environmental sciences, but with the ethical dimension of the environmental and medical humanities, and religion-and-ecology discourse.

Acknowledgements

I am grateful to the volume contributors, the anonymous reviewers and the production team at Taylor & Francis, who together helped to ensure diverse and interesting engagement with the topic. Thanks to Paul Lane who coordinated anonymous reviews for my own contribution, and the British Academy Mid-Career Fellowship (2014–15) and a British Academy-Leverhulme Small Grant (2016–17) for funding related research. Thanks to Paul Lane, Felix Riede and Madan Thangavelu for constructive comments on an earlier version of this introduction, and to the organizers and participants of the 'Human:Non-Human Bodies, Things, and Matter across Asia and Europe' Conference, University of Zurich, 6–8 October 2016, for helpful discussion on underlying themes. As ever, all extant shortcomings are mine alone.

References

Agarwal, A., and S. Narain. 1997. *Dying Wisdom: Rise, Fall and Potential of India's Traditional Water Harvesting Systems*. New Delhi: Centre of Science and Environment.

Alley, K. D. 2002. *On the Banks of the Ganga: When Wastewater Meets a Sacred River.* Michigan: University of Michigan Press.

Bennett, J. 2001. *The Enchantment of Modern Life. Attachments, Crossings and Ethics*. Princeton: Princeton University Press.

Barad, K. 2010. "Quantum Entanglements and Hauntological Relations of Inheritance: Dis/continuities, Space Time Enfoldings, and Justice-to-Come." *Derrida Today* 3 (2): 240–268. doi:10.3366/drt.2010.0206.

Berry, T. 1988. *The Dream of the Earth*. Berkley: Counterpoint Press.

Boivin, N. L., M. A. Zeder, D. Q. Fuller, A. Crowther, G. Larson, J. M. Erlandson, T. Denham, and M. D. Petraglia. 2016. "Ecological Consequences of Human Niche Construction: Examining Long term Anthropogenic Shaping of Global Species Distributions." *Proceedings of the National Academy of Sciences* 113: 6388–6396. doi:10.1073/pnas.1525200113.

Braidotti, R. 2013. *The Posthuman*. Cambridge: Polity.

Braje, T. J. 2016. "Evaluating the Anthropocene: Is There Something Useful about a Geological Epoch of Humans?" *Antiquity* 90: 504–512. doi:10.15184/aqy.2016.32.

Burls, A. 2007. "People and Green Spaces: Promoting Public Health and Mental Well-being Through Ecotherapy." *Journal of Public Mental Health* 6(3): 24-39

Carson, R. 1962. *Silent Spring*. Boston: Houghton Mifflin.

Chakrabarty, D. 2009. "The Climate of History: Four Theses." *Critical Inquiry* 35 (2): 197–222. doi:10.1086/ 596640.

Chester, D.K., 2005. "Theology and Disaster Studies: The Need for Dialogue." *Journal of Volcanology and Geothermal Research* 146: 319-328.

Chester, D.K., A.M. Duncan, and C.J.L. Dibben, 2008. "The Importance of Religion in Shaping Volcanic Risk Perception in Italy, With Special Reference to Vesuvius and Etna." *Journal of Volcanology and Geothermal Research* 172: 216-228.

Clement, C. R., W. M. Denevan, M. J. Heckenberger, A. B. Junqueira, E. G. Neves, W. G. Teixeira, and W. I. Woods. 2015. "The Domestication of Amazonia before European Conquest." *Proceedings of the Royal Society*, *Biological Sciences* 282: 20150813. doi:10.1098/rspb.2015.0813.

Cohen M.N. 1977. *The Food Crisis in Prehistory: Overpopulation and the Origins of Agriculture*. New Haven: Yale University Press.

Crutzen, P., and E. Stoermer. 2000. "The 'Anthropocene'." *Global Change Newsletter* 41: 17–18.

Dalby, S. 2016. "Re-evaluating the Anthropocene." *Antiquity* 90: 514–515. doi:10.15184/aqy.2016.36.

Dalglish, D. 2012. "Archaeology and Landscape Ethics." *World Archaeology* 44:3: 327–341. doi:10.1080/00438243.2012.723320.

Davies, M. I. 2009. "Wittfogel's Dilemma: Heterarchy and Ethnographic Approaches to Irrigation Management in Eastern Africa and Mesopotamia". *World Archaeology* 41(1): 16-35,.

Davies, M.I.J., and M'Mobogori, F.N. (Eds.), 2013. *Humans and the Environment: New Archaeological Perspectives for the Twenty-First Century*. Oxford: Oxford University Press.

Derrida, J. 1994. *Spectres of Marx: The State of Debt, the Work of Mourning and the New International*. New York: Routledge.

Di Castro, A. 2012. "Graves Trees and Powerful Spirits as Archaeological Indicators of Sacred Spaces." In *Old Myths and New Approaches*, edited by A. Haendel, 237-251. Clayton, Australia: Monash University Publishing.

Dixit, Y., D. A. David, A. Hodell, and C. A. Petrie. 2014. "Abrupt Weakening of the Summer Monsoon in Northwest India 4100 Yr Ago." *Geology* 42: 339–342. doi:10.1130/G35236.1.

Dorje, O. T. (H.H. 17th Gyalwang Karmapa), 2006. "Walking the Path of Environmental Buddhism through Compassion and Emptiness." *Conservation Biology* 25 (6): 1094–1097. doi:10.1111/j.1523-1739.2011.01765.x

Douglas, M. 1966. *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo.* London: Routledge and Kegan Paul.

Downs, G. 2016a. "From Hillsborough to Pesticides: Establishment Cover-ups, Lies and Corruption." *Resurgence and Ecologist*, May 4. http://www.theecologist.org/News/news_analysis/2987648/from_hillsborough_to_pesticides_establishment_coverups_lies_and_corruption.html

Dukes, P. 2013. "Big History, Deep History And The Anthropocene." History Today 63 (11): 4–5.

Dupre, J. 2013. "A Postgenomic Perspective on Sex and Gender." Lecture at University of Cambridge, Diane Middlebrook and Carl Djerassi Visiting Professorship Lectures, October 24. Accessed 15 January 2015. http://upload.sms.cam.ac.uk/media/1596279

Edgeworth, M. 2014. "Introduction, Archaeology of the Anthropocene, Forum discussion." *Journal of Contemporary Archaeology* 1 (1): 73–77.

Ellis, E., M. Maslin, N.L. Boivin, and A. Bauer. 2016. "Involve Social Scientists in Defining the Anthropocene." *Nature* 540 (7632), 192-193.

Evans, D. 2016. "Airborne Laser Scanning as a Method for Exploring Long-term Socio-ecological Dynamics in Cambodia." *Journal of Archaeological Science*. doi:10.1016/j.jas.2016.05.009.

d'Alpoim Guedes, J.A., S. A. Crabtree, R.K. Bocinsky, and T. A. Kohler , 2016. "Twenty-first century approaches to ancient problems: *Climate and society PNAS* 113 (51): 14483-14491. doi:10.1073/pnas.1616188113

d'Alpoim Guedes, J.A, Jin Guiyun, Kyle Bocinsky, 2015. "The Impact of Climate on the Spread of Rice Agriculture to North-Eastern China: An Example from Shandong." *PLoS-One* 10(6): e0130430

Fagan, B. 2011. *Elixir: A History of Water and Humankind*. New York: Bloomsbury.

Genuis, S. J. 2012. "What's Out There Making Us Sick?" *Journal of Environmental and Public Health* 10. Article ID 605137. doi:10.1155/2012/605137.

Gilliland, K., I. A. Simpson, W. P. Adderley, C. I. Burbidge, A. J. Cresswell, D. C. W. Sanderson, R. A. E.Coningham, et al. 2013. "The Dry Tank: Development And Disuse Of Water Management Infrastructure In The Anuradhapura Hinterland, Sri Lanka." *Journal of Archaeological Sciences* 40: 1012–1028. doi:doi:10.1016/j. jas.2012.09.034

Goodson, W.H., et al. 2015. "Assessing the Carcinogenic Potential of Low Dose Exposures to Chemical Mixtures in the Environment: The Challenge Ahead." *Carcinogenesis* 36 (Suppl 1): S254–S296. doi:10.1093/carcin/bgv039.

Grim, J., and M. E. Tucker. 2014. *Ecology and Religion*. Washington: Island Press.

Haraway, D. 2008. *When Species Meet*. Minnesota: University of Minnesota Press.

Hodder, I. 2012. *Entangled: An Archaeology of the Relationships Between Humans and Things*. Chichester: Wiley-Blackwell.

Holm, P., et al. 2015. "Humanities for the Environment: A Manifesto for Research and Action." *Humanities* 4:977–992.

Hulme, M. 2016. "Varieties of Religious Engagement with Climate Change." In *Routledge Handbook of Religion and Ecology*, edited by M. E. Tucker, W. Jenkins, and J. Grim, 239–248. London: Routledge.

Hulme, M. 2010. "The Idea of Climate Change: Exploring Complexity, Plurality and Opportunity." *Gaia* 19 (3): 171–174.

Ingold, T. 2015. *The Life of Lines*. London: Routledge.

Johnston, J. 2017. "Stone-agency: sense, sight and magical efficacy in traditions of the Highlands and Islands of Scotland." *Religion*. DOI:10.1080/0048721X.2017.1294523

Johnston, J. 2016. "Cultivating Subtle Matter: The Aesthetics and Ethics of Esoteric Ecologies." Paper delivered at Human: Non-Human:Bodies, Things, and Matter across Asia and Europe, URPP Asia and Europe Conference, University of Zurich, October 6–8. http://www.asienundeuropa.uzh.ch/de/events/conferences/bodies.html

Kajale, M.D. 1991. "Current status of Indian palaeoethnobotany: introduced and indigenous food plants with a discussion of the historical and evolutionary development of Indian agriculture and agricultural systems in general." In *New Light on Farming: Recent Developments in Palaeoethnobotany*, edited by C. Renfrew, 155-190. Edinburgh: Edinburgh University Press.

Lane, P. L. 2015. "Archaeology in the Age of the Anthropocene: A Critical Assessment of Its Scope and Societal Contributions." *Journal of Field Archaeology* 40 (5): 485–498. doi:10.1179/2042458215Y.0000000022.

Lansing, J. S. 1991. *Priests and Programmers: Technologies of Power in the Engineered Landscape of Bali*.Princeton: Princeton University Press.

Lansing, J. S. 2006. *Perfect Order: Recognizing Complexity in Bali*. Princeton: Princeton University Press.

Latour, B. 2013a. "Facing Gaia: A New Enquiry into Natural Religion." Series of Gifford Lectures, Edinburgh. http://www.bruno-latour.fr/node/486

Latour, B. 2013b. *An Inquiry into Modes of Existence: An Anthropology of the Moderns*. Cambridge, MA: Harvard University Press.

Lorimer, J. 2015. *Wildlife in the Anthropocene: Conservation After Nature*. University of Minnesota Press.

Lucero, L. J., R. Fletcher, and R. Coningham. 2015. "From 'Collapse' to Urban Diaspora: The Transformation of Low-density, Dispersed Agrarian Urbanism." *Antiquity* 89: 1139–1154. doi:10.15184/aqy.2015.51.

Luke, T. 1999. "Environmentality as Green Governmentality." In *Discourses of the Environment*, edited by E. Darier, 121–151. Oxford: Blackwell.

Matteucci, R., G. Gosso, S. Peppoloni, S. Piacente, and J. Wasowski. 2014. "The Geoethical Promise: A Proposal." *Episodes* 37 (3): 190–191.

Mitchell, P. 2008. "Practising Archaeology at a Time of Climatic Catastrophe." *Antiquity* 82 (318): 1093–1103. doi:10.1017/S0003598X00097805.

Mithen, S. 2012. *Thirst: Water and Power in the Ancient World*. London: Weidenfeld & Nicolson.

Morrison, K. D. 2015. "Provincializing the Anthropocene." *Seminar*, 2015: Nature in History. Web edition. http://www.india-seminar.com/semframe.html

Morrison, K. D., and M. T. Lycett. 2014. "Constructing Nature: Socio-natural Histories of an Indian Forest." In *The Social Lives of Forests: Past, Present, and Future of Woodland Expansion*, edited by K. D. Morrison, S. B. Hecht, and C. Padoch, 148–160. Chicago: University of Chicago Press.

Mostafalou, S., and M. Abdollahi. 2013. "Pesticides and Human Chronic Diseases: Evidences, Mechanisms, and Perspectives." *Toxicology and Applied Pharmacology* 268 (2): 157–177. doi:10.1016/j.taap.2013.01.025.

Mummert, A., E. Esche , J. Robinson, G.J. Armelagos, 2011. "Stature and robusticity during the agricultural transition: evidence from the bioarchaeological record. *Economics and Human Biology* 9(3):284–301. doi:10.1016/j.ehb.2011.03.004

Murphy, C., and D.Q. Fuller, 2017. "The Future is Long-term: past and current directions in environmental archaeology." *General Anthropology* 24(1), 1, and 7-10.

Næss, A. 2003. "The Deep Ecology Movement: Some Philosophical Aspects." In *Environmental Ethics: An Anthology*, edited by A. Light and H. III Rolston, 262–274. Malden, MA: Blackwell.

Neimanis, A., C. Åsberg, and J. Hedrén. 2015. "Four Problems, Four Directions for Environmental Humanities: Toward Critical Posthumanities for the Anthropocene." *Ethics and the Environment* 20 (1): 67–97. doi:10.2979/ethicsenviro.20.1.67.

Northcott, M. 2015. "Myth, Ritual, and the New Universe Story in the Inner Hebrides." *Journal for the Study of Religion, Nature and Culture* 9 (2): 192–198. doi:10.1558/jsrnc.v9i2.2140.

Nolt, J. 2015. *Environmental Ethics for the Long Term: An Introduction*. New York: Routledge.

Northcott, M. 2015. "Myth, Ritual, and the New Universe Story in the Inner Hebrides." *Journal for the Study of Religion, Nature and Culture* 9 (2): 192–198. doi:10.1558/jsrnc.v9i2.2140.

Otto, R. 1923. *The Idea of the Holy: An Inquiry into the Non-rational Factor in the Idea of the Divine and its Relation to the Rational.* Translated J.W. Harvey. New York: Oxford University Press .

Palmer, C., K. McShane, and R. Sandler. 2014. "Environmental Ethics." *Annual Review of Environment and Resources* 39 (1): 419–442. doi:10.1146/annurev-environ-121112-094434.

Riede, F. 2016. "Anthropology, Weather and Climate Change (Conference Report)." *The European Archaeologist* 49: 24–27.

Riede, F., A.H. Sørensen, J. Dietrich, M. Skaaning Høegsberg, M.V. Nordvig, and E.B. Nielsen, 2016. "Learning From the Past: Teaching Past Climate Change and Catastrophes as Windows onto Vulnerability and Resilience." In *Teaching Climate Change in the Humanities* , edited by S. Siperstein, S. Lemenager, and S. Hall, 126-135. New York: Routledge.

Robbins, P. 2007. *Lawn People: How Grasses, Weeds, and Chemicals Make Us Who We Are.* Philadelphia: Temple University Press.

Roy, E.A. 2017. "New Zealand River Granted Same Legal Rights as Human Being." *The Guardian*, March 16, 2017. https://www.theguardian.com/world/2017/mar/16/new-zealand-river-granted-same-legal-rights-as-human-being

Royal College of Physicians and Royal College of Paediatrics and Child Health, 2016. *Every Breath We Take:The Lifelong Impact of Air Pollution.* https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-takelifelong-impact-air-pollution

Ruddiman, W. F. 2003. "The Anthropogenic Greenhouse Era Began Thousands of Years Ago." *Climatic Change* 61: 261–293. doi:10.1023/B:CLIM.0000004577.17928.fa.

Ruddiman, W. F. 2010. *Plows, Plagues, and Petroleum: How Humans Took Control of Climate*. Princeton: Princeton University Press.

Ruddiman, W.F. 2013 "Bridging a Disciplinary Gap." In *Climates, Landscapes, and Civilizations*, edited by L. Goisan, D.Q. Fuller, K. Nicoll, R.K. Flad, and P.D. Clift, 1-10. Washington: American Geophysical Union.

Ruddiman, W. F., D. Q. Fuller, J. E. Kutzbach, P. C. Tzedakis, J. O. Kaplan, E. C. Ellis, S. J. Vavrus, et al. 2016. "Late Holocene Climate: Natural or Anthropogenic?" *Review of Geophysics* 53. doi:10.1002/2015RG000503.

Safi, M. 2017a. "Cow slaughter to be punishable by life sentence in Gujarat." *The Guardian,* 14 March 2017. https://www.theguardian.com/world/2017/mar/14/indian-state-government-life-sentence-cow-slaughter

Safi, M. 2017b. "Ganges and Yamuna Rivers Granted Same Legal Rights as Human Beings." *The Guardian*, March 21, 2017. https://www.theguardian.com/world/2017/mar/21/ganges-and-yamuna-rivers-granted-same-legal-rights-as-human-beings

Schnorr S., K. Sankaranarayanan, C.M. Lewis, and C. Warinner. 2016. "Insights into Human Evolution from Ancient and Contemporary Microbiome Studies." *Current Opinion in Genetics and Development* 41:14-26.

Shaw, J. 2007. *Buddhist Landscapes in Central India: Sanchi Hill and Archaeologies of Religious and Social Change, C. 3rd Century BC to 5th Century AD*. London: British Association for South Asian Studies, British Academy; Routledge.

Shaw, J. Forthcoming (2017). "Integrated Survey Methodologies for the study of ritual and settlement landscapes in Central India: Fieldwalking, Satellite Remote Sensing, and Local Memory." *Current Science* (Special Section on Geospatial Analysis for Cultural Heritage).

Smith, L. J. 2014. "Visitor Emotion, Effect and Registers of Engagement at Museums and Heritage Sites." *Conservation Science in Cultural Heritage* 14 (2): 125–131.

Solomon, S. 2010. *Water: The Epic Struggle for Wealth, Power, and Civilization*. New York: Harper.

Steingraber, S. 1997. *Living Downstream: An Ecologist Looks at Cancer and the Environment*. Boston: Da Capo Press.

Sykes, N., and J. Shaw (Eds.) *Archaeologies of Medicine and Health Care*. Special volume of *World Archaeology* 50(3). http://explore.tandfonline.com/page/ah/the-archaeology-of-medicine-and-healthcare

Taylor, M. 2017. "Greenpeace fined under Lobbying Act in 'act of civil disobedience'." *The Guardian*, 18 April 2017. https://www.theguardian.com/politics/2017/apr/18/greenpeace-first-organisation-fined-lobbying-act

Tucker, M. E., W. Jenkins, and J. Grim, eds. 2016. *Routledge Handbook of Religion and Ecology*. London: Routledge.

United Nations, 2015. *Transforming Our World - The 2030 Agenda for Sustainable Development: Resolution Adopted by the General Assembly on 25 September 2015*. Seventieth session, Agenda items 15 and 116. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

UK Health Alliance on Climate Change, 2016. *A Breath of Fresh Air, Addressing Climate Change and Air Pollution Together for Health*. http://www.ukhealthalliance.org/wp-content/uploads/2016/10/UK-Health-Alliance-A-Breath-of-Fresh-Air-Final-Report.pdf

Van De Noort, R. 2011. "Conceptualising Climate Change Archaeology." *Antiquity* 85: 1039–1048. doi:10.1017/S0003598X00068472.

Walimbe S.R. 1998. "Bio-cultural Adaptations in Cranial Morphology Among the Early Farming Chalcolithic Populations of the Deccan Plateau." In *Contemporary Studies in Human*

*Ecology: Human Factor, Resource Management and Developmen*t, edited by M.K Bhasin and S.L. Mailik, 25-40. Delhi: Indian Society for Human Ecology.

Watts, N., N.W. Adger, S. Ayeb-Karlsson, Y. Bai, P. Byass, D. Campbell-Lendrum, T. Colbourn, et al. 2017. "The Lancet Countdown: Tracking Progress On Health And Climate Change." The Lancet 389 (10074)L 1151–1164. doi:10.1016/S0140–6736(16)32124–9

Wells, J. C. K., E. Pomeroy, S.R. Walimbe, B.M. Popkin, and C. Yajnik. 2016. "The Elevated Susceptibility to Diabetes in India: An Evolutionary Perspective." *Frontiers in Public Health* 4(145). https://doi.org/10.3389/fpubh.2016.00145

White, L. 1967. "The Historical Roots of Our Ecologic Crisis." *Science* 155: 1203–1207. doi:10.1126/science.155.3767.1203.

Whitmee, S., A. Haines, C. Beyrer et al. 2015. "Safeguarding Human Health in the Anthropocene Epoch: Report of the Rockerfeller Foundation-Lancet Commission on Planetary Health." *The Lancet* 386. November 14, 2015. 1973-2028. http://dx.doi.org/10.1016/S0140-6736(15)60901-1

Wittfogel, K. 1957. *Oriental Despotism: A Comparative Study of Total Power*. New Haven, CT: Yale University Press.