Anthropocene – a cautious welcome from environmental sociology?

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This paper concerns the way in which environmental sociologists might approach the concept of ‘the Anthropocene’. As our title suggests, we extend in the paper a cautious welcome to this concept. Such a stance – an openness to ‘natural’ accounts accompanied by cautionary tales – has a long history within environmental sociology. In the paper, we document how the concept of the Anthropocene presents environmental sociology with a global environmental narrative that supports many of its own modes of thought. The concept of the Anthropocene reinforces, for example, the value of scholarship scrutinising ontological relationality, political-economic change, inter-disciplinary collaboration and cause-effect dynamics. At the same time, contemporary narratives of the Anthropocene seem to pose challenges for environmental sociology. We suggest that these narratives open up a need to think carefully about issues of naturalisation, difference, knowledge, agency and justice. We suggest that environmental sociology needs to draw on the full repertoire of its discipline in order to establish a critical-constructive relation between its own ways of thinking and those that are currently prominent within the narrative of the Anthropocene.

Keywords: Anthropocene; environmental sociology; narrative; environmental challenges; post-disciplinarity

Introduction

Leading environmental scientists have recently coined a new concept, ‘the Anthropocene’, to convey the sense that humanity has become a global geophysical force, equal to other natural processes acting upon the Earth System (Crutzen and Steermer 2000; Steffen et al. 2011a; Oldfield et al. 2014). For Earth System scientists and geologists, the coining of this term immediately inspired much activity and debate: a major concern was to evaluate whether this new geological epoch could indeed be said to have come about, and whether it could be formalised (Cerini and Scalenghe 2015; Zalasiewicz et al. 2010). However, as a claim that humanity has entered a new epoch, this has an impact well beyond geology; it has also evoked a more generative set of responses and debates amongst both the natural and the social sciences.

It is notable, for example, that the idea of the Anthropocene has inspired a sense of reflection but also one of moral tension and urgency. In a short time, it seems, the Anthropocene has become more than a concept; it has become a set of compelling narratives. We use this idea – of a set of narratives – to convey the sense that differentiated strands of debate can be identified within the term ‘Anthropocene’ and that these narrative strands not only condense large amounts of information, but also include normative assumptions that organise that information. Such narratives offer a historical account, including causes and consequences, and assign to the Anthropocene specific meanings (cf. Jasanoﬀ 2006, 276; Hajer 2009). The narratives of the Anthropocene also invoke agency, legitimate decisions and motivate actions, not least by constructing a shared understanding of a problem, thereby connecting different actors’ perspectives and practices.

One of the most interesting forms of this narrative is that of a warning about the journey that humanity, writ large, is embarked upon. The Anthropocene is described as a reminder that ‘we’ (humanity as a whole) are leaving a planetary environment – the Holocene – which we know, and within which human societies have developed. As we leave this environment, we head towards a putative new epoch – the Anthropocene – which is itself radically shaped by our actions, but about which we know very little. This narrative of Anthropocene has, in a short time, been institutionalised within the scientiﬁc community: networks have been formed, conferences organized, websites established, research programmes have been elaborated, pedagogical and artistic interventions have been generated, and two journals have even been launched with the aim of studying all aspects that pertain to the Anthropocene.1

The predominant framing of the concept – the whole of humanity leaving one epoch and entering another – has led to some urgent, global-scale questioning about the qualitatively and quantitatively different world we are entering, as well as the possibility of human agency to affect, or even reverse, our journey. Earth scientists, in particular, have stressed the need for action: they are urging quick, effective responses to the knowledge that already exists of an Earth System that is tipping into a qualitatively different world. The predicted world is one which is outlined in physical terms as one in which there is

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Earth scientists have also strayed away from their disciplinary comfort zone and have begun to ask a host of much more sociological questions about the extent of humanity’s knowledge and responsibility, and the possibility of human agency and stewardship at a global system level. Calls for interdisciplinary research programmes, and for the integration of perspectives through genuine and real synthesis are now being raised by natural scientists (Ellis and Trachtenberg 2014). There are complementary moves being made by social scientists, where claims are being made for the need to transcend disciplinary boundaries and focus more on social-environmental dynamics (ISSC 2013; Lockie, Sonnenfeld, and Fisher 2014). For environmental sociology, this boundary crossing is not new: this sub-discipline has always stressed the importance of including society-environment dynamics at the core of its identity. And this evident criss-crossing of disciplines is not constrained to the above examples: a far deeper and more pervasive trend of inter- and trans-disciplinary working is underway in many areas of inquiry and scholarship. Observers and researchers of the Anthropocene are now writing about humanity having reached a ‘tipping point’ in terms of our traditional methods of knowledge acquisition, asking truly open, even post-disciplinary questions, ‘With what means, methods and senses can we encounter the world of our own creation?’ (Scherer 2014, 4).

The posing of these kinds of post-disciplinary questions is stimulating and challenging. However, within the context outlined above, our suggestion in this paper is that it may still be helpful to connect the claims and narrative of the Anthropocene with current debates within environmental sociology. Being environmental sociologists who have been working across European and US traditions as well as within an increasingly globally inflected science and technology studies (STS), we believe that there is a need for environmental sociology to critically engage in the discussion on the Anthropocene. We see disciplinary knowledge production as still important, even as it adapts to a changed societal context. Thus, even if a public problem transgresses disciplinary boundaries (Biagioli 2009), there is nevertheless a need for disciplinary (or sub-disciplinary) knowledges. The reason we give is that the complex interdependencies of nature and society call not only for synthesis but also for specialisation. Thus, elaborating disciplinary knowledge within a broader context of postdisciplinarity implies both that broader knowledge is produced, in terms of different interpretation and analysis of phenomena, and that such knowledge might act as a corrective against universal knowledge claims, where a specific interpretation is given precedence over alternative (disciplinary) interpretations. Thus, our aim with this paper is to put environmental sociology to work in such a context, where, in fact, disciplinary and post-disciplinary perspectives are not mutually exclusive.

The paper is composed of four sections, this introduction included. These sections are based on current orderings and relations within the Anthropocene narrative: as we write this article these are changing and informing one another, and whilst we artificially stabilise these we also try to show the movement within them. The next section introduces the Anthropocene narrative, including its current focus and internal debates, and singles out some possible connections with the concerns of environmental sociology. The third section turns to environmental sociology, and identifies some central features that could contribute to the Anthropocene narrative. The fourth section broadens the discussion, encouraging environmental sociologists to draw on the diverse strengths of this sub-discipline in order to extend a welcome, albeit a cautious one, to the concept and narratives of the Anthropocene and to the disciplinary and post-disciplinary practices that may be inspired by it.

Anthropocene: humanity as a geological force

Origin and conceptual meaning

The origin of the Anthropocene concept can be traced back to a conference that took place in the year 2000 by the International Geosphere-Biosphere Programme (IGBP). The session organizer focussed his contribution on the Holocene (the current geological epoch that began 12,000 years ago, replacing the Pleistocene). Finally one of the participants, the chemist and Nobel laureate Paul Crutzen lost his patience, effectively announcing the end of this current era. As he later recalled: ‘I said we no longer live in the Holocene, but in the Anthropocene. After that, it suddenly went very quiet in the hall. In the coffee break the only issue discussed was the Anthropocene’ (Crutzen 2013, our translation). Since then, the concept has made a remarkable journey, and is now widely adopted by many environmental scientists. Crutzen and colleagues have since asked themselves why the concept was not discarded as footnote in the history of geological ideas: they believe that the reason for its wide adoption is due to a broader cultural trend – the growing consciousness of humanly induced global environmental change (Zelasiewicz et al. 2010, 2228).

The Anthropocene is, however, still very much a concept in the making, and there is a vibrant debate about its different aspects. This is visible not least in the volumes of the Anthropocene Review (2014–2015), in which 43 articles (including editorials) span from discussing isotopic signatures of geological epochs and fossil records of land mammals to human rights and aesthetics, including contributions by researchers in climatology, stratigraphy, geography, human ecology and history inter alia. Thus, the idea of the Anthropocene is not fixed, but involves a plurality of meanings and tensions.
Despite the broadness and flexible use of the Anthropocene concept, however, we find it possible to pin down some key elements shared by those who relate positively to it: (i) that earth itself is a single system within which the biosphere is an essential component; (ii) that human impact is global and accelerating, now threatening the fundamental life process of earth; (iii) that this change is traceable geologically, possibly implying a new geological epoch, ‘the Anthropocene’; (iv) that there is a need to radically change current human activities in order avoid this threat. These elements stabilize the debate; they also enable movement within the debate whereby different perspectives, tensions and standpoints are communicated, as well as renegotiated. We explore these elements through the metaphor of ‘layers’ below which helps avoid a unidirectional, overly coherent narrative trajectory – e.g. from an exclusive Earth system view to a more inclusive view that also includes social aspects. Metaphorical layers suggest the possibility (as in geological formations) of ongoing folding, mixing, and even inverting, giving insight into the dynamic tensions and movements between different strata.

Layers of the Anthropocene

We can decipher at least four layers in the discussion of Anthropocene; a geological layer, a biosphere layer, a socio-economic layer and an ethical layer. These layers, it should be noted, can be present and ‘mixed up’ in any one presentation of what the Anthropocene is, or why it matters. Observing them empirically, so to speak, they occur as folded arguments that are part of the emerging knowledge production associated with the Anthropocene concept. We characterise them here as distinct layers only for heuristic reasons. Whereas the first two layers, then, concern the environmental state of the earth, the third addresses the societal causes of this state, and the fourth considers how to evaluate and act upon this diagnosis.

A geological layer

The idea of the Anthropocene is originally anchored in a geological formation; the idea being that there now is a geological period characterised by a humanly modified earth stratum (the Anthropocene) distinct from the non-human geological deposits (the Holocene). To a large extent this ‘geological layer’ involves a search for the stratigraphic boundary that characterises the Anthropocene; involving a quest for suitable stratigraphic markers and for the temporal location of the shift (Edgeworth et al. 2015). Thus, a vibrant discussion amongst geologists, Earth system scientists and historians of the earth is underway, concerning how to periodise history in a geologically sound way. Is it possible and important to establish whether the Anthropocene is really a new geological epoch, similar to those of the Cambrian, Jurassic, Pleistocene and Holocene epochs (Dean, Leng, and Mackay 2014; Zalasiewicz et al. 2014)? And if there is a distinctly Anthropocene stratal unit, will it not only be recognised today but also be preserved in the Earth’s future (Ellis and Trachtenberg 2014)? Related to this are questions about when the Anthropocene began, i.e. when natural forces and human forces became intertwined (e.g. Barnosky et al. 2014b; Fischer-Kowalski, Krausmann, and Pallua 2014; Certini and Scalenghe 2015; Johnson et al. 2014; Steffen et al. 2011a, 2015a; Zalasiewicz et al. 2014). A further question concerns whether or not the concept of Anthropocene is based on an overly linear and deterministic view of history (Head 2014). These questions seem bounded by geological and historical interest, but they also have relevance for thinking about the future, as we will see in the next section.

An Earth system layer

The Anthropocene is, however, much more than a narrative of geological formations; its infiltration into the environmental sciences is largely due to the emphasis placed on human impact on the biosphere. These impacts are now understood to be affecting the fundamental processes and functions of the Earth system. Earlier, so the narrative goes, humans had modified ecosystems but that they had never completely transformed them. Now, it is claimed that we can see how the chemical composition of the atmosphere and the oceans have fundamentally changed. It is no longer only restricted areas that are thought to be affected, but the entire biosphere and all ecosystem functions. Global climate change is described as just the tip of the iceberg because not only has the carbon cycle been changed by humans but also other biogeochemical cycles that are fundamental to biological life (for example, nitrogen, phosphorus and sulphur) (Steffen et al. 2004; Williams et al. 2015). The quantitative advance of human environmental impact is now understood to have entailed a qualitative shift: humans are now threatening the functioning of the Earth system, as we have known it.

This message was deepened and clarified with the introduction of the concept of planetary boundaries. An article in Nature in 2009 (Rockström et al. 2009) defines nine planetary boundaries which bring into being nine thresholds for various biophysical sub-systems and processes. This article was further updated, developed and regionalised (including sub-global heterogeneity) in an article in Science 2015 (Steffen et al. 2015b). The main idea, simply put, is that humankind should not exceed the newly constructed and quantified limits defined by earth scientists and delineated in the text. Within these boundaries, the authors have demarcated what they call ‘a safe operating space for humanity’. If these thresholds are crossed, it is thought that humanity will enter into a zone of uncertainty where earth’s life-support system is threatened. The authors claim that, today, three of these defined boundaries have been exceeded: those referring to climate, biodiversity and the cycles of nitrogen and phosphorus. The proposed solution is a return to a Holocene-like state – that is, a planet where humanity no longer threats...
the functioning of the Earth system (Rockström et al. 2009; Steffen et al. 2015b). The Holocene, we are reminded, ‘has been a stable, accommodating environment and is the only state of the Earth System that we know for sure can support contemporary society’ (Steffen et al. 2011b, 739). This imagined reversal is a huge challenge and so far no political solutions (such as climate mitigation) or technological innovations (such as geengineering) have shown the potential, in real-time planning terms, to meet such a challenge. At the same time, earth scientists see an urgent need for a new paradigm which integrates human development with the maintenance of the Earth system (Steffen et al. 2015a).

A socio-economic layer

Earth system analyses of ‘planetary boundaries’ include a plea for social change, but rarely contain analysis of the reasons why these boundaries are approaching or have been crossed. However, another layer in the Anthropocene narrative brings two kinds of analysis together, relating earth system trends to socio-economic trends. Originally, the beginning of Anthropocene was temporally located to the dawn of Western industrial society, i.e. the late 1700s onwards, when a variety of technological and social innovations led to fossil fuels replacing wind, water, solar and biomass as primary energy sources (Crutzen and Stoermer 2000). Whereas the latter sources were tied to availability and location, fossil fuels – rich in power, easily transportable and relatively accessible – became abundant and increasingly cheap in the twentieth Century, meaning not only an accommodation of energy demand, but also that new human needs were created (Urry 2013, 2014).

The great acceleration is a term coined to grasp a drastic increase in human polluting activities starting after World War II (Hibbard et al. 2006; Steffen, Crutzen, and McNeill 2007). Through 12 different indicators including human population, GDP, damming of rivers, fertilizer consumption, water use and paper consumption the above authors have shown that, since 1950, a variety of human activities have dramatically increased. Even the number of McDonald’s restaurants in business globally is used as an indicator of this dramatic increase in human material consumption and use of natural resources. These activities have been linked to large adverse environmental effects: including greenhouse gas emissions, depletion of the ozone layer, loss of tropical rainforests, and woodland and biodiversity loss (Steffen et al. 2004, 2011a). The argument made is that the human enterprise ‘switched gears’ in the 1950s (Steffen et al. 2011a, 849) and the magnitude and rate of the human imprint dramatically increased. Graphs depicting the great acceleration – where ‘the hockey stick’ figure is used as metaphor for a dramatic increase in consumption and emissions occurring around 1950 – have become iconic symbols of the Anthropocene (White, Rudy, and Gareau 2015, chapter 2). Social and natural scientists are often agreed that the Anthropocene can also be interpreted as an unintended side-effect of modernization in a mode of analysis reminiscent of that of Ulrich Beck and colleagues in the 1990s (Beck 1992; Beck, Giddens, and Lash 1994). And some social and political scientists, recognising that it is ‘carboniferous capitalism, the dominant emergent life-form in the biosphere that is now risking precisely the conditions that gave rise to it’ (Dalby 2013a, 187) are now arguing for a new vision of politics based along the ‘geo-metrics that now matter’ – seen as volumetric entities concerning sea levels and Arctic ice, carbon dioxide concentrations and degrees of warming, rather than the flat two-dimensional boundary demarcations of states (Dalby 2013b, 46). But such arguments are also strongly rejected for their naturalising tendencies and the lack of differentiation of humanity that occurs when the planet becomes the entity inspiring political action (Malin and Hornborg 2014). A bundle of socio-economic approaches resting on some of the above arguments and debates are now claiming the need for a more systematic socio-structural perspective, and to imagine alternative sociocultural orderings (e.g. Buck 2015; Castree 2014; Gibson-Graham 2011; Gibson-Graham and Roelvink 2011; Hajer et al. 2015; Neimanis, Åsberg, and Hedrén 2015).

An ethical layer

Gradually, ethical aspects have been folded in the Anthropocene narrative. We use the term ethical here in a broadly encompassing way – to signal the recognition, amongst commentators, that the current planetary situation has been a product, not only of history and contingency, but of normative decision-making. We also want to signal that many authors are asking for more open, explicit consideration of natural and social ‘goods’ and ‘bads’ given current warnings about the status quo. Originally, ethical strands of the Anthropocene narrative focussed on the way in which humanity has altered environmental conditions and how humanity now poses a threat not only for certain ecosystems but also for the planet as whole. Humanity is presented as a new and abstract global force (Barnosky et al. 2014a; Hibbard et al. 2006; Steffen et al. 2011b). Following this, a number of sweeping formulations have been made about the need to change institutions and economic systems which encompass unlimited growth as an imperative and fundamental value, implying a need to regulate certain kinds of trade, movements of capital and economic integration (Steffen et al. 2011b). The need to avoid technological innovations that lead to new products and new needs, thus putting further burden on the planet has also been mooted. Also, partnerships between universities, industry and government that seem to press for more material growth have been critically scrutinised. Furthermore, the failure to build an effective global governance system has also become a matter of concern (Biermann 2014; Lövbrand et al. 2015). Many of these ethical strands are in the debate concern pulling back on resource use, or even on innovation (Hulme 2014). But
there also exist ethical debates about moves in the opposite direction – the idea that we must innovate and develop new technologies (such as geoengineering (Lynas 2011), but also smart cities and green technologies) to build our way out of the impending environmental crisis (Buck 2015). Other contributions in the ‘ethical layer’ highlight the very nature of the Anthropocene as a moral discourse and having a moral core (e.g. Ellis and Trachtenberg 2014). Such contributions are not only concerned with human responsibility for the future of the earth; they suggest that the current situation is a product of human, ethical choice.

As for the framing of the Anthropocene narrative itself, harsh criticism has been raised that many contributions to the idea of the Anthropocene narrative treat ‘humans’ as a single, monolithic whole, implying an ignorance of the fact that the Great Acceleration has, until very recently, been mainly driven by a small fraction of the human population and also that the wealth benefits are unevenly distributed (Biermann 2014; Lövbrand et al. 2015; Malm and Hornborg 2014). The Anthropocene narrative has more recently started to include the notion that humanity is spatially and socially differentiated. There is a growing debate about the need to think ethically about this, to avoid occluding global inequities through reference to a universal humanity and to geological epochs that signal universal, global human periodisation (Berkhout 2014; Biermann 2014; Malm and Hornborg 2014). This coincides with a move to make more visible the great variation in human-induced environmental impact, spatially as well as socially. The update of the great acceleration graphs (Steffen et al. 2015a) also includes differentiated graphs for OECD and non-OECD countries respectively, in order to show that serious equity issues are masked by considering only global aggregates. Furthermore, it is now often stressed that the consequences of global environmental challenges are unevenly distributed. The need to acknowledge the cultural diversity of humanity is increasingly being expressed as an ethical aspect of Anthropocene debates (Robin et al. 2014). Instead of stressing an abstract humanity, it is argued that the Anthropocene narrative needs to identify real actors and their embeddedness – socially, spatially and culturally (Berkhout 2014; Lövbrand et al. 2015). These emerging debates are important strands that we bring together in our own analysis and we draw on them below.

**Contributions to environmental sociology**

The Anthropocene narrative conceptualises environmental challenges in a way that chimes well with some aspects of sociological thought regarding environment and society. In particular, we find four aspects to be of major relevance for environmental sociology.

First, the Anthropocene narrative is (implicitly) based on a relational ontology where society and nature are co-constructed. It is no longer earth system processes alone that determine or restrict human life – humans have become co-producers of the conditions of possibility for life on earth (Dearing et al. 2015; Knight 2015; Zalasiewicz et al. 2010). This understanding may provide opportunities for sociology to transcend the old debate (or ‘dead-lock’) about whether environmental sociology should include biophysical realities, or not, in its analyses (for an overview, see Lidskog, Mol, and Oosterveer 2015; White, Rudy, and Gareau 2015). It transcends this debate by not only stating that environmental sociology needs to include an understanding of social life as dependent on ecosystem processes but also that environmental sciences need to include an understanding of how ecosystem processes are heavily influenced by social processes. Not only environmental issues, but also the environment itself is co-constituted by ecological and social processes. The implication is a re-conceptualisation of environmental–human relationships – something that environmental sociology (especially environmental sociology inflected by STS) has argued for since its inception. The narrative of the Anthropocene, however, deepens our sense of the inter-relations involved (Palsson et al. 2013).

Second, the Anthropocene narrative stresses the need for system change. In a world where political solutions to environmental problems are often seen in terms of a technical quick-fix and where ‘post-political’ solutions flourish (Swyngedouw 2010) the Anthropocene narrative makes clear that these will not suffice: rather, there is a need for fundamental change. Thereby, it provides the opportunity for a re-politicisation of environmental challenges. It also provides opportunities for a political re-contextualisation where political action is not solely attached to nation-states and international negotiations but implies new forms and arrangements of environmental citizenship and subjectivity (Beck 2009, 2015). By creating a human awareness of, and responsibility for, a vulnerable earth, the Anthropocene provides an opportunity to create a new cosmopolitan public around ‘matters’ (Beck 2009; Latour 2004, 2010; Stengers 1997). Thus the Anthropocene narrative implicitly opens up not just one, but many futures – imaginaries about worlds that would be good to live in and ways of reaching them (Berkhout 2014; Latour 2010; Lövbrand et al. 2015; Urry 2013). Such arguments reach out to the exciting and demanding strands of social theory, often deriving from within Sociology and STS, that have informed many aspects of environmental sociology over recent years.

Third, as we have suggested, the Anthropocene narrative stresses the need for disciplinary collaboration. Anthropocene stories continuously highlight the multiple, interdependent relations within nature, within different forms of materiality, within technologies and within social systems, but they also stress the interconnections between these domains. As such, the Anthropocene narrative is a generous and inclusive one, inviting all disciplines – from engineering and environmental science to the social sciences and humanities – to work with and through it (Ellis and Trachtenberg 2014; Oldfield et al. 2014). Anthropocene narratives also stress the importance of recognising much closer relations and also configuring much better relations.
between science and society in order to find agreements on solutions to specific environmental challenges (Barnosky et al. 2014a). Thus, the Anthropocene narrative raises a call similar to that of public sociology (Baraway 2009), which encourages academic engagement between different disciplines and non-academic constituencies without abandoning sociology’s reflexive and disciplinary character.

Fourth, the Anthropocene narrative contains a dynamic view not only of nature and society, but also of cause and effect whereby it is acknowledged to be virtually impossible to establish simple, linear links between them (Oldfield et al. 2014). Here the idea of the Anthropocene aligns closely with recent work in post-humanist social theory and feminist STS that acknowledges the indeterminacy and emergence of entities that we usually take for granted as independently existing entities pre-existing their acting upon one another (Barad 2007, 33; Law 2004). ‘Realness’ in the research of Karen Barad, for example, is understood to be continually emerging within the relations of already entangled agencies. Such work, closely mapping some of the more constructivist and STS-inclined elements of environmental sociology (Hannigan 2014; Irwin 2001), is highly relevant to the way we understand living entities and their inter-relations. It has inspired a rethinking not only of causality, effect, linearity, and the ongoing shaping of things, but also turns questions about responsibility into questions about ‘response-ability’ (Barad 2007) – i.e. how do humans encounter entities that are constantly ‘coming into being’. How do, or might, human societies develop an appropriate responsiveness to such an emergent view of the world? And what are the implications for ideas of management and control (Schrader 2010)?

In sum, then, the Anthropocene narrative evokes recognition of the value of some of the key elements of knowledge production within environmental sociology. Not least, it seems to establish a basis for building and developing a relational, political, collaborative and dynamic environmental sociology – an environmental sociology that draws deeply upon its own diverse theoretical contributions, that acknowledges global complexity, and that can analyse a world characterised by increasing interconnectedness, interconnectedness and shifting boundaries and borders (Gross and Heinrichs 2010; Lidskog, Mol, and Oosterveer 2015; White, Rudy, and Gareau 2015). Simultaneously, the Anthropocene narrative has a number of ambiguities which offer significant challenges for the discipline of environmental sociology and provide a sense of some frictions that need to be faced. We turn to examine these in the next section.

Environmental sociology: stratified societies rather than a single planet

**Naturecultures in the Anthropocene**

First, as we have already suggested, at one level, the Anthropocene narrative implicitly underlines the importance of a relational ontology. As Lövbrand, Stripple, and Wiman (2009, 11) note ‘One implication of the understanding of humanity as a geological agent is the dissolution of the nature-society divide and a transformation of what counts as social connections’. It is certainly notable and helpful, at a superficial level perhaps, that this exciting ‘new’ sense of natureculture relations comes, in part, from Earth Scientists who include in their analyses many questions about human knowledge, human responsibility and the possibilities of human agency.

But, we suggest, such a reaction would be complacent: one of the first things that a sociology of the Anthropocene can and should do is to examine more cautiously the claims to an end of nature/culture dualism, and begin to scrutinise carefully how it is that an Earth System metaphor and approach ostensibly replacing nature/culture splits might itself become naturalised (Lövbrand, Stripple, and Wiman 2009). Environmental sociologists are well equipped also to pursue the next question: what consequences might there be from this ‘world picture’ becoming a natural focus of analysis and a prompt or call to social and political action?

Pushing this point further Head (2014) argues that we need to look for a more nuanced articulation of the Anthropocene – one that is ‘more consistent with contingent understandings of history and science’. Rather than accepting that narratives of the Anthropocene confirm the end of Cartesian dualisms, her suggestion is to examine the uneven, uncontrolled and contingent ‘where and when’ of the human activities that have begun to shape geophysical dynamics on the planet. Furthermore, she suggests documenting the Anthropocene as an uneven and non-linear collection of events and developments that do not constitute progressive developmental steps, each leaving the other behind, but rather, are a collection of phases, each adding to, co-existing with, and interacting with already existing phases (Head 2014, 120).

At first glance this insistence on historical detail may seem pedantic – the big story is a natureculture narrative which tells of how humans have, for the very first time, begun to act with as much force as other geophysical forces upon the very system of the Earth – and this is what is important. But a sociological approach to this changing environment would include looking carefully at the ways in which particular versions of nature and culture are stabilised and naturalised (Hannigan 2014; Irwin 2001; Pellow and Nyseth Brehm 2013). Such a perspective invites a sense of nonlinearity, variability and differentiated and situated politics into the idea of the Anthropocene. So our first point is that environmental sociology needs to avoid blithe acceptance of narratives which presuppose ‘the end of’ natureculture dualisms and assume a clarity about ‘what needs to be done’. Environmental sociology, rather, needs more carefully to examine how nature and culture are themselves, still, constantly being ‘done’ within the narrative of the Anthropocene; and with what effects, on whom, where, and with what consequences for our senses of human
agency. To give an example, we suggest that environmental sociologists need to scrutinise carefully how the thresholds specified as constituting a ‘safe space for humanity’ have been determined, and what kinds of actions are proposed should those thresholds be over-ridden, with what kinds of possible consequences, and for whom.

**Differentiating Anthropos**

A second point that environmental sociology can offer concerns variability and situated difference. At the core of the Anthropocene narrative is the idea of transitioning from a broadly ‘ecological’ perspective to one that defines thinking at the level of the entire Earth System. Within Earth System science, the earth is seen as a total entity in an unceasing state of flux and driven by natural cycles of both micro and macro scales. Humans, so the narrative goes, have only recently become ‘a dominant process’ in this system. From an Earth System perspective, humans and human activities are just a process. That is, humans are attributed no temporal or spatial variability, no differentiated history, culture, or politics. Environmental sociology can contribute here, re-describing ‘humans’ as ‘particular groups of humans doing particular things that generate particular processes’ (Ogden et al. 2013). As Head (2014, 122) suggests, the Anthropos at the heart of the Anthropocene must not be left unexamined. And this human, for a contemporary environmental sociology, also needs to be thought through relationally, that is, in relation to the non-human: there are many resources that environmental sociology can connect with here in areas of post-humanism, STS, environmental humanism, cultural geography and anthropology (Barad 2007; Braudotti 2013; Haraway 2008; Lorimer 2012; Neimanis, Åsberg, and Hedrén 2015; Szerszynski 2012).

**Understanding and acting**

This brings us to our third point which concerns knowledge and agency, and our human ability to fully understand the world of which we are part. The assumption within dominant Earth System science narratives on the Anthropocene is that we humans are ‘the first generation with widespread knowledge of how our activities influence the Earth System’ (Steffen et al. 2011b, 757). Armed with such knowledge we are claimed, therefore, to be ‘the first generation with the responsibility to change our relationship with the planet’ (ibid). As a rallying cry to those in the ‘cock-pit’ of governmental and intergovernmental organisations, some social scientists are optimistic that this key concluding message from Steffen and colleagues may have some mobilising political effects (Hajer et al. 2015). But environmental sociologists need to think about the assumed primacy of knowledge and human agency here and the way in which it is assumed that ‘we’ are a different, exceptional, species that can know and control the Earth System (Colebrook 2012; Szerszynski 2012). An important task lies in uncovering where Anthropocene narratives of human agency assume anthropocentric expert knowledge and control over all the intersecting sociophysical relations of the planet, and where, on the other hand, they imply more humility, prompting the need to understand a more variable authorship of knowledge and agency and to undertake new ethical discussions that take such understandings seriously (Dalby 2004; Lövbrand, Stripple, and Wiman 2009; Stirling 2014). Many of the claims to knowledge of the Anthropocene have been carried out in relation to global warming – the dominant lens through which environmental change has been viewed. But these research programmes and literatures evidently overlap with those of biodiversity loss, food security, air quality, nutrient flows and so on (Beck et al. 2014) and this much more distributed, interacting, multi-agency aspect of the Anthropocene deserves careful attention.

Additionally, environmental sociology can help tease out the presence of politics, power and inequality within the idea of a universal, knowing, ‘first generation’ that is supposed to have the agency to act and change its relationship with the earth. Understandings of the way in which imaginaries of a global governance bring particular kinds of universal subject into play (here, one that is knowing and that can change) will be important resources here with which to resist blanket assumptions of power and agency. Sociologists are adept at tracing where power and agency resides but also how it travels: which ideas, subjectivities, objectifications, institutionalisations and practices carry and transfer power to change society, and how. Research in this area might involve, for example, more of a focus on the agencies of finance and capital rather than on human environmental knowledge and agency per se (Cooper 2010; Urry 2013). Indeed, some researchers suggest Capitalocene as a term for the new post-Holocene epoch, due to the fact that it is a historically specific set of social relations around capital accumulation that mark the genesis of a humanly modified earth (Haraway 2015; Moore 2015; Johnson et al. 2014). A related point is that assumptions about social change, and the ability to change, need to be complemented by empirical understanding of everyday practices and their embeddness into materialities, institutions and cultural systems (Shove and Spurling 2013).

**Temporalities**

Our final injunction for environmental sociology concerns the implicit temporalities of Anthropocene narratives. On the one hand, as Earth System science renders it, the Anthropocene marks a point of transition – from one epochal ‘earth stage’ to another. We have already suggested that this creates a distorted sense of the unity of earth and its sociophysical histories, occluding the fragmented nature of ecological/human pasts and (by implication) the complexity of the present and of possible sociophysical futures. The implicit universal temporality of the Anthropocene, in other words, is performative, limiting imagination of diverse and perhaps justifiably uneven
sociocultural futures for different kinds of ‘human’ and different kinds of ‘scene’. As other studies have shown, efforts to combat environmental destruction inevitably invoke the future when predicting the consequences of various course of action. These expectations of the future help to set priorities, amass resources, coordinate activities and facilitate actions, thereby increasing the likelihood of particular futures to come into being (Borup et al. 2006; Brown and Michael 2003). Environmental sociology needs to detect and interrogate these implicit temporal performances within Anthropocene narratives, rendering them more prominent in their own and in public debates. A second temporal problem, we would suggest, derives from the tendency within Anthropocene narratives to structure knowledge acquisition towards the future. As Lockie notes, a reliance on future-oriented modelling and scenario setting contributes to ‘a disjuncture between discourses of future climate change and people’s experience of living in and needing to adapt to an already variable climate’ (Lockie 2014, 104, italics in original). Narratives with a future-oriented grammar have been analysed elsewhere as having complex performative effects on the present (Sunder Rajan 2006; Waterton, Ellis, and Wynne 2013) and in the current case, the sense of urgency, even impending apocalypse embedded within Anthropocene narratives have led some to argue that this framing performs a paradoxical delaying response, a ‘politics for the day after tomorrow’, keeping in place current risk management discourses and arrangements within government and policy (Methmann and Rothe 2012; see also Swyngedouw 2010). Again, environmental sociology, needs to signal the instances and effects of this syndrome.

Finally such a future-oriented narrative tends to occlude the possibilities and potential of slow, ongoing processes of change or, as feminist scholars Gibson-Graham (2011, 2) put it: ‘starting where you are’. Scholars in feminist STS have ably articulated this point: the seminar series ‘Arts of Living on a Damaged Planet’ at the University of Santa Cruz, California in 2014, suggests a resolute ambition to engender new conversations about living in this world, here and now.”

To summarise, environmental sociology has a mission to challenge naturalisation, stressing that all versions of nature and culture need to be critically examined; to insist on diversity and difference as key constituents of the Anthropocene, stressing that humanity should not only be viewed as an up-scaled global abstract force, but also from within, as people, groups and organisations embodying particular characteristics; to bring the issue of justice and equity to the fore in the analysis, investigating the historical causes as well as future implications of proposed ways forward; and to contest a universal present and future, stressing the need to develop spaces for diverse voices to develop and critically examining the performative function of any proposed sociocultural futures.

Conclusion: articulating with the Anthropocene narrative

Twenty-five years ago the sociologist Ted Benton extended a ‘cautious welcome’ to biology (and biological analyses) from the perspective of a sociology that had ‘gone too far’, in its fear of biological determinism. Biology, he suggested, needed to be let back into the domain of social analyses, but cautiously so. Interestingly, Benton’s model for letting biology ‘back in’ came not from within the academy, but from home-grown social movements such as the environmental and peace movements. Benton was impressed, seemingly, by the intuitive grasp that such movements seemed to have on the relations and traffic (rather than opposition) between nature and society (Benton 1991, 7). Of course what Benton identified as the intensely relational understandings and practices of social movements pointed precisely to the kind of conceptual terrain that environmental sociologists have been arguing for since Catton and Dunlap (in the United States) and Arthur Mol and others (in European circles) first started thinking of themselves as environmental sociologists. Looking back, it could be said that environmental sociology, in most of its variants, has responded to Benton’s suggestion with appropriate care: attempting to include the biological/natural/causal but in such as ways as to avoid ‘reification’ and the return of simplistic deterministic analyses (Castree 2014; Hannigan 2014; Irwin 2001; Lidskog, Mol, and Oosterweel 2015).

The context of our own cautious welcome is somewhat different, however. Today, as sociologists, we are witnessing a surge of interest in a particular rendition of the natural. We suggest that the narrative of the Anthropocene has scaled up a sense of the contemporary sociocultural crisis and the place of humans within this and that environmental sociology, in particular, has much to contribute to such debates. When Steffen and colleagues, for example, write that, ‘Humankind, or own species, has become so large and active that it now rivals some of the great forces of Nature in its impact on the functioning of Earth system’ (Steffen et al. 2011a, 843), there is a need to respond from the sub-discipline that has continually addressed the challenges of thinking in natural and social terms simultaneously. In the face of such claims, on the other hand, many authors in both social and natural sciences have registered a kind of excitement at idea of the emergent geological agency of the human. The Anthropocene represents a new phase in the history of both humankind and of the Earth, when natural forces and human forces became intertwined, so that the fate of one inflects the fate of the other.

But although we appreciate and are stimulated by developments in the geosciences that have made the tracing of Anthropocene possible (Dalby 2013a), we also take the point that the advent of the Anthropocene presents a conjuncture: a moment pregnant with risks as well as
generative opportunities (Johnson et al. 2014). In scaling up its narrative to Earth System dimensions, the concept of the Anthropocene has created a new universal ‘earth system’ and a new universal ‘we’ loaded with knowledge, responsibility and agency. Not only the limits and thresholds of the earth, but also ‘the human’ and human societies and politics are now naturalised.

It will be evident from the above that we are imagining environmental sociology to be able to articulate with the Anthropocene in ways that re-set the narrative, allowing for a much more differentiated sense of this earth and this ‘we’, including a much more differentiated sense of the responsibilities to be carried, and a more variable accounting of the sense of agency implied by the various calls for new forms of planetary stewardship and action. As we have pointed out, environmental sociology has much to draw upon here from neighbouring disciplines (STS, public sociology, post-humanism, anthropology, political ecology and the environmental humanities, etc.) that have long contributed to its own delta of ideas. What is exciting is that the concept of the Anthropocene reinforces the value of several strands of scholarship and debate within environmental sociology – its understanding of a relational socio-environmental ontology; its acknowledgement of the need for political and institutional system change; its embrace of inter- or post-disciplinary collaborations; its critical appraisal of cause-effect relations. But what is also clear is that environmental sociology also has a delicate role to balance between being critical and being productive. The Anthropocene hitherto has been a fear-based narrative that can lead to a social landscape of surveillance and hierarchical control (Buck 2015; Cook and Balyannnis 2015). By stressing alternative, but sociologically realistic, futures, the Anthropocene can be re-told, identifying alternative pathways – some of them already in use – that might re-direct socionatural development. These kinds of narrative should, we suggest, include both opportunities and tensions, gains and losses, power and powerlessness in order to stimulate proactive debate.

It has been suggested that what is at stake in the concept of ‘the Anthropocene’ is the identification and articulation of a world whose social, political, and physical parameters are changing faster than our capacity to process and analyse them (Johnson et al. 2014). However, the real test seems to be to respond calmly and carefully to this pressure and to contribute appropriately according to the core strengths of the discipline. As the challenges to adapt ways of knowing intensify, there is still room for environmental sociology to draw on its own diverse intellectual history, and its critical but constructive disciplinary culture, in order to help build a much more socially robust and reflexive narrative of the times we are in.

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Notes
1. See the websites Welcome to the Anthropocene (www.anthropocene.info) and The Anthropocene Review blog (anthropoceneblog.blogspot.co.uk). The journal Anthropocene was launched in 2013 and Anthropocene Review in 2014. Artistic and pedagogical initiatives have been part of ‘The Anthropocene Project’ hosted by the Haus der Kulturen Der Welt, Berlin (see http://www.hkw.de/en/program/projects/2014/anthropoaen/anthropozaen_2013_2014.php)

2. In 2008, the Stratigraphy Commission of the Geological Society of London decided, by a large majority, that there was merit in considering the possible formalization of this term, that is, that it might eventually join the geological time scale similar to Cambrian, Jurassic, Pleistocene and Holocene. In 2016, the commission will present preliminary findings in on whether the Anthropocene is distinctive and enduring enough to be defined as a new epoch, and if so, where the boundary Holocene-Anthropocene should be set (Dean, Leng, and Mackay 2014). See also the commission’s website http://quaternary.stratigraphy.org/workinggroups/anthropocene/

3. Lewis and Maslin (2015a) in article in Nature, which proposed criteria for determining the formal onset of the Anthropocene Epoch and from these, derived new starting dates. The article resulted in a vivid debate among geoscientists (see e.g. Hamilton 2015; Zalasiewicz et al. 2015; Lewis and Maslin 2015b).

4. As Hamilton and Grinevald (2015) show, the Anthropocene presuppose an ‘Earth system’ concept, which was made possible through computer-based methodology of system dynamics and an interdisciplinary view of earth system as a total complex ecosystem.

5. In a recent analysis, the number of McDonalds’ restaurants has been replaced by primary energy use as indicator of globalisation (Steffen et al. 2015a, 83).

6. http://ihr.ucsc.edu/portfolio/anthropocene-arts-of-living-on-a-damaged-planet/

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