



# Environmental humanities and climate change: understanding humans geologically and other life forms ethically

Libby Robin \*

Edited by Matthias Heymann, Domain Editor, and Mike Hulme, Editor-in-Chief

The task of reconceptualizing planetary change for the human imagination calls on a wide range of disciplinary wisdom. Environmental studies were guided by the natural sciences in the 1960s, and in the 1970s broadened to include policy and the social sciences. By the 1990s, with global environmental changes well-documented, various humanist initiatives emerged, expanding the idea of ethics, responsibility and justice within the transdisciplinary mode of environmental studies. Shared problems, places, and scales form the basis for collaborative work in the environmental humanities, sometimes in partnerships with natural sciences and the creative arts. Experiential learning and trust in judgments based on different methods typically guide humanities interventions. Shifting the frameworks of environmental research to be more consciously inclusive and diverse is enabling concepts of the physical world that better include humans and taking ethics beyond humans to consider more-than-human Others. This review considers historically how the environment and the humanities became conceptualized together. It then explores three emerging fields in transdisciplinary environmental scholarship where environmental humanities are playing major leadership roles: (1) climate and biodiversity justice, both for humans and for other forms of life; (2) the Anthropocene as a metaphor for living with planetary changes and (3) life after ‘the end of nature,’ including rewilding and restoration. While environmental humanities also work in many other fields, these cases exemplify the crucial tasks of situating the human in geological and ecological terms and other life forms (the ‘more-than-human’) in ethical terms. © 2017 Wiley Periodicals, Inc.

How to cite this article:  
WIREs Clim Change 2018, 9:e499. doi: 10.1002/wcc.499

## Introduction: The Emergence of an Interdisciplinary Humanism with an Environmental Focus

The task of reconceptualizing planetary change for the human imagination calls on a wide range of

\*Correspondence to: libby.robin@anu.edu.au

Fenner School of Environment and Society, Canberra, Australia

Conflict of interest: The author has declared no conflicts of interest for this article.

disciplinary wisdom. Environmental studies were guided by the natural sciences in the 1960s, and in the 1970s broadened to include policy and the social sciences. By the 21st century, with climate change and global environmental changes (GECs) well-documented, the environmental humanities have emerged, extending the idea of the *human* within the transdisciplinary mode of environmental studies.<sup>1–6</sup> GEC scholarship acknowledged a role for history, for example, through programs like the Integrated History and future Of People on Earth (IHOPE),<sup>7–9</sup> but more

recently, humanities scholars are framing environmental questions more broadly, not merely providing commentary on questions raised by GEC scientists (Box 1). The geographers Noel Castree<sup>4,10</sup> and Mike

## BOX 1

### ENVIRONMENTAL HUMANITIES—DEFINITION AND ORIGINS

The Environmental Humanities are not so much a new discipline or method, as a fresh combination of humanistic perspectives and partnerships. The environmental humanities include history, philosophy, aesthetics, geography, comparative religious studies, literature, theater, film, and media studies informed by the most recent research in the sciences of nature and sustainability.<sup>2</sup> The 21st century environmental humanities gather together humanities scholars who engage with transdisciplinary field of 'environmental studies,' building on key subdisciplines, such as environmental philosophy, environmental history, political ecology, ecocriticism, cultural geography, and environmental anthropology, which have emerged since the 1970s.<sup>1</sup>

International initiatives like the Humanities for the Environment (HfE)<sup>2</sup> and the Sawyer Seminar Series (UCLA)<sup>1</sup> build partnerships with natural science and arts to add history, perception, emotion, and cultural dimensions to complex issues like climate change. Critics of Intergovernmental Panel on Climate Change (IPCC) reports say they overlook these dimensions and define future pathways through the limited 'framework of academic economics.'<sup>12</sup>

While the environmental humanities are educative and political in profound ways, their work is distinct from advocacy and overt 'activism.'<sup>3</sup> Rather, they engage the broadest spectrum of human intelligence, enabling diverse logical, moral, intuitive, and philosophical approaches to understand the world that are compatible with more than Western cultures. By moving beyond traditional disciplinary methods, and using experiential learning, performance, art and narrative, the environmental humanities extend collaborative practice beyond science and the academy. Environmental humanities, with their commitment to clarity, transparency, and plain language, add accessibility to complex problems like climate change.

Hulme<sup>11</sup> are prominent among those who have urged more engagement with the environmental humanities. Cultural scholarship has the potential to alter radically the 'character' of understandings of GEC.

Biologist and cultural theorist Donna Haraway suggests that the 'problem' framework can limit responses. A focus on 'solutions' can lead to a failure to 'stay with the trouble.'<sup>13</sup> Adaptation and resilience are less about 'fixing' the environment as re-imagining it. Providing different language can stimulate new approaches,<sup>14</sup> and metaphors can be powerful tools in environmental management.<sup>15</sup> Adaptation to what has already happened is clearly an urgent part of living with future climate, as whatever remedies can be added to the system will not reverse the changes immediately. Before adaptation, however, there is a need for imagination. The environmental humanities work to shift the focus from 'solving' complex problems like climate change, to *living with* problems and change, and to framing them in ways that recognize that climate-changed environments are unevenly distributed, geographically and socially. Adaptation science makes similar claims,<sup>16</sup> describing itself as a practice 'no longer constrained by discipline and sectoral boundaries, geopolitical polarity, or ... technical problematisation' (Ref 16, p. 11), yet the focus on the 'decision context'<sup>19</sup> positions adaptation science as primarily a tool of policy making. Environmental humanities may influence policy-makers, but their target is a broader audience. Changing the language affects 'decision-making,' but it also changes the democratic context in which decision-making is practiced. A broader audience enables environmental humanities to focus on *justice* rather than regulation.<sup>6</sup> This is part of a wider popular trend. For example, while the important 2006 documentary film about climate change, *An Inconvenient Truth*, was informed by the latest climate science,<sup>18</sup> its sequel *An Inconvenient Sequel* in 2017 strongly emphasized questions of justice.<sup>19</sup>

Cognitive scientist Jerome Kagan describes 'three cultures'<sup>20</sup> of knowledge. He distinguishes between the emphasis on prediction and explication in natural and social sciences (with respect to natural phenomena and human behavior, respectively), and the focus of the humanities on the 'meanings humans impose on experience.' He singles out 'culture, the historical era and life history' as determinants of human reactions (Ref 20, p. 4). Thus the humanities add a new dimension to transdisciplinary fields such as climate change research: prediction and modeling are important for future scenarios but pathways to action from present experience depend on understanding culture and history. The future is not just technical: it is cultural.<sup>21</sup> A 'visceral understanding' of how

carbon emissions are embedded in lives is something that can change behavior.<sup>22</sup> Music and the arts can represent climate change in ways that people can see and feel, not just ‘know about.’

Aspiration is also visceral, not something that can be modeled or predicted. It is about feelings. A sense of a positive future makes life meaningful, yet as anthropologist Arjun Appadurai argues, if the future is defined by ‘neoclassical economics’ and ‘contractual and risk management strategies’ (Ref 22, p. 285), it is drained of cultural context. Modeling and prediction, tools of the digital revolution, have been adopted by economics, environmental science, planning, and disaster management alike as ways to define the future. The future is measured in probabilities, leaving no space for participation or imagination, nor for ways of knowing that do not fit the models. The environmental humanities work to foster hope: they are not limited to mathematical models, and they work with emotional intelligence as well as logic. ‘Chasing hope’ has been a peculiarly American obsession, Bangladeshi historian Dipesh Chakrabarty argues, by defining hope within a Western tradition, others may be deprived of it.<sup>22–24</sup> All people have their own histories. Those with ‘subaltern pasts’<sup>25</sup> (nonwestern history) imagine different possible futures from those in the West.

Where did environmental humanities come from and who develops such scholarship? What are key focuses and approaches? This essay considers first the original reasons given historically for conceptualizing the environment and the humanities together. It then explores three ‘case studies’ of broad issues in environmental humanities that have implications for climate science and policy researchers. There are, of course, many others. But in a short review paper in the context of this journal, I begin by considering three areas where environmental humanities reframe interdisciplinary thinking:

1. climate and biodiversity justice, both for humans and for other forms of life,
2. the Anthropocene as a metaphor for living with planetary changes,
3. life after ‘the end of nature’<sup>26</sup> including ideas of rewilding and restoration.

In limiting itself to these themes, this review has not devoted space to the many ways environmental humanities scholars have contributed in fields shaped by the insights of natural and social scientists. Climate change research begins with atmospheric physics because this was where global warming was

first detected. But Earth Systems science (ESS) soon expanded to consider the feedback effects in terrestrial and marine systems. ESS now includes most natural sciences that work on a global scale. But there are other scales possible, and the human scale is also important, not least because it is the scale that is most meaningful to humans. Marine science and oceanography have led discussions of the acidification of the oceans and the bleaching of coral reefs, yet these changes have also been deeply felt and passionately opposed: environmental humanists have made important contributions to evaluate these changes in different ways.<sup>27,28</sup> Likewise, the detection of toxic chemicals in the environment (including human bodies) required technical tools from the medical sciences, but also evaluation of human responses.<sup>29</sup> While agricultural sciences lead research into many new possibilities for ‘feeding the world,’ the problems of living in monocultural agricultural communities are explored by environmental humanists.<sup>30,31</sup> For this brief overview of the environmental humanities in a climate change journal of transdisciplinary scholarship, I have chosen to concentrate on fields where environmental humanities work with other disciplines, and have broken new ground because they operate in different ways from natural and social sciences.

## Where Did the Environmental Humanities Come From?

Environmental humanities, Swedish historian Sverker Sörlin has argued, is a ‘symptom’ of a ‘transformation to a new research policy regime giving more space to responsibility, risk and complexity.’<sup>32</sup> It provides a new ‘stimulus for integrative, challenge oriented approaches across all science fields’, including the humanities (Ref 32, p. 18). Such scholarly policy research and cross-fertilization is both descriptive and ‘aspirational’ (Ref 32, p. 11). Environmental humanities thrive where interdisciplinary exchange within and beyond universities is encouraged by public culture, and where policy communities turn to universities for innovation.<sup>33</sup>

In most places, environmental science preceded environmental ‘studies,’ with the latter explicitly including the human as part of the environment. The term ‘environmental science’ was still very new in the 1960s.<sup>5,34</sup> Environmental science emerged in a ‘double helix’ with the idea of environment,<sup>35</sup> the two concepts emerging and developing ‘not consecutively but simultaneously,’ environment being ‘constructed by those that claimed expertise on it and also provided the advice’ (Ref 35, p. 15). Other precursors of

environmental studies include Human Ecology, a term advocated in the 1950s by prominent ecologist, Paul Sears,<sup>36</sup> who described ‘the total landscape as ... the basis of our culture,’ and ‘an expression of it’ (Ref 36, p. 963). In Australia, ‘human ecology’ was not used till later, but the idea was already present in 1965, when a group of Fellows of the Australian Academy of Science proposed a Biological Centre in Canberra.<sup>37</sup> It was to be a national *cultural* institution for ecological literacy, to promote ‘biological awareness ... in persons in all walks of life’ (Ref 37, p. 4).

The environmental politics of the 1970s gave rise to sub-disciplines like environmental history<sup>1,38</sup> and environmental philosophy.<sup>39,40</sup> It also drove the development of meta-disciplines like environmental studies. In 1973 in Australia, Monash University conceived environmental studies as a way to combine zoology and culture in its undergraduate teaching,<sup>41</sup> and the Australian National University established the Centre for Resource and Environmental Studies (CRES) under the direction of Frank Fenner, an eminent virologist and a proponent of the Biological Centre,<sup>42</sup> now called the Fenner School of Environment and Society. Environmental studies were also encouraged by the growth in interdisciplinary faculties in new universities. Established in 1975, Griffith University in Queensland, Australia, had a distinctive foundation Faculty of Environmental Studies and Linköping University, Sweden, included ‘TEMA’ (Themes in interdisciplinary studies including an environment theme).<sup>5</sup> Interdisciplinary studies in Sweden also included Future Studies, supported by the eminent politician and sociologist Alva Myrdal<sup>43</sup> following the United Nations Conference on the Human Environment, held in Stockholm in 1972.<sup>44</sup>

In the United States, the American Society of Environmental History was founded in 1977 which supported a journal, now called *Environmental History*.<sup>38</sup> While in the United States, environmental history began as a sub-discipline of history, elsewhere it was more a ‘field,’ practiced by geographers, archeologists and others with interests in peoples and environments over the long-term.<sup>32,45</sup> Since 1990s, ‘environmental historians’ came from environmental sciences, political science and geography, not just history and the humanities.<sup>46</sup> Meanwhile histories of environmental activism were sometimes regarded as history,<sup>47</sup> and sometimes political science.<sup>48,49</sup>

Humanists normally favor a human scale, and focus on what can be seen by the human senses unaided, but even so, new ‘big’ specialties have arisen within the humanities since the 1980s. For example, we have seen the rise of Big History,<sup>50,51</sup> taught in partnership with natural sciences. Big History aims

to reunite physics and history, and works on both planetary and human timescales. The humanities have also contributed to rethinking distinctions between the global (and its human institutions) and the planetary (and natural systems), and forms of justice for both.<sup>6</sup> The challenges of inequality are not merely a concern for ‘global experts,’ but also the people disadvantaged by big systems and dominant practices. Big global institutions like the United Nations have struggled to include voices ‘from below,’ despite being formal advocates of human rights.<sup>52</sup> The scholarly environmental humanities, through events and artistic performances, support new ways to enable more inclusive conversations and provide opportunities for people to speak for themselves.<sup>53</sup>

As the western world approached the turn of the millennium, apocalyptic ideas lurked, ever present.<sup>54</sup> The global view was disturbing, but also dispiriting. The world was becoming hardened to environmental bad news. More than the general millennial anxiety of the significant calendar moment, there was a new ‘yearning to know the future and to charge science with accurate prognosis’ (Ref 54, p. 19). Climate scientists agreed that anthropogenic climate change was under way.<sup>55–57</sup> Biodiversity experts talked of a sixth mass extinction event.<sup>58,59</sup> Meanwhile the world’s population was rapidly approaching the 7.8 billion ‘absolute limit’ mooted by statistician George Knibbs in 1928.<sup>60</sup> The bigger and gloomier the news, the less the opportunity to take personal responsibility for action. This was the ‘environmental crisis’ that motivated a small group of Australian scholars from history, anthropology and cultural studies held a meeting at the Australian National University in 2000 to develop a research initiative in ‘ecological humanities’.<sup>5,61</sup> Its call for action focused on what philosopher Val Plumwood described as an ‘ecological crisis of reason’.<sup>62</sup> In 2002, the group partnered with the Joint Academies Forum, a joint initiative of the four learned Academies of Australia (Humanities, Social Science, Science, Technological Science and Engineering), for the workshop on cultural policy, ‘Climate and Culture in Australia’.<sup>63</sup> The Australian Academy of Humanities also promoted Tom Griffiths’ report, ‘The Humanities and an Environmentally Sustainable Australia’.<sup>64–66</sup> From 2004, *Australian Humanities Review* included an ‘Ecological Humanities Corner,’ until 2012, when *Environmental Humanities* was established as its own journal, now international and published by Duke University Press. Sponsorships from leading environmental humanities institutions ensure that it is still free to readers. The ‘free to air’

principle has been a crucial part of the discipline's inclusion of independent scholars, artists and the GLAM (Galleries, Libraries, Archives and Museums) sector. The journal explicitly supports the scholarly humanities to engage with these groups to critique and explore policy and action for public and planetary issues.<sup>67</sup>

The 'environmental crisis' itself is changing as scholars grapple with environmental change and its moral repercussions. Princeton literary professor, Rob Nixon, argues that 'fast' media (social and commercial) and the 24-h news cycle make 'slow violence' invisible.<sup>68</sup> Reflective justice scholarship works in partnership *with* those suffering through long-term events like famines and droughts and other effects of climate change. The longer the time frame, the less likely are injustices reported in the news, so 'slow media'<sup>69</sup> like the arts and museums provide important platforms for reflection and activism.<sup>70</sup> Slow violence has been widely recognized by justice scholars and activists as something demanding very different frames from crisis and emergency management.<sup>68–70</sup>

Another humanistic approach to the climate crisis is offered by Timothy Morton's concept of the 'hyperobject'.<sup>71,72</sup> Morton describes hyperobjects as real, nonlocal 'entities whose primordial reality is withdrawn from humans' (Ref 71, p. 15). That is, they are phenomena that transcend and saturate human experience without ever being singular or emplaced. Their significance is that 'they stretch experience beyond the time scales and places of daily life'<sup>73</sup> but, in doing so, 'are unfathomable and induce in us a sense of the uncanny' (Ref 73, p. 2). While Morton himself, prefers to use the term 'global warming,' rather than climate change, his concept has been influential in developing a thought experiment in thinking beyond humans into the geological future,<sup>74</sup> conceptualizing a strange future 'without us'.<sup>71</sup> Several scholars in this journal<sup>72,73</sup> have developed the hyperobject as a tool to reconsider how climate change affects humanity at an unconscious level, and skews responses in unexpected ways. Elizabeth Boulton acknowledges that Morton's difficult language can at times obscure the usefulness of the concept, but that 'hyperobjects' do offer a new frame or narrative, that is more than merely logical and quotidian.<sup>72</sup> It has long been evident that the uncanny, the unconscious, and the unintended do shape human behavior.<sup>75</sup> Leaving them out of consideration, particularly in analysis of times of crisis, may result in significant omissions and surprises; allowing that climate change may function like a hyperobject enables humans to engage with their vulnerability. By humbling humanity, Morton develops 'more democratic modes of

coexistence between humans and with nonhumans', Boulton argues (Ref 72, p. 777).

Over the last decade, 'environmental humanities' initiatives have emerged at many universities, in museums and in 'pop-up' public forums across the world. One of the first and most internationally influential is the German government funded initiative, the Rachel Carson Center of Environment and Society at Ludwig-Maximilians-Universität (LMU), Munich (established 2009).<sup>76</sup> The Center works in a close partnership with the Deutsches Museum of Science and Technology to promote international collaborative interdisciplinary sustainability research led by history and other humanities. Sweden's KTH Environmental Humanities Laboratory was established in 2011 at the Royal Institute of Technology (KTH), Stockholm to 'experiment' in the environmental humanities.<sup>77</sup> This initiative was funded by the donation of a private philanthropist. The Seedbox Collaboratory (based at University of Linköping, within TEMA) was funded as a pilot scheme from 2015 to 2019 through Swedish competitive research grants (MISTRA and Formas), with the aim of becoming a long-term international research hub in Sweden from 2019.<sup>5,78</sup> In North America, an early leader in environmental history and ecocriticism, the interdisciplinary environmental humanities brought together history, literary criticism, aesthetics anthropology, cultural studies, religious studies, gender studies, media studies, and science and technology studies (STS).<sup>1</sup> One of the most international of these initiatives is HfE funded from 2013 to 2015 by the Andrew W. Mellon Foundation.<sup>79,80</sup> The project networked universities and researchers internationally through a system of 'Observatories.' Beginning with North American, Asia-Pacific, and Australia-Pacific Observatories, it has expanded since with renewed support to include Africa, East Asia, Europe, and Latin America.<sup>80,81</sup>

All these initiatives, and many others funded by individual universities, work in different ways to build humanities strength in environmental studies. Three distinctive case studies of what this means for developments in scholarly thinking is explained below.

## Climate and Biodiversity Justice: A New Ethics of the 'More-Than-Human'

The environmental crisis that inspired the first ecological humanities initiatives focused on the ethical implications of extinction, an issue of international concern raised by conservation biologists.<sup>82,83</sup> The biologically diverse continent of Australia, despite best-practice science and the resources of a wealthy nation, led the world in medium-size mammalian

extinctions, and this was a concern for humanities scholars as well as scientists.<sup>64–66,84</sup> Biodiversity was famously promoted internationally by biologists Thomas Lovejoy and Edward Wilson at the conference of the Smithsonian Institution that launched the Society for Conservation Biology in 1986.<sup>85,86</sup> Biodiversity seized the agenda for action on extinctions by the International Union for Conservation of Nature (IUCN) and others through creating a term that enabled comparisons of loss. Policy-making was affirmed by evidence that could be counted; trust in numbers increased steadily over the 20th century, aided and abetted by the digital revolution.<sup>87</sup> Biodiversity enhanced the policy effectiveness of comprehensive inventories of the global conservation status of biological species (IUCN Red Lists).<sup>85,88</sup> Michael Soulé described conservation biology as ‘crisis science’ or *triage for nature*, a new marriage of functional postulates (ecological principles) and normative postulates (management principles) to create both an ethic and science for action.<sup>89</sup>

Biodiversity captured not only the imagination of biologists but also the philanthropic conservation community. It became the way to talk about nature, for example, when the large US-based organization *Conservation International* was launched in 1987. Justice for the more-than-human requires that biodiversity be integrated into public policy,<sup>83</sup> but this alone is not enough. In her book *Imagining Extinction*, professor of environmental humanities, Ursula Heise suggests that biodiversity is no longer a shorthand for conservation.<sup>90</sup> Conservation is not simply the sum of ecology and crisis: it is more complex. This crisis cannot be managed by triage—it is a long-term emergency. While ecological principles can help to understand ‘how the lives of other species are being reshaped by human actions’, sometimes enabling the forecasting of their long-term consequences, ecology ‘cannot be called upon to determine what our relationship to other species should ideally be’ (Ref 90, p. 199). Environmental justice demands ‘multi-species justice,’ which is based on the principle that communities are neither mere ecosystems nor human social communities, but ‘conglomerates of human and non-human species that shape each other’ (Ref 90, p. 195).

Climate change complicates extinctions and their cultural meanings. While conservation biologists have argued about what to do about species loss, it is earth system scientists who revealed the ‘hyperthreat’ of climate change.<sup>72</sup> Now a new genre of dystopian science fiction engages with apocalyptic nature of planetary scale change, ‘cli-fi’ (climate fiction).<sup>3,91</sup> Ecocriticism, a branch of literary criticism, initially developed through a focus on romantic and nostalgic nature writing and

‘green poetry’<sup>92</sup> turned dark as its attention shifted to horror and dystopia. While nature writers and critics contributed to biodiversity politics, the newer ecocriticism directed its work to climate activism. In other places where environmental questions were not central to literary criticism,<sup>93</sup> cli-fi and films are more often discussed by scholars of STS. Climate change now pervades all sorts of literature, not just fiction, but also poetry and drama: between the WIREs: Climate Change reviews of climate change literature in 2011<sup>91</sup> and 2016,<sup>3</sup> there was an explosion of new writing about climate change.<sup>94</sup> There has also been a corresponding expansion of performance arts of all sorts (Figure 1). Performance art is even included in international policy and governance forums. For example, the poet, Kathy Jetñil-Kijiner from the low-lying Marshall Islands in the Pacific opened the United Nations Climate talks in New York in 2014 with her poem of hope, ‘Dear Matafele Peinam’.<sup>53</sup> She also opened the European Parliament in 2015, when climate change talks were a major part of proceedings. Historical relations between the humanities and science communities in different places have shaped different frames for environmental crisis and approaches to human responsibility.

Not all literary figures accept ‘cli fi’ as serious fiction: science fiction has always been a genre apart, and climate change a step too far for some. Prize-winning Bangladeshi writer, Amitav Ghosh in his nonfiction work, *The Great Derangement*,<sup>95</sup> argues that the tropes of the modern novel cannot cope with climate change. The rules of fiction cannot stretch so far from the everyday for him, even though he has explored biodiversity loss in several of his novels. *The Hungry Tide*<sup>96</sup> is situated in the low-lying Sunderbans, where climate change will be felt first.

Climate change is inherently uncanny: weather conditions and the high carbon lifestyles that are changing them, are extremely familiar and yet have been given a new menace and uncertainty (Ref 95, p. 30).

In the modern novel, the unheard-of moves ‘towards the background,’ to foreground and explore the everyday (Ref 95, p. 17). In what adaptation scientists dub the ‘postnormal’ world, there is no every day for the novel to explore. Ghosh struggles with his very craft. Perhaps the tropes of the novel itself must shift to accommodate the profound uncanniness and unknowability of a climate-changed world.

Environmental justice depends on political ecology. Environmental activism is a form of human endeavor that is deeply cultural: ‘environmentalism’ does not mean the same thing in every place, despite the fact that concern about the environment emerged

at similar times in different places, as a response to accelerate global developments that have compromised life in the biosphere.<sup>97</sup> There are many ‘varieties of environmentalism,’ Indian historian Ramachandra Guha and Catalonian sociologist Juan Martínez Alier argue.<sup>98</sup> Activism in the global south is distinct.<sup>68</sup> While conservation might seem optional in the United States where its focus is on recreational areas,<sup>99</sup> it is fundamental to human livelihoods in the tropical places, which support so much of the world’s biodiversity, as well as many of the world’s poor. Guha, describing what he calls the distinct environmentalism of the poor, quotes Mahatma Gandhi: ‘Even God dare not appear to the poor man except in the form of bread’ (Ref 97, p. 92).

The expression ‘*more-than-human*’ conceptualizes an ethical and moral world that is more than simply the home of the human species. It is a prominent concept in animal studies, but is also relevant in law, and in the law, the Global South is often leading debates. Only ‘persons’ have the right to pursue legal justice, and this has led to various initiatives to give legal rights to trees in the United States<sup>100</sup> and rivers in New Zealand and India.<sup>101</sup> Rights for Nature are now part of the constitutions of Ecuador and Bolivia.<sup>102</sup> The *Ley de Derechos de la Madre Tierra* (‘law of the rights of mother nature’) was passed in 2010 as Bolivian law 071. Ecuador was the first country to vote to recognize Rights of Nature in its

Constitution, ratified by referendum in September 2008. Within its constitution there is a chapter on ‘Rights for Nature,’ which acknowledges that nature in all its life forms has the *right to exist, persist, maintain and regenerate its vital cycles*. The ecosystem itself can be named as a defendant in a court of law.<sup>103</sup>

## The Metaphor of the Anthropocene

In 2012, Sörlin published a Viewpoint in *BioScience*, appealing to biologists interested in the environment, to take the humanities seriously.<sup>104</sup> ‘The arrival of humanists to the environmental enterprise ... will mean new opportunities for bioscientists to collaborate with those in the humanities,’ he noted. He promised ‘deeper reflexivity’ and ‘a sense of realism’ in work for the environment and sustainability (Ref 104, p. 789). With fellow historian, Anders Ekström, Sörlin also published a major book about measuring the contribution of the humanities to Sweden’s future.<sup>105</sup> Ekström and Sörlin noted the environment as one important domain where the humanities were already working in intellectual partnerships—not only with science, but also with cultural institutions and artists—to lead new initiatives that shape future society. Likewise, Icelandic anthropologist, Gísli Pálsdóttir, and colleagues urged more reflection on the



**FIGURE 1 |** *Luminous Relic* 2017: Alexander Boynes, Mandy Martin, and Tristen Parr; pigment, sand, crusher dust, acrylic on linen; three-channel high-definition video; stereo sound score; 6'10" duration; 260 cm × 1170 cm. Courtesy of the artists and Australian Galleries, Melbourne and Sydney. (Geelong Gallery install). Photographer: Andrew Curtis. Shown as part of the CLIMARTE festival 2017, *Luminous Relic* 2017 is an example of the multimedia performance art that complements the environmental humanities. [Correction added on 15 December 2017, after first online publication: Figure 1 has been updated.]

'Anthropos' in GEC research, and more involvement for the humanities.<sup>106</sup>

The idea of the Anthropocene began in science in 2000, in the context of a meeting of the International Geosphere–Biosphere Program (IGBP), one of the key scientific groups that synthesized research for the IPCC.<sup>107,108</sup> The concern of this group was that the future should not be reduced to dire predictions about climate change<sup>109</sup> and should include human responses to the impending global warming crisis, recognizing that the recent acceleration of change has its roots in the very particular human behaviors of the fossil-fuel economies of the 20th century.<sup>110</sup> By 2005, when many of the scientific leaders active in IPCC developed a plan for at a workshop in Dahlem, Germany, ESS reached out to include archeology, history, anthropology and other humanities disciplines in their international networks through an interdisciplinary history program, the IHOPE.<sup>7,8,111,112</sup> In the latest initiative, Future Earth,<sup>113</sup> supersedes three of the four original GEC programs [DIVERSITAS, IGBP and the International Human Dimensions Program (IHDP)]. It also includes over 20 new projects, ranging from the Global Carbon Project to the Earth System Governance Project. Future Earth, based in five 'Global Hubs,' Colorado, Montreal, Paris, Stockholm, and Tokyo, and aspires to develop global sustainability science to become 'intellectually inclusive and socially influential.'<sup>10</sup>

For the disciplines of geology and stratigraphy, the Anthropocene rests on the question of whether Earth might have entered a new geological epoch, and how this might be manifested in rock strata.<sup>114–116</sup> Meanwhile, other sciences were more interested in contesting its 'origins.' Depending on what data sets were their focus, they generated different answers to the question of *when* exactly the Anthropocene began.<sup>117</sup> In the museum sector, the Anthropocene is often simplified as the Age of Humans<sup>118</sup> while the humanities and creative arts celebrate its value as a metaphor in times of planetary change. Metaphors are important in framing environmental management<sup>115</sup> and are useful tools for understanding human responses to crisis and change in environmental variables such as climate. The idea of metaphor reframes the Anthropocene as a tool for action, not just a description of the state of the planet.<sup>119</sup> As geographer Lauren Rickards argues 'the value of a metaphor is not simply a matter of how accurately it depicts the world, but of what insights, storylines, emotions and aesthetics it offers' (Ref 119, p. 281). What does it mean, not just to face planetary change at a catastrophic level (which has happened before), but to

*ourselves* bring on 'the sixth extinction'.<sup>59,120</sup> Philosopher, Benjamin Hale comments that human causality 'is a distinguishing feature of what we are experiencing now, you'd think we'd spend a good deal more energy emphasizing the anthropogenic dimension and downplaying the catastrophic. Instead we do exactly the opposite' (Ref 120, p. 35).

Recognizing the Anthropocene as a metaphor enables a critique of the privileging of global scale and western perspectives over all others. Treating humans as a 'species' de-emphasizes their moral responsibilities.<sup>121</sup> While it is undoubtedly our species that is shifting the geological rules of the planet, it is not every human. Migration historians Armiero and De Angelis argue, 'the Anthropocene discourse conflates the individual and the society at large'<sup>122</sup> ... 'If people live in this mess ... they should only blame themselves as members of the universal human species or, in the optimistic version, act as a member of the same universal human species to improve the situation' (Ref 122, p. 353). As climate refugees already flood out of anthropogenic North African droughts, the questions of the Anthropocene are increasingly human and moral.<sup>123</sup> Climate justice is a very practical problem.

If human society is treated as a monoculture where dominant social systems become the way the species is conceived, the opportunity is lost to consider alternative human social systems that do not rely on capitalism, patriarchy, and colonialism. It may be in these places that there is hope for the future of humanity. In 'Let Them Drown,'<sup>124</sup> the provocative 2016 Edward Said lecture, Naomi Klein suggests that the future might depend on nonwestern models for living. In a warming world, people need to be more than good citizens, they should also be 'good ancestors,' and take account of the world in seven generations time.<sup>124</sup> Conceptualizing the 'human' in terms of the immediate present (and in Western terms) normalizes the historically exceptional.<sup>125</sup> Historian Tony Judt argues:

Something is profoundly wrong with the way we live today. Much of what appears 'natural' today dates from the 1980s: the obsession with wealth creation, the cult of privatization and the private sector, the growing disparities of rich and poor (Ref 125, p. 7).

A short 'present' leads to a discounted future. Thinking like an ancestor, or developing a 'Long Now'<sup>126</sup> has important ramifications for a very different future. Stewart Brand, the co-founder of the Long Now Foundation—a very humanist idea, is an entrepreneur, software developer and creator of the *Whole Earth Catalog*. Humanism is sometimes

practiced by polymaths better known for contributions to science or engineering, like Julian Huxley, foundation director of UNESCO, René Dubos, Pulitzer Prize winner, and Jan Zalasiewicz, who combines geology with creative nonfiction and the arts.<sup>74</sup> The Clock of the Long Now was the centerpiece of the first museum Anthropocene Gallery.<sup>69,127</sup> The interdisciplinary environmental humanities are not limited to the academy, and draw strength from scholarly partnerships beyond universities.

The Anthropocene is a complex and multifaceted idea that reshapes the disciplinary landscape. The idea that the human species has become a geological force for planetary change means that there is now no distinction between human history and planetary history.<sup>24</sup> The history of climate and the history of capital have become conjoined.<sup>128</sup> The Anthropocene was conceived in a time of unprecedented greed. Most of the accelerating changes in social and natural systems that are gathered under the heading of the Great Acceleration<sup>129</sup> were historically driven by the western nations whose development has materially benefited from this rapid and unsustainable consumption. The moral implications of this demand a careful analysis of the ‘human,’ not merely a focus on what the species has done to the planet.

### Life After Nature: The Domestic Wild and Rewilding the Earth

What does the rapid loss of species, of biodiversity, mean for people? Are people grieving about extinctions? Environmental humanist, Thom van Dooren explores the ethical practice of scientific conservation and what it means for ‘life and loss at the edge of extinction’, in his book *Flight Ways*.<sup>130</sup> Such ethical questions have been a very important part of ‘animal studies’ and other humanities, especially those who argue that ‘biophilia’,<sup>131</sup>—or practical engagement with nature—is part of what it means to be fully human. Lebanese–Australian social theorist, Ghassan Hage argues in his new book, *Is Racism an Environmental Threat?* that there are intrinsic connections between the invasion, occupation, domination, and exploitation of an ‘othered people’ and the invasion, occupation, domination, and exploitation of an ‘othered nature’.<sup>121</sup>

The disciplines of design and architecture, and of ecological restoration have all been active in taking these questions beyond ‘managing’ nature (in accordance with Red Lists and species counts) to projects that consider humans and nonhuman others together and recognize feedback loops between them. Some acknowledge the ‘novel ecosystems’,<sup>132</sup> of the

Anthropocene, and work to find ways whereby these ecosystems may still support people’s need for nature. Such questions stimulate new work on urban nature, moving scholarship away from limiting nature to ‘wilderness,’ a concept that has proved a problematic category even in the United States where it was once considered ‘America’s Best Idea.’<sup>133,134</sup> Yet right in the heart of a city, as ecologists in West Berlin discovered during the Cold War years, ‘wild’ nature and rare species can flourish.<sup>135</sup> The importance of the ‘domestic wild’<sup>136</sup> of suburban gardening, in nurturing memory and in re-framing modernity is the subject of important new studies in human geography.<sup>136–138</sup>

If 70% of humans live in cities, and more and more already live in megacities, what does this mean for the relationships between people and nature? It certainly brings city planners and designers into the mix, and the artistic dimensions of their work will make the future nature which is closest to most people. Sculpture and garden design, public parks, and accidental spaces are all important places for encounters with nature. Grander designs can be found in projects like Rewilding Europe.<sup>82,137,139</sup> Even tidy parts of the planet like Western Europe are talking about ‘letting go’ of domesticated landscapes and enabling ‘rambunctious gardens.’<sup>138</sup> This is not so much ‘managing nature’ but listening to people who want to talk about their relationships with nature, in the city, in rural areas<sup>30</sup> and in places beyond agriculture. There is a new agreement fostered by greater integration of the perspectives of Indigenous peoples, that *people are good for conservation*.<sup>140</sup> Natural resource management now includes human behaviors in its ambit.<sup>141</sup> The language of ‘co-management’ embraces a broader expertise that includes alternative visions of what country *ought* to look like and who it benefits. In Australia, traditional Aboriginal land management is as much about human well-being as ecological systems. The Healthy Country, Healthy People project in northern Australia found that ‘caring for country’ makes Indigenous people healthier—something that Djelk ranger, Victor Rostron says he ‘has always known’ (Ref 140, p. 242).

### The Expertise of Humanists: A Case in Point

Throughout this paper, I have emphasized the trans-disciplinary environmental humanities, the elements of our work that reach beyond technical disciplinary audiences, and include the thoughtful ‘general public,’ who want to engage with the big ideas of our time. The public, of course, includes the technically trained

in areas other than ours: art, music, and theater are accessible to far more than artists, musicians, and actors: that is the point of them. Museums aim to include the interests of broad audiences. Embracing the arts as scholarship is a crucial part of transdisciplinary humanities thinking, and practicing artists of all sorts research the history and ontology (coming into being) of the concepts they enliven with their art.

Writing books that are read by many readers is another crucial form of transdisciplinary scholarship. Writing for a broad audience requires mastery of the technical skills and concepts, but spares the reader details that are not crucial to the argument. Synthesizing scholarship is an important skill that complements technical analysis, and opens up new questions, for example, why science does not always motivate action.<sup>142</sup> But the two are distinct. Those who would throw out the environmental humanities because some of its theories are not popularly accessible miss the fact that all scholarship has internal as well as external readers. The assumption that there is no ‘expertise’ in the humanities—no need to talk technically between humanists—is something that would never be assumed of physicists or economists. Nor would the expertise of physicists or economists be called into question should they choose to explain their ideas to broader audiences in different language from what they use with their colleagues. They remain ‘experts,’ even as they communicate their ideas.

Clive Hamilton, in his recent book, *Defiant Earth: The Fate of Humans in the Anthropocene*<sup>143</sup> shows himself to be a brilliant advocate of Earth System Science (ESS), the technical field that has defined climate change as an issue. ESS was also the midwife of the Anthropocene concept, as noted already.<sup>107</sup> *Defiant Earth* explores the ‘rupture’ of the Anthropocene. Hamilton argues passionately that this is not just a significant human footprint on the Earth’s surface; it is not just a layer in the rocks, nor is it just a landscape change, nor just about the environment. Rather it is a rupture to the whole system, lock-stock-and-barrel. It therefore requires a paradigm shift: no longer should we be thinking from the perspective of humans, rather we need a planetary perspective. ‘The natural world inherited by modernity is gone and all the ideas that built on it now float on its memory’, he writes (Ref 143, p. 38). He sees ESS as the knowledge system that can apprehend the Anthropocene rupture, because it focuses on ‘processes that transcend the bounds of ecosystems and operate on a global level’ (Ref 143, p. 21). But if ESS is the ‘only’ way forward, where does this lead Hamilton and his readers?

First, this is an angry book. It is not actually a book of solutions, so much as railing at present human impotence. He writes, ‘Keeping alive the sense of human invulnerability accumulated during the last two or three centuries of the Holocene grows more wilful by the day’ (Ref 143, p. 46). It is a book about fear: the ‘ornery beast of Gaia’ will fight back: the earth system is alive. Nature here is no victim, but rather something that transcends humans and renders them irrelevant. Such a rupture is way outside of the reach of environmentalists who want to ‘save’ nature, he argues. Globalization is entwined in the Anthropocene and the Great Acceleration<sup>129</sup> of the post-war years has carried them forward together—they are interconnected ‘totalizing forces’ (Ref 143, p. 89). Humans are not just another species, they are ‘super-agents,’ ‘powerful beyond the imaginings of the moderns’ (Ref 143, p. 101).

Yet we have seen arguments like this in history already, long before the Anthropocene was mooted. Alfred Crosby in his book, *Ecological Imperialism: The Biological Expansion of Europe 900–1900*,<sup>144</sup> makes the case that European forces were so powerful in the New World not just because of technologies like gunpowder, but also because of the microbes, which they carried unintentionally. Disease, and the well-adapted animals and plants of their portmanteau biota, conquered the New World, rather than the Europeans. Like Hamilton’s argument about the Great Acceleration, the disaster was created not by one thing on a single scale, but by the cumulative effect of many things on many scales.

If we accept Hamilton’s argument that the scale of the global is the only way of conceptualizing the Anthropocene, then the systems that work on human scales, such as those that are theorized by Bruno Latour as *nature-culture*<sup>145</sup> or Timothy Morton as *hyperobject*<sup>71</sup> are no use. Only some experts can speak for this beast. Hamilton takes on the theories of the humanities only to dismiss them as arcane and irrelevant. He cherry-picks a handful of technical ‘post-humanist’ theorists, and finds humanism and ‘history from below’ as indefensible in the inexorable globalizing moment of the Anthropocene. He quotes from Jane Bennett’s theory of *Vibrant Matter*,<sup>146</sup> noting that ‘an actant never really acts alone. Its efficacy or agency always depends on the collaboration, cooperation or interactive interference of many bodies and forces’, then says that what is needed instead is a ‘systems approach’ (Ref 143, p. 91). Bennett’s *is* a systems approach. But it is not ESS. Nor does it operate on a global scale. Hamilton belittles thinking at the human scale, yet he admits that human-scale thinking can have planetary consequences.

History has no problem with the idea of Big History,<sup>51</sup> of planetary history,<sup>50</sup> or the history of geological forces<sup>147</sup> either. The environmental humanities combine science and ecocriticism<sup>148</sup> and ecocriticism and history to work on time-scales way beyond the present.<sup>149,150</sup> Environmental humanities favor human-scale projects, but this is not their only working canvas. Hamilton is shadow-boxing, railing against his own construction of the environmental humanities as naive and incompetent at the only scale that matters. What he fails to see is that the human scale is part of the Earth System too, and the conundrum of the Anthropocene demands plural scales.

Hamilton wants the end of mere Holocene thinking: ‘What does it mean if we no longer live in the light? ... we must live in the half-light of not knowing, in the new atmosphere of endangerment ... vindicating the sorrows of the Anthropocene’ (Ref 143, p. 158). Having dismissed humanism as empty theory, Hamilton, unconsciously echoes humanists like TS Eliot,<sup>151</sup> and finishes with a trope that eerily echoes Holocaust Studies,<sup>152</sup> in his search for ‘new humans who build a new civilization from the planetary ashes of the old one, who look at the ashes and declare: Never again’ (Ref 143, p. 158). Learning to live with uncertainty need not be ‘half-lit.’ It can be the beginning of new thinking, of living differently. This is why the environmental humanities are important to the disciplinary mix. Issues like climate change ‘bite’ on many scales. Always starting at the global end will fail on the scale where the human imagination begins.

## Conclusions: How do the Environmental Humanities Innovate?

The question of who shapes a problem is political: if a normative (“ought”) solution is proposed, there are winners and losers. Issues of human justice and fairness, of long-term planetary futures and of immediate economic gains and losses shadow environmental decision-making. It is helpful to tease these apart. The humanities reflect on how certain groups get to frame the problem, and why they do it and how. Expertise about the environment itself has changed over time,<sup>153,154</sup> and nature’s future always depends closely on local people on the ground, as much as distant experts.

The idea of framing a problem or concept as a narrative or story, breathing life into complex or abstract ideas like climate change, biodiversity or environmental justice, is not exclusive to the environmental humanities. South African bishop, Desmond Tutu, for example, is a prominent advocate for climate justice, labeling it as the most urgent human right.<sup>155</sup> However, the idea of developing

transdisciplinary epistemologies for climate research that take the methods and scholarship of the humanities and creative arts seriously, not limiting them to ‘science communication,’ is fresh, even radical. The environmental humanities are diverse and inclusive. There is no single ‘right way’ to tell stories, but the best stories will ring true for many audiences. The environmental humanities seek out a diversity of ways to speak on a human-scale about our times of rapid environmental change. They are committed to developing ways of telling that include audiences from beyond the academy (Box 2). They use the skills and tools of a range of disciplines. Then they throw away the disciplinary scaffolding enabling the stories to reach people beyond those disciplines.

Environmental humanities focus on ecological problems and issues in the following innovative ways:

### 1. Interdisciplinarity and team-based humanities

Where humanities scholars have traditionally tended to write solo-authored articles and monographs, environmental humanities scholars work in groups and teams, and their products are multi-authored and collaborative, and often performative or artistic as well. Environmental humanities are not the only interdisciplinary humanities. In some senses, history and geography have always been interdisciplinary: time and space (respectively) are concepts that draw on multiple methods and styles; the practical circumstances of field anthropology demand openness to conceptualizing a world view in ways beyond a single ‘method.’ In recent years, new subject-based interdisciplines have emerged, including cultural studies, museum studies and gender studies, which are transdisciplinary in style. Disciplines with eclectic combinations of methods have been prominent in the environmental humanities, and have enabled environmental humanities to venture even further into transdisciplinary territory. Although environmental humanities scholars publish single author books and papers, the multi-author format is more common than in other humanities fields.

### 2. Beyond humanities to include partnerships with natural sciences

The focus on ‘environment’ enables collaborations with natural sciences, as well as with artists, musicians, and others beyond the academy. History and philosophy of science (HPS) and its cousins STS and Sociology of Scientific Knowledge (SSK), are prominent leaders in environmental humanities.<sup>145</sup> Historically ‘the environment’ was conceptualized first as science, so writing environmental humanities requires scientific

## BOX 2

**ANTHROPOCENE SLAM**

Performance and creativity are some of the important elements of the environmental humanities. The participatory media—including theater, fun-fairs and museums—have a complex history dating back to the 19th century and earlier.<sup>156</sup> They brought big ideas and strange objects to popular audiences.

The Anthropocene Slam, first held in Madison, Wisconsin, 2014, is a case of ‘performative scholarship’.<sup>157,158</sup> The idea of the Slam was to ‘pitch’ an object that signified the Anthropocene.<sup>159</sup> The ‘slam’ originated with poetry, performance, and a competitive spirit. The first Poetry Slam, in 1984, set a trend where poets perform their words and audiences vote, with acclamation, for winners. The Anthropocene Slam borrowed the performance and entertainment idea, asking contributors to ‘pitch in a public fishbowl setting’ an object that might represent the Anthropocene in a *Cabinet of Curiosities*. The Cabinet juxtaposed 25 objects, telling different stories that might help humanity rethink ‘its relationship to time, place, and the agency of things that shape planetary change.’ It was an event inclusive of ‘more than the environmental humanities,’ which extend what is usually possible in academic settings.

The Cabinet also became a traveling show. Some of its objects traveled on to the Deutsches Museum in Munich, Germany, for its 2014–2016 exhibition *Willkommen im Anthrozän* (*Welcome to the Anthropocene*), the world’s first gallery exhibition of the Anthropocene.<sup>127</sup>

literacy, if not expertise in the variety of natural sciences that have identified as ‘environmental sciences’ since the early 1960s.<sup>154</sup> Scholars literate in both humanities and science have also facilitated transdisciplinary teams that include natural and social scientists in innovative ways.<sup>12,160,161</sup>

### *3. Problem focused interdisciplinarity*

Environmental humanities do not advocate methods, or work with a singular scholarly template. Often, the ‘method’ is narrative, but stories can be told many ways, including orally and through theater and art, as well as conventionally (see, e.g., Figure 1). The cluster of disciplines that inform environmental

humanities is determined by the problems or questions, which are usually complex.

The intervention of the environmental humanities offers more than just new methods for interdisciplinary environmental scholarship, it also offers new imaginative questions and scales of action. The environmental humanities add a new form of expertise in approaching complex, multi-scalar, ‘wicked problems’ like climate change.<sup>162</sup> The development of partnerships in ‘doing,’ in ‘experiential learning,’ has been one of the lessons of projects like the Millennium Ecosystem Assessment (MEA).<sup>163</sup> Experiential learning, trust and willingness to accommodate judgments based on different methods were the basis for success in the MEA. Ecologist Richard Norgaard, who was one of the assessors, wrote a reflective essay about how making the exercise work required all their different contexts and shared experience, and bringing them together worked to instil hope in the MEA, which was their shared goal.<sup>163</sup>

The crucial tasks of the environmental humanities, according to one 2015 Manifesto,<sup>164</sup> are to situate the human in ecological terms and to situate the nonhuman (or ‘more-than-human’) in ethical terms (Ref 164, p. vii). Ways of doing this include: (1) thinking with Others (other-than-humans, as well as other-than-western-humans); (2) sharing stories (especially listening with care) and (3) broadening the scope of research to be more inclusive. The transdisciplinary character of environmental humanities favors initiatives in places like Sweden or Australia, where there is less than a critical mass in any one discipline, or cultural institution. Crucial to such initiatives are public expectations that what happens in the academy is available and accessible beyond the academy.<sup>33</sup>

There are multiple responses possible to the cascading effects of global environmental change, and many are not rational. Care and practice are also important elements of humanist responses to uncertainty. This is not just true for the humanities, but also for the natural sciences, as Richard Norgaard has argued in his reflection on how ecologists ‘found hope’ by caring about outcomes.<sup>163</sup> Change itself can be a threat and accelerating change can be oppressive and give rise to unpredictable response. Ideological polarities may aggravate the situation. The best scholarship must transcend entrenched political positions and engage more-than-human perspectives in its scope. Environmental humanities contribute through a richness of methods, enabling a wider participation in conversations about the greatest challenges of our time.

## FURTHER READINGS

- Adamson J, Davis M, eds. *Humanities for the Environment*. Abingdon and New York: Routledge; 2016.
- Buffon, le Compte de (Georges-Louis le Clerc). *The Epochs of Nature* [Transl. Jan Zalasiewicz, Anne-Sophie Milon and Mateusz Zalasiewicz]. Chicago: University of Chicago Press; 2018.
- Cronon W, ed. *Uncommon Ground: Rethinking the Human Place in Nature*. New York: W.W. Norton; 1995.
- Global Alliance for the Rights of Nature. Available at: <http://therightsofnature.org/>. (Accessed October 2, 2017).
- Heise U, Christensen J, Niemann M. *The Routledge Companion to the Environmental Humanities*. London and New York: Routledge; 2017.
- Holm P, Scott D, Jarrick A. *Humanities World Report 2015*. Basingstoke: Palgrave MacMillan; 2015.
- Iovino S, Opperman S. *Material Ecocriticism*. Bloomington: Indiana University Press; 2014.
- Klein, N 'Let them Drown', Edward Said Lecture. Available at: <https://www.youtube.com/watch?v=CChLEtIu4iY>. (Accessed October 2, 2017).
- Marshall JP, Connor LH. *Environmental Change and the World's Futures: Ecologies, Ontologies and Mythologies*. London: Routledge; 2016.
- Siperstein S, Hall S, LeMenager S. *Teaching Climate Change in the Humanities*. Abingdon and New York: Routledge; 2016.
- The Long Now Foundation. Available at: <http://longnow.org/>. (Accessed October 2, 2017).
- Whole Earth Catalog. Available at: <http://www.wholeearth.com/history-whole-earth-catalog.php>. (Accessed October 2, 2017).

## REFERENCES

1. Heise U. Introduction: planet, species, justice—and the stories we tell about them. In: Heise U, Christensen J, Niemann M, eds. *The Routledge Companion to the Environmental Humanities*. London and New York: Routledge; 2017, 1–10.
2. Adamson J. Introduction: integrating knowledge, forging new constellations of practice in the environmental humanities. In: Adamson J, Davis M, eds. *Humanities for the Environment*. Abingdon and New York: Routledge; 2016, 1–19.
3. Johns-Putra A. Climate change in literature and literary studies from cli-fi, climate change theatre and ecopoetry to ecocriticism and climate change criticism. *WIREs Clim Change* 2016, 7:266–282. <https://doi.org/10.1002/wcc.385>.
4. Castree N, Adams WM, Barry J, Brockington D, Büscher B, Corbera E, Demeritt D, Duffy R, Felt U, Neves K, et al. Changing the intellectual climate. Perspective. *Nat Clim Change* 2014, 9:763–768. <https://doi.org/10.1038/NCLIMATE2339>.
5. Nye D, Rugg L, Fleming J. *The Emergence of the Environmental Humanities*. Background Paper. Stockholm: Mistra (Swedish Foundation for Environmental Research); 2013. [http://www.mistra.org/download/18.7331038f13e40191ba5a23/Mistra\\_Environmental\\_Humanities\\_May2013.pdf](http://www.mistra.org/download/18.7331038f13e40191ba5a23/Mistra_Environmental_Humanities_May2013.pdf). (Accessed October 2, 2017).
6. Robin L. A history of global ideas about environmental justice. In: Lukasiewicz A, Dovers S, Robin L, McKay J, Schilizzi S, Graham S, eds. *Natural Resources and Environmental Justice: Australian Perspectives*. Melbourne: CSIRO Publishing; 2017, 13–25.
7. Costanza R, van der Leeuw S, Hibbard K, Aulenbach S, Brewer S, Burek M, Cornell S, Crumley C, Dearing J, Folke C. Developing an Integrated History and future of People on Earth (IHOPE). *Curr Opin Environ Sustain* 2012, 4:106–114. <https://doi.org/10.1016/j.cosust.2012.01.010>.
8. Robin L, Steffen W. History for the Anthropocene. *History Compass* 2007, 5:1694–1719. <https://doi.org/10.1111/j.1478-0542.2007.00459.x>.
9. Robin L. Histories for changing times: entering the anthropocene? *Aust Hist Stud* 2013, 44:329–340. <https://doi.org/10.1080/1031461X.2013.817455>.
10. Castree N. 'The Three Cultures' problem in Global Change Research', EnviroSociety Blog, 9 March, 2015. Available at: <http://www.envirosociety.org/2015/03/the-three-cultures-problem-in-global-change-research/>. (Accessed October 2, 2017).

11. Hulme M. *Weathered: Cultures of Climate*. London: Sage Publications; 2017.
12. Holm P, Winiwarter V. Climate change studies and the human sciences. *Global Planet Change*. In press. doi: <https://doi.org/10.1016/j.gloplacha.2017.05.006>.
13. Haraway D. *Staying with the Trouble: Making Kin in the Chthulucene*. Durham, NC: Duke University Press; 2016.
14. Monbiot G. Forget ‘the environment’: we need new words to convey life’s wonders. *The Guardian* 2017. Available at: <https://www.theguardian.com/commentisfree/2017/aug/09/forget-the-environment-new-words-lifes-wonders-language>. (Accessed October 2, 2017).
15. Larson B. *Metaphors for Environmental Sustainability*. New Haven: Yale University Press; 2011.
16. Colloff MJ, Lavorel S, van Kerkhoff LE, Wyborn CA, Fazey I, Gorddard R, Mace GM, Foden WB, Dunlop M, Prentice IC, et al. Transforming conservation science and practice for a post-normal world. *Conserv Biol* 2017, 31:1008–1017. <https://doi.org/10.1111/cobi.12912>.
17. Gorddard R, Colloff MJ, Wise RM, Ware D, Dunlop M. Values, rules and knowledge: adaptation as change in the decision context. *Environ Sci Policy* 2016, 57:60–69. <https://doi.org/10.1016/j.envsci.2015.12.004>.
18. Guggenheim D. *An Inconvenient Truth*, Documentary Film. Paramount, CA, 2006.
19. Cohen B, Shenk J. *An Inconvenient Sequel: Truth to Power*, Documentary Film. Paramount, CA, 2017.
20. Kagan J. *The Three Cultures: Natural Sciences, Social Sciences and the Humanities in the 21st Century*. Cambridge: Cambridge University Press; 2009.
21. Appadurai A. *The Future as a Cultural Fact: Essays on the Global Condition*. London: Verso; 2013.
22. van Renssen S. The visceral climate experience. *Nat Clim Change* 2017, 7:168–171. <https://doi.org/10.1038/nclimate3233>.
23. Chakrabarty D. *Provincializing Europe: Postcolonial Thought and Historical Difference*. Princeton: Princeton University Press; 2000.
24. Chakrabarty D. The climate of history: four theses. *Critical Inquiry* 2009, 35:197–222.
25. Chakrabarty D. Minority histories, subaltern pasts. *Econ Polit Wkly* 1998, 33:473–479.
26. McKibben B. *The End of Nature*. New York: Anchor; 1989.
27. Gaynor A, McCann J. “I’ve had Dolphins...looking for abalone for be”: oral history and the subjectivities of marine engagement. *Oral Hist Rev* 2017, 44:260–277. <https://doi.org/10.1093/ohr/ohx023>.
28. McCalman I. *The Reef: A Passionate History*. Viking: Melbourne; 2013.
29. Langston N. *Toxic Bodies: Hormone Disrupters and the Legacy of DES*. New Haven: Yale University Press; 2010.
30. Main G. *Heartland: The Regeneration of Rural Place*. Sydney: University of New South Wales Press; 2005.
31. Muir C. *The Broken Promise of Agricultural Progress*. London: Routledge; 2014.
32. Sörlin S. Grön humaniora – vad, när, varför och varthän. *Kulturella Perspective* 2016, 25:7–18.
33. Robin L. The view from off-centre: Sweden and Australia in the imaginative discourse of the Anthropocene. In: Head L, Saltzman K, Setten G, Stenseke M, eds. *Nature, Temporality and Environmental Management: Scandinavian and Australian Perspectives on Landscapes and Peoples*. London and New York: Routledge; 2017, 76–92.
34. Robin L, Sörlin S, Warde P. *The Future of Nature: Documents of Global Change*. New Haven: Yale University Press; 2013.
35. Sörlin S. Reconfiguring environmental expertise. *Environ Sci Policy* 2013, 28:14–24.
36. Sears P. Human ecology: a problem in synthesis. *Science* 1954, 120:959–963. Available at: <http://science.sciencemag.org/content/120/3128/959>. (Accessed October 2, 2017).
37. Boyden S. A Biological Centre for Canberra: A Proposal submitted to the Rt Hon Sir Robert Menzies, Prime Minister. Canberra: Committee for the Establishment of a Biological Centre for Canberra, 1965.
38. Miller C, Rothman H, eds. *Out of the Woods: Essays in Environmental History*. Pittsburgh: University of Pittsburgh Press; 1997.
39. Elliot R, Gare A, eds. *Environmental Philosophy a Collection of Readings*. Philadelphia: Pennsylvania State University Press; 1983.
40. Passmore J. *Man’s Responsibility for Nature: Ecological Problems and Western Traditions*. London: Duckworth; 1974.
41. Marshall AJ, ed. *The Great Extermination: A Guide to Anglo-Australian Cupidity, Wickedness and Waste*. London and Melbourne: Heinemann; 1966.
42. Fenner F. ‘A Lateral Arabesque: From Virology to Environmental Studies.’ Public Lecture. 3 September, 1974. Australian Academy of Science archives: MS143-11-4B1. Unpublished.
43. Myrdal A. *Att välja framtid*. Stockholm: Swedish Institute; 1972 (English ed. To Choose a Future: A Basis for Discussions and Deliberations on Future Studies in Sweden, 1974).
44. Ward B, Dubos R. *Only One Earth: The Care and Maintenance of a Small Planet*. New York: Norton; 1972.
45. Odén B. ‘Miljöns historia i ett långsiktigt perspektiv’, Aktuellt om historia, 1. Bromma: Historielärarnas förening; 1978.

46. Dovers SR. *Australian Environmental History: Essays and Cases*. Melbourne: Oxford University Press; 1994.
47. Radkau J. *Natur und Macht*. München: C.H. Beck; 2002 (English ed. 2008).
48. Papadakis E. *The Green Movement in West Germany*. London: St Martins Press; 1984.
49. Papadakis E. *Environmental Politics and Institutional Change*. Cambridge: Cambridge University Press; 1996.
50. Christian D. *Maps of Time: An Introduction to Big History*. Berkeley: University of California Press; 2004.
51. Hesketh I. The story of big history. *History Present* 2014, 4:171–202. <https://doi.org/10.5406/historypresent.4.2.0171>.
52. United Nations. Universal Declaration of Human Rights, 1948. Available at: <http://www.un.org/en/universal-declaration-human-rights/>. (Accessed October 2, 2017).
53. Jetñil-Kijiner K. Dear Matafele Peinam. In: Newell J, Robin L, Wehner K, eds. *Curating the Future: Museums, Communities and Climate Change*. London and New York: Routledge; 2017, 267–269.
54. Gould SJ. *Questioning the Millennium: A Rationalist's Guide to a Precisely Arbitrary Moment*. New York: Harmony Books; 1997.
55. IPCC. Climate Change 1995. Working Group 1. In: Houghton JT, Meira Filho LG, Callander BA, Harris N, Kattenberg A, Maskell K, eds. *Second Assessment Report for Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press (for IPCC); 1996.
56. IPCC. Climate Change 2001. Working Group 1. In: Houghton JT, Ding Y, Griggs DJ, Noguer M, van der Linden PJ, Dai X, Maskell K, Johnson CA, eds. *Third Assessment Report for Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press (for IPCC); 2001.
57. Dryzek J, Norgaard R, Scholsberg D, eds. *The Oxford Handbook of Climate Change and Society*. Oxford: Oxford University Press; 2011.
58. Wilson EO. *The Future of Life*. New York: Vintage; 2003.
59. Kolbert E. *The Sixth Extinction: An Unnatural History*. London: Bloomsbury; 2015.
60. Knibbs GH. *The Shadow of the World's Future or the Population Possibilities of the Consequences of the Present Rate of Increase of the Earth's Inhabitants*. London: Ernest Benn; 1928.
61. Rose DB, Robin L. The ecological humanities in action: an invitation. *Aust Humanities Rev* 2004, 31–32. Available at: <http://www.australianhumanitiesreview.org/archive/Issue-April-2004/rose.html>. (Accessed October 2, 2017).
62. Plumwood V. *Environmental Culture: The Ecological Crisis of Reason*. London: Routledge; 2002.
63. Sherratt T, Griffiths T, Robin L, eds. *A Change in the Weather: Climate and Culture in Australia*. Canberra: National Museum of Australia; 2005.
64. Australian Academy of Humanities. *The Humanities and Australia's National Research Priorities*. Canberra: AAH; 2003.
65. Griffiths T. Environmental history, Australian style. *Aust Hist Stud* 2015, 46:157–173. <https://doi.org/10.1080/1031461X.2015.1035289>.
66. Griffiths T. The humanities and an environmentally sustainable Australia. *Aust Humanities Rev* 2007, 43. Available at: <http://www.australianhumanitiesreview.org/archive/Issue-December-2007/EcoHumanities/EcoGriffiths.html>. (Accessed October 2, 2017).
67. Rose DB, Thom van Dooren T, Chrusew M, Cooke S, Kearnes M, O'Gorman E. Thinking through the environment, unsettling the humanities. *Environ Humanities* 2012, 1–5.
68. Nixon R. *Slow Violence and the Environmentalism of the Poor*. Cambridge, MA: Harvard University Press; 2011.
69. Robin L, Avango D, Keogh L, Möllers N, Scherer B, Trischler H. Three galleries of the Anthropocene. *Anthropocene Rev* 2014, 1:207–224. <https://doi.org/10.1177/2053019614550533>.
70. Newell J, Robin L, Wehner K, eds. *Curating the Future: Museums, Communities and Climate Change*. Abingdon: Routledge; 2017.
71. Morton T. *Hyperobjects: Philosophy and Ecology after the End of the World*. Minneapolis, MN: University of Minnesota; 2013.
72. Boulton E. Climate change as a 'hyperobject': a critical review of Timothy Morton's reframing narrative. *WIREs Clim Change* 2016, 7:772–785. <https://doi.org/10.1002/wcc.410>.
73. Baldwin A. Climate change, migration, and the crisis of humanism. *WIREs Clim Change* 2017, 8:e460 <https://doi.org/10.1002/wcc.460>.
74. Zalasiewicz J. *The Earth After Us: What Legacy Will Humans Leave in the Rocks?* Oxford: Oxford University Press; 2008.
75. Jung C. *Modern Man in Search of a Soul*, vol. 1933. 1st German ed. Abingdon: Routledge; 2001.
76. Rachel Carson Center for Environment and Society, Munich, Germany. Available at: [http://www.carsoncenter.uni-muenchen.de/about\\_rcc/index.html](http://www.carsoncenter.uni-muenchen.de/about_rcc/index.html). (Accessed October 2, 2017).
77. KTH Environmental Humanities Lab, Stockholm, Sweden. Available at: <https://www.kth.se/en/abe/instit/philhist/historia/ehl>. (Accessed October 2, 2017).
78. Seedbox Collaboratory, Linköping, Sweden. Available at: <https://www.theseedbox.se/mer-om-oss?l=en>. (Accessed October 2, 2017).

79. HfE Humanities for the Environment website, North American Observatory, Phoenix. Available at: <http://hfe-observatories.org/>. (Accessed October 2, 2017).
80. Holm P, Adamson J, Huang H, Kirdan L, Kitch S, McCalman I, Ogude J, Ronan M, Scott D, Thompson KO, et al. Humanities for the environment—a manifesto for research and action. *Humanities* 2015, 4:977–992. <https://doi.org/10.3390/h4040977>.
81. Adamson J, Davis M, eds. *Humanities for the Environment: Integrating Knowledge, Forging New Constellations of Practice*. Routledge Environmental Humanities Series. Abingdon and New York: Routledge; 2017.
82. Hall M. Extracting culture or injecting nature? Rewilding in transatlantic perspective. In: Drenthen M, Keulartz J, eds. *Old World and New World Perspectives in Environmental Philosophy. The International Library of Environmental, Agricultural and Food Ethics*, vol. 21. Cham: Springer; 2014, 17–35. [https://doi.org/10.1007/978-3-319-07683-6\\_2](https://doi.org/10.1007/978-3-319-07683-6_2).
83. Adams WM. *Against Extinction: The Story of Conservation*. London: Earthscan; 2004.
84. Lindenmayer D, Burgman M. *Practical Conservation Biology*. Melbourne: CSIRO Publishing; 2005.
85. Robin L. The rise of the idea of biodiversity: crises, responses and expertise. *Quaderni* 2011, 76:25–38.
86. Farnham T. *Saving Nature's Legacy: The Origins of the Idea of Biodiversity*. New Haven: Yale University Press; 2007.
87. Porter T. *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life*. Princeton, NJ: Princeton University Press; 1995.
88. Pimm SL, Russell GJ, Gittleman JL, Brooks TM. The Future of Biodiversity. *Science* 1995, 269:347–350. <https://doi.org/10.1126/science.269.5222.347>.
89. Soulé ME. What is conservation biology? *BioScience* 1985, 35:727–734. <https://doi.org/10.2307/1310054>.
90. Heise U. *Imagining Extinction: The Cultural Meanings of Endangered Species*. Chicago: University of Chicago Press; 2016.
91. Trexler A, Johns-Putra A. Climate change in literature and literary criticism. *WIREs Clim Change* 2011, 2:185–200. <https://doi.org/10.1002/wcc.105>.
92. Gifford T. *Green Voices: Understanding Contemporary Nature Poetry*. Manchester: Manchester University Press; 1995.
93. Robin L. The eco-humanities as literature: a new genre? *Aust Literary Stud* 2008, 23:290–304.
94. Trexler A. *Anthropocene Fictions: The Novel in a Time of Climate Change*. Charlottesville: University of Virginia Press; 2015.
95. Ghosh A. *The Great Derangement: Climate Change and the Unthinkable*. Chicago: University of Chicago Press; 2016.
96. Ghosh A. *The Hungry Tide*. London: HarperCollins; 2004.
97. Armiero M, Sedrez L, eds. *A History of Environmentalism: Local Struggles, Global Histories*. NY: Bloomsbury Continuum Books; 2014.
98. Guha R, Martinez Alier J, eds. *Varieties of Environmentalism: Essays North and South*. London: Earthscan; 1997.
99. Fazey I, Fischer J, Lindenmayer DB. What do conservation biologists publish? *Biol Conserv* 2005, 124:63–73.
100. Stone CD. *Should Trees Have Standing? Law Morality and the Environment*. 3rd ed. Oxford and New York: Oxford University Press; 2010.
101. O'Donnell E, Talbot-Jones J. Three rivers are legally people—but that is just the start of looking after them. *Conversation* 2017. Available at: <https://theconversation.com/three-rivers-are-now-legally-people-but-thats-just-the-start-of-looking-after-them-74983>. (Accessed October 2, 2017).
102. Global Alliance for the Rights of Nature, Bolivia's Leadership. Available at: <http://therightsofnature.org/bolivia-experience/>. (Accessed October 2, 2017).
103. Ecuador Constitution (in English), 2008. Available at: <http://pdbs.georgetown.edu/Constitutions/Ecuador/english08.html>. (Accessed October 2, 2017).
104. Sörlin S. Environmental humanities: Why should biologists interested in the environment take the humanities seriously? *BioScience* 2012, 62:788–789.
105. Ekström A, Sörlin S. *Alltings Mått: Humanistisk kunskap i framtidens samhälle*. Stockholm: Norstedts; 2013.
106. Pálsson G, Szerszynski B, Sörlin S, Marks J, Avril B, Crumley C, Hackmann H, Holm P, Ingram J, Kirman A, et al. Reconceptualizing the 'Anthropos' in the Anthropocene: integrating the social sciences and humanities in global environmental change research. *Environ Sci Policy* 2013, 28:3–13. <https://doi.org/10.1016/j.envsci.2012.11.004>.
107. Crutzen PJ, Stoermer EF. The 'Anthropocene'. IGBP. *Newsletter* 2000, 41:17–18.
108. Steffen W. Commentary. In: Robin L, Sörlin S, Warde P, eds. *The Future of Nature: Documents of Global Change*. New Haven: Yale University Press; 2013, 486–490.
109. Hulme M. Reducing the future to climate. *Osiris* 2011, 26:245–266.
110. McNeill JR. *Something New Under the Sun: An Environmental History of the Twentieth Century World*. New York: W.W. Norton; 2000.
111. Costanza R, Graumlich L, Steffen W, eds. *Sustainability or Collapse: An Integrated History and Future of People on Earth*. 96th Dahlem Workshop. Cambridge: MIT Press; 2007.

112. Hibbard KA, Costanza R, Crumley C, van der Leeuw S, Aulenbach S, Dearing J, Morais J, Steffen W, Yasuda Y. *Developing an Integrated History and Future of People on Earth (IHOPe): Research Plan*. IGBP Report No. 59. Stockholm: IGBP Secretariat; 2010.
113. Future Earth. Available at: <http://www.futureearth.org/who-we-are>. (Accessed October 2, 2017).
114. Zalasiewicz J, Waters CN, Williams M, Barnosky AD, Cebarreta A, Crutzen P, Ellis E, Ellis MA, Fairchild IJ, Grinevald J, et al. When did the Anthropocene begin? A mid-twentieth century boundary level is stratigraphically optimal. *Quat Int* 2015, 383:196–203. <https://doi.org/10.1016/j.quaint.2014.11.045>.
115. Finney SC, Edwards LE. The “Anthropocene epoch”: scientific decision or political statement? *GSA Today* 2016, 26:4–10.
116. Sörlin S. *Antropocen: En essä om människans tidsålder [The Anthropocene—An Essay on the Age of Humanity]*. Stockholm: Weyler; 2017, 231.
117. Robin L. Histories for changing times: entering the Anthropocene? *Aust Hist Stud* 2013, 2013:329–340. <https://doi.org/10.1080/1031461X.2013.817455>.
118. Kress WJ, Stine J, eds. *Living in the Anthropocene: Earth in the Age of Humans*. Washington: Smithsonian Institution Scholarly Press; 2017.
119. Rickards LA. Metaphor and the Anthropocene: presenting humans as a geological force. *Geogr Res* 2015, 53:280–287. <https://doi.org/10.1111/1745-5871.12128>.
120. Hale B. *The Wild and the Wicked: On Nature and Human Nature*. Cambridge, MA: MIT Press; 2016.
121. Hage G. *Is Racism an Environmental Threat?* Cambridge: Polity Press; 2017.
122. Armiero M, De Angelis M. Anthropocene: victims, narrators, and revolutionaries. *South Atl Quart* 2017, 116:345–362. <https://doi.org/10.1215/00382876-3829445>.
123. Muir C. The remixing of peoples: migration as adaptation. *Griffith Rev* 2017, 57:93–115.
124. Klein N. Let them drown: the violence of othering in a warming world. *Lon Rev Books* 2016, 38:11–14.
125. Judt T. *Ill Fares the Land: A Treatise on our Present Discontents*. New York: W.W. Norton; 2010.
126. Brand S. *The Clock of the Long Now: Time and Responsibility*. London: Weidenfeld & Nicolson; 1999.
127. Möllers N, Schwägerl C, Trischler H, eds. *Willkommen im Anthroponen. Unsere Verantwortung für die Zukunft der Erde* [Transl. to English, 2015]. Deutsches Museum: Munich; 2014.
128. Chakrabarty D. Climate and capital: on conjoined histories. *Critical Inquiry* 2014, 41:1–23.
129. McNeill JR, Engelke P. *The Great Acceleration: An Environmental History of the Anthropocene Since 1945*. Cambridge, MA: Harvard University Press; 2014.
130. van Dooren T. *Flight Ways: Life and Loss at the Edge of Extinction*. New York: Columbia University Press; 2014.
131. Kellert SR, Wilson EO. *The Biophilia Hypothesis*. Washington DC: Island Press; 1993.
132. Hobbs R, Higgs E, Harris J. Novel ecosystems: implications for conservation and restoration. *Trends Ecol Evol* 2009, 24:599–605. <https://doi.org/10.1016/j.tree.2009.05.012>.
133. Cronon W. The trouble with wilderness; or getting back to the wrong nature. In: Cronon W, ed. *Uncommon Ground: Rethinking the Human Place in Nature*. New York: W.W. Norton; 1995, 69–90.
134. Robin L. Being first: why the Americans needed it, and why Royal National Park didn’t stand in their way. *Aust Zoologist* 2013, 36:321–329. <https://doi.org/10.7882/AZ.2012.025>.
135. Lachmund J. *Greening Berlin: The Co-Production of Science, Politics, and Urban Nature*. Cambridge, MA: MIT Press; 2013.
136. Ginn F. *Domestic Wild: Memory, Nature and Gardening in Suburbia*. Abingdon: Routledge; 2017.
137. Lorimer J. *Wildlife in the Anthropocene: Conservation after Nature*. Minneapolis: Minnesota University Press; 2015, 264.
138. Marrs E. *Rambunctious Garden: Saving Nature in a Post-Wild World*. New York: Bloomsbury; 2011.
139. Wuerthner G, Crist E, Butler T, eds. *Keeping the Wild: Against the Domestication of Earth*. Washington DC: Island Press; 2014.
140. Griffiths B. Caring for country: the place where the dreaming changed shape. *Griffith Rev* 2017, 56:232–245.
141. Kenchington RA. Conservation and coastal zone management. In: Moritz C, Kikkawa J, eds. *Conservation Biology in Australia*. Sydney: Surrey Beatty; 1994, 245–250.
142. Hulme M. *Why We Disagree About Climate Change: Understanding Controversy, Inaction and Opportunity*. Cambridge: Cambridge University Press; 2009.
143. Hamilton C. *Defiant Earth: The Fate of Humans in the Anthropocene*. Cambridge: Polity Press; 2017.
144. Crosby A. *Ecological Imperialism: The Biological Expansion of Europe 900–1900*. Cambridge: Cambridge University Press; 1986.
145. Latour B. Agency at the time of the Anthropocene. *New Lit Hist* 2014, 45:1–18.
146. Bennett J. *Vibrant Matter: A Political Ecology of Things*. Durham, NC: Duke University Press; 2009.

147. Zalasiewicz J, Sörlin S, Robin L, Grinevald J. Introduction: Buffon and the history of the earth. In: Buffon, le Compte de (Georges-Louis Le Clerc), ed. *The Epochs of Nature* (Transl. Jan Zalasiewicz, Anne-Sophie Milon and Mateusz Zalasiewicz). Chicago: University of Chicago Press; 2018, xiii–xxxiv.
148. Heise UK. Environmental literature and the ambiguities of science. *Anglia* 2015, 133:22–36. <https://doi.org/10.1515/anglia-2015-0003>.
149. Bergthaller H, Emmett R, Johns-Putra A, Kneitz A, Lidström S, McCollum S, Pérez Ramos I, Phillips D, Rigby K, Robin L. Mapping common ground: ecocriticism, environmental history, and the environmental humanities. *Environ Humanities* 2014, 5:561–576.
150. Johns-Putra A. Historicizing the networks of ecology and culture: Eleanor Anne Porden and nineteenth-century climate change. *Interdiscip Stud Lit Environ* 2015, 21:27–46 212. <https://doi.org/10.1093/isle/isv002>.
151. Eliot TS. The Hollow Men (1925 poem). In: Eliot TS, ed. *Collected Poems 1909–1962*. London: Faber and Faber, e-2009.
152. Clark LB. Never again and its discontents. *Performance Res* 2011, 16:68–79. <https://doi.org/10.1080/13528165.2011.561677>.
153. Warde P, Sörlin S, Robin L. *The Environment: A History*. Baltimore, MD: Johns Hopkins University Press. In press.
154. Warde PS, Sörlin SR. Expertise for the future: the emergence of environmental prediction c. 1920–1970. In: Andersson J, Rindzevičiūtė E, eds. *The Struggle for the Long-Term in Transnational Science and Politics*. London: Routledge; 2015, 38–62.
155. Tutu, D. We fought Apartheid: Now climate change is our global enemy. *Guardian* 2014. Available at: <https://www.theguardian.com/commentisfree/2014/> sep/21/desmond-tutu-climate-change-is-the-global-enemy. (Accessed October 2, 2017).
156. Ekström A, Jülich S, Lundgren F, Wisselgren P, eds. *History of Participatory Media: Politics and Publics, 1750–2000*. London: Routledge; 2011.
157. Robin L, Muir C. Slamming the Anthropocene: performing climate change in museums. *reCollections* 2015:10. Available at: [http://recollections.nma.gov.au/issues/volume\\_10\\_number\\_1/papers/slammaing\\_the\\_anthropocene](http://recollections.nma.gov.au/issues/volume_10_number_1/papers/slammaing_the_anthropocene). (Accessed October 2, 2017).
158. Mitman G, Armiero M, Emmett R, eds. *Future Remains: A Cabinet of Curiosities for the Anthropocene*. Chicago: University of Chicago Press; 2018.
159. Anthropocene Slam 2014 (distributed through H-Net online 2013). Available at: [http://www.carsoncenter.uni-muenchen.de/download/events/cfps/cfp\\_cabinet-of-curiosities.pdf](http://www.carsoncenter.uni-muenchen.de/download/events/cfps/cfp_cabinet-of-curiosities.pdf). (Accessed October 2, 2017).
160. Hartman S, Ogilvie A, Ingimundarson JH, Dugmore A, Hambrecht G, McGovern T. Medieval Iceland, Greenland, and the new human condition: a case study in integrated environmental humanities. *Glob Planet Change* 2017, 156:123–139. <https://doi.org/10.1016/j.gloplacha.2017.04.007>.
161. Hartman S. Unpacking the Black Box: The need for Integrated Environmental Humanities. Future Earth Blog, 3 June 2015.
162. Brown VA, Harris JA, Russell J. *Tackling Wicked Problems: Through the Transdisciplinary Imagination*. Earthscan: Abingdon & New York; 2010.
163. Norgaard R. Finding hope in the Millennium Ecosystem Assessment. *Cons Biol* 2008, 22:862–869. <https://doi.org/10.1111/j.1523-1739.2008.00922.x>.
164. Gibson K, Rose DB, Fincher R. *Manifesto for Living in the Anthropocene*. New York: Punctum; 2015.