The Politics of the Anthropogenic*

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Keywords

Anthropocene, capitalism, climate change, climax theory, Earth system science, global environment

Abstract

The term anthropogenic takes its meaning from an implied contrast to an idealist notion of nature as separate from humans and endowed with a timeless or cyclical equilibrium. In recent decades, however, scientists have concluded that human influences now dominate nature at global and geological scales, reflected in the contention that Earth has entered a new epoch called the Anthropocene. Anthropogenic global warming is central to these developments, and the United Nations Framework Convention on Climate Change obligates the international community of nations to "prevent dangerous anthropogenic interference with the climate system." Scientific debates surrounding anthropogenic impacts on the environment have a much longer history, however, revealing chronic empirical difficulties with the human-nature dualism combined with an inability to overcome it conceptually. Anthropologists have a key role to play in emerging transdisciplinary efforts to understand the anthropogenic across scales from the molecular to the global.

INTRODUCTION

UNFCCC: United Nations Framework Convention on Climate Change

The term anthropogenic dates to the 1920s, but the dualism from which it gets its meaning is ancient. In his magisterial *Traces on the Rhodian Shore*, Glacken (1967) summarized Western thought from the pre-Socratics to the end of the eighteenth century as sharing three persistent themes: Humans shape the environment, the environment shapes humans, and humans and environments are matched in ways that suggest harmony or divine will. Today, however, scientists contend, "even on the grandest scale, most aspects of the structure and functioning of Earth's ecosystems cannot be understood without accounting for the strong, often dominant influence of humanity" (Vitousek et al. 1997, p. 494). We have entered a new geological time period dubbed the Anthropocene (Crutzen & Stoermer 2000). As this harmonious relationship between humans and nature breaks down, the two poles of the dualism become difficult to separate; they are not breaking up so much as they are merging into something unrecognizable, or uncognizable, in terms of our inherited concepts.

The demise of the human-nature dualism and the tenacious hold it nonetheless maintains are both strongly linked to industrial capitalism. In his brilliant essay "Ideas of Nature," Williams (1980) suggested that the Industrial Revolution strengthened an abstract, idealist notion of Nature as pristine and untouched by humans, in part through the ideologies and activities of the enriched bourgeoisie, who retreated from cities despoiled by their factories to country estates and hunting reserves from which common people were excluded. For the Nobel Prize–winning chemist Crutzen (2002) and many others, meanwhile, the Industrial Revolution marks the beginning of the Anthropocene, because Watt's dramatically improved steam engine enabled an ever-accelerating use of fossil fuels, releasing carbon that had been sequestered over hundreds of millions of years and thereby disrupting the energy balance of Earth. The "ultimate objective" of the United Nations Framework Convention on Climate Change (UNFCCC), adopted in 1992, is to "prevent dangerous anthropogenic interference with the climate system" (UNFCCC 1992, article 2). Exactly what this means and what it requires have since become highly contentious scientific and political questions.

The politics of the anthropogenic is not reducible to climate change, however. Outside of the UNFCCC, the political battles and public debates about climate change are rarely framed in terms of the anthropogenic per se, with the partial exception of a small but influential group of climate change skeptics who continue to insist, in direct defiance of the scientific consensus, that global warming is "natural" rather than human caused. The politics of climate change is both too large to review here and only a subset of the anthropogenic. The anthropology of climate change was ably reviewed in the previous volume of this journal (Crate 2011), and climate change and island communities is discussed elsewhere in this volume (Lazrus 2012, in this volume). Here I take the politics of the anthropogenic to be a separate, if intersecting, topic that is limited neither to anthropology nor to academia as a whole.

First, I review the topics and debates that gave rise to the term anthropogenic early in the twentieth century, when it denoted ecological forces distinct from soils and climate. Almost immediately, the problem of specifying the spatial and temporal limits of anthropogenic factors presented itself. Nonetheless, the conceptual framework established at that time continues to structure scholarship in a wide range of fields. Curiously, almost everyone asserts that the nature-humans distinction is fundamentally flawed and must be transcended, but even saying so seems to make doing so more difficult. For ecologists and environmentalists, the politics of the anthropogenic is fraught with both practical and ideological complications.

Second, I review the idea that Earth is now in the Anthropocene. Discussions about the advent of a new geological epoch resemble earlier debates about the anthropogenic, with the key difference that the term now encompasses rather than contrasts with climate.

Anthropogenic climate change represents a global experiment around which virtually every field of the biophysical sciences can converge, as represented in a number of emerging fields and scientific institutions such as the Intergovernmental Panel on Climate Change (2007) and the Millennium Ecosystem Assessment (2006). Opportunities abound for anthropologists to engage these developments.

Third, I survey the literature about (not of) climate science: its history, politics, and social conditions of possibility. If the origins of anthropogenic climate change lie in the Industrial Revolution, detection and attribution—that is, perceiving its effects and confirming it as anthropogenic—were made possible rather inadvertently by military science conducted during the Cold War. The authors who have chronicled climate science for general audiences are attempting something similar to what Crate (2011) calls for: critical, collaborative, and multisited "climate ethnography." They have shown that the industries most responsible for anthropogenic global warming (AGW)—including oil, coal, electricity, and automobiles—have actively and intentionally stymied effective public response to the problem through a complex web of misinformation, lobbying, intimidation, and public relations. Why this effort has been so successful in fomenting "climate denialism," especially in the United States, is a question with rich anthropological potential.

Fourth and finally, I ask what these developments portend for the politics of the anthropogenic. I review some of the efforts social scientists have made to catch up with the burgeoning biophysical scientific knowledge about climate change. In the Anthropocene, the question becomes not whether, but how much, anthropogenic change has occurred, and the politics of the anthropogenic concerns who caused which changes, with what impacts on whom.

ORIGINS

According to the *Oxford English Dictionary*, anthropogenic means "having its origins in the activities of man" [*sic*]. *Merriam-Webster's Dictionary* defines it as "of, relating to, or resulting from the influence of human beings on nature." The term was first used in this sense by the famous English botanist and ecologist Tansley (1923) in his textbook *Practical Plant Ecology*. The need for the term arose from the problem of accounting for change. Clements (1916) had famously theorized vegetation change as plant succession, a universal process by which climate and soil determined a single climax state for the plant community in any given site. Tansley insisted that other factors could interfere and hold vegetation in what Clements termed subclimaxes, not only arresting succession but also modifying it more or less permanently—these too, Tansley felt, should be considered climaxes. Clements had worked out his theory in the western United States, in landscapes that he viewed (along with most other Euro-Americans) as pristine, wild, or untouched by humans. Tansley, by contrast, took his bearings from the English countryside [for a full-length study of this transatlantic contrast in environmental thought, see Hall (2005)]:

> In a country like Great Britain, where man has modified the spontaneous vegetation so that most of it is what we have called "semi-natural," we can rarely find those long series of stages of development from bare habitats to the climatic climax . . . which we can study in regions of the world approximating to the virgin condition. We find instead a patchwork of communities . . . nearly all modified in various ways by man or his animals . . . Where he has introduced a more or less permanent modifying factor or set of factors, we have biotic (anthropogenic) climaxes or some stage of development towards them.
>
> (Tansley 1923, p. 48)

Later, Tansley removed the parentheses and referred directly to "anthropogenic climaxes." He resorted to anthropological primitivism as an explanation:

> Primitive man, just like any other animal, originally formed, and in some few parts of the

AGW: anthropogenic global warming

> world still forms, a component, nicely adjusted to the system as a whole, of the ecosystems of those regions which he inhabits. But with his increasing control over "nature" the human animal became a unique agent of destruction of the original ecosystems, as he cleared and burned natural vegetation and replaced it with his pastures, crops and buildings.
>
> (Tansley 1939, p. 128)

He then offered a dramatic prediction that foresaw the coming Anthropocene:

> Limited at first to the regions where civilisation originally developed, this destructive activity has spread during recent centuries, and at an increasing rate, all over the face of the globe except where human life has not yet succeeded in supporting itself. It seems likely that in less than another century none but the most inhospitable regions—some of the more extreme deserts, the high mountains and the arctic tundra—will have escaped. Even these may eventually come, partially if not completely, under the human yoke.
>
> (Tansley 1939, p. 128)

Tansley was prescient, but human factors affecting the environment could not be so easily confined to the recent or modern period. Sauer (1950) shared Tansley's critique of Clementsian climax theory, but he recognized climate variability and discerned a human imprint stretching back hundreds of thousands of years. "Great changes in climate have dominated the physical world for at least the last million years . . . The second great agent of disturbance has been man [*sic*], an aggressive animal of perilous social habits, insufficiently appreciated as an ecologic force and as modifier of the course of evolution" (Sauer 1950, p. 18). Through the use of fire, humans had coevolved with vegetation, especially grasses; even the soils of grassland areas were at once natural and cultural.

CONTINUITIES FROM ECOLOGY

The basic contours and concepts of many recent debates are identical to those found in Tansley (1923, 1939) and Sauer (1950), even if the conclusions differ. Humans, climate, soils, and nonhuman biota are taken as conceptually distinct though empirically interactive; nature is presumptively static or cyclical until proven otherwise; humans are the cause of change, whether progressive or detrimental, incremental or abrupt; and humans who do not have such effects are (or were) ecologically no different from animals. Science can challenge the conclusions drawn from this framework—whether preindustrial societies were in equilibrium with their environments, for example—but it must do so through this basic conceptual scaffolding.

In general, Sauer (1950), too, now appears prescient: Many of his claims have been confirmed and elaborated by subsequent scholarship (not including his supposition of human presence in the Americas hundreds of thousands of years ago). Pyne (1982, 1991, 1995, 1997, 2007), for example, has documented the coevolution of humans, fire, and vegetation in every terrestrial corner of the planet; Antarctica is the exception that proves the rule (Pyne 1986). Smith (1980) advanced the theory that Amazonian black earth (*terra preta*) is anthropogenic, a view now widely shared and of enormous interest to climate scientists owing to the vast quantities of carbon that black earth could sequester if the techniques of producing it could be rediscovered (Glaser & Woods 2004). Cronon (1983) demonstrated the pervasive influence of Native Americans on the ecology of New England, and Mann (2005) assembled scholarly discoveries of precontact indigenous environmental management and impacts in the Americas as a whole. With increasingly powerful tools from remote sensing, isotopic and other chemical analysis, as well as computer modeling, scholars are finding further evidence of premodern humans' influence over their environments; the anthropogenic and its classical opposites—climate, soils, vegetation—structure this research (Metcalfe et al. 1989, Kirch 1996, Tilley et al. 2000, Veblen et al. 2000, Fisher et al. 2003, Heckenberger et al. 2008, Gillison & Ekblom 2009).

Anthropologists have utilized this scaffolding for decades, arguably reinforcing its relevance even when they appeared or sought to challenge it. Hames (2007) reviewed one such case—"The Ecologically Noble Savage Debate"—in the pages of this journal not long ago. Fisher & Feinman (2005, pp. 62–63) convened a special issue of *American Anthropologist* to explore "the total sweep of anthropogenic environmental change," noting "a sea change in the way that the human environment dialectic is perceived" and calling for "the collection of long-term socionatural data" to understand current environmental problems. Similarly, Headland (1997, p. 605) led a forum in *Cultural Anthropology* in which he promoted the emerging field of historical ecology. "Historical ecologists emphasize not only that environments have a history but that the dichotomy between 'natural' and human-influenced landscapes is a false one. They argue that all ecosystems have been greatly modified by humans for thousands of years." A review of historical ecology appeared in this journal in 2006 (Balee 2006; see also Crumley 1994).

For the social scientists engaged in these debates, the concept of the anthropogenic is useful and fairly uncontroversial, except insofar as it is linked to more value-laden notions such as primitivism or ecological nobility. But among ecologists and especially environmentalists, the idea of pervasive and long-standing anthropogenic impacts strikes deep ideological chords. Without a pristine, original nature untouched by humans, how is one to define the environment to be protected or preserved? Cronon (1996, p. 22) ignited a storm in the inaugural issue of *Environmental History* when he challenged wilderness as a culturally constructed myth: "Any way of looking at nature that encourages us to believe that we are separate from nature—as wilderness tends to do—is likely to reinforce environmentally irresponsible behavior." More recently, a group of conservation biologists influenced by Martin's (2005) Pleistocene-overkill hypothesis proposed a new conservation strategy called Pleistocene rewilding (Donlan et al. 2005, 2006). Noting that "Earth is nowhere pristine," they argued that "we can no longer accept a hands-off approach to wilderness preservation" (Donlan et al. 2005, pp. 913, 914). Instead, they proposed introducing Old World large mammals to the New World as evolutionary and ecological proxies for those lost following the arrival of humans. Opponents of the idea challenged it on scientific and practical grounds: "Resources would be better spent on preserving threatened organisms in their native habitats and reintroducing them to places in their historical ranges from which they were only recently extirpated" (Rubenstein et al. 2006, p. 232). Caro (2007, p. 281) correctly noted that the "brouhaha" turned on "the conventional but arbitrary 1492 conservation benchmark (i.e., the date that Caucasians arrived in the New World) to which conservation biologists seek to restore North American communities." Both sides of the debate were, in effect, suggesting that nature without humans is, or was, more natural—they differed over which group of humans (or absence thereof) to consider most relevant to conservation.

Very similar arguments are now playing out in the face of the Anthropocene. In *Nature*, Marris (2011) proclaimed "The End of the Wild" and reported on the challenges that climate change poses to the National Park Service's long-standing devotion to original or pristine conditions. In *Conservation Biology*, Caro et al. (2011, p. 2) insisted that "some areas of the globe are still intact" and should be protected from human uses. "We fear that the concept of pervasive human-caused change may cultivate hopelessness in those dedicated to conservation and may even be an impetus for accelerated changes in land use motivated by profit" (Caro et al. 2011, p. 1). Marris et al. (2011, p. A31) provided a retort in the *New York Times*: "Yes, we live in the Anthropocene—but that does not mean we inhabit an ecological hell."

The conceptual scaffolding put in place to define the anthropogenic some 80 years ago has proved remarkably tenacious. Many scholars have criticized the human-nature

dichotomy embedded in the concept, but even in so doing, they have had to employ it and, seemingly, to grant it continued de facto conceptual purchase. There are signs that this may be changing, however, as the sheer weight of evidence begins to exceed what the old scaffolding can support. The key difference, compared with the time of Clements and Tansley, is that climate has become anthropogenic in measurable ways. And because climate is a global system influencing every place on Earth, the four distinct component concepts with which the ecologists began—humans, climate, soils, and nonhuman biota—have collapsed into one another. Even Tansley's deserts, mountains, and tundra, as well as the oceans, are now anthropogenic (Vitousek et al. 1997). Our technology, consciousness, concepts, and the material world combine to produce an "environmental globalism" in which "it is virtually impossible to disentangle the social and the natural" (White 1999, p. 979). How, then, can we think in ways that are adequate to this reality?

THE ANTHROPOCENE

Crutzen & Stoermer (2000) proposed that the current geological epoch be named the Anthropocene (meaning recent age of humankind). They suggested it began in the late-eighteenth century, "because, during the past two centuries, the global effects of human activities have become clearly noticeable" (Crutzen & Stoermer 2000, p. 17). This was followed by a series of further refinements of their argument (Crutzen 2002, Steffen et al. 2007, Zalasiewicz et al. 2010), citing evidence of human domination of basic biogeochemical processes: the carbon, sulfur, and nitrogen cycles; global atmosphere; erosion and sedimentation; extinction rates; sea-level rise; and oceanic pH. All these factors will eventually be visible where it matters most for geologists: in the sediments, fossils, and rocks of the present period. In 2008, the Stratigraphy Commission of the Geological Society of London voted to consider declaring the Anthropocene a formal unit of geological time.

When Did It Begin?

Crutzen & Stoermer (2000) acknowledged that specifying the start of the Anthropocene was unavoidably arbitrary, and debates have swirled within the earth sciences about when, exactly, it began. Broadly, the problem is the same one Sauer identified with regard to climax plant communities: Humans have altered the environment for as long as they have been around. Steffen et al. (2007, p. 615) argued that "[p]reindustrial societies could and did modify coastal and terrestrial ecosystems but they did not have the numbers, social and economic organisation, or technologies needed to equal or dominate the great forces of Nature in magnitude or rate." Ruddiman (2003, 2005) countered that humans, in fact, began to affect global atmospheric greenhouse gas concentrations as much as 8,000 years ago, through paddy-rice and domestic-livestock production, which he argues explains an otherwise anomalous rise in methane concentrations. Crutzen & Steffen (2003, p. 253, emphases in original) respond that, Ruddiman's claims notwithstanding, the "period of the Anthropocene since 1950 stands out as the one in which human activities rapidly changed from merely *influencing* the global environment *in some ways* to *dominating it in many ways*." This "Great Acceleration" (Steffen et al. 2007, p. 614) can be seen in population, urbanization, dams, transportation, greenhouse gas emissions, surface temperatures, deforestation, fisheries exploitation, nitrogen deposition, and extinctions.

Meanwhile, "the Anthropocene" has caught on and spread widely both inside and outside the academy. *The Economist* (2011b) made it a cover story with the subheadline "Humans have changed the way the world works. Now they have to change the way they think about it, too." Further inside, the editors called it a real "paradigm shift" because "[f]or centuries, science has progressed by making people peripheral" (*Economist* 2011a, p. 81). Calls for integration of social and biophysical sciences abound; remarkably, these calls are coming more loudly from the biophysical side than from the social

side (Vitousek et al. 1997, von Storch & Stehr 1997).

What Does It Mean?

The key points to draw from the Anthropocene have less to do with when it began than with how it affects the underlying assumptions that scientists make about understanding the world. First, the ancient dichotomy of humans and nature is now empirically false at the global scale: The "Earth System includes humans, our societies, and our activities; thus, humans are not an outside force perturbing an otherwise natural system but rather an integral and interacting part of the Earth System itself" (Steffen et al. 2007, p. 615). Second, although the past can shed light on dynamics and key thresholds of change, we cannot assume that the lessons it reveals will continue to apply in the future: "Earth is currently operating in a *no-analogue state*" (Crutzen & Steffen 2003, p. 253, emphasis in original).

The challenge is to rebuild our conceptual scaffolding to reflect these novel realities. Demands arising from social movements, expressed in terms such as "climate justice" (Bond 2012), will likely do much of this work. Inside the academy, the emergence of new fields and institutions within the biophysical sciences—such as Earth system science (Wainwright 2009), land-change science (Turner 2009), remote sensing (Balzter 2009), global-change science, the Intergovernmental Panel on Climate Change, and the Millennium Ecosystem Assessment—indicates some of the ways that this rebuilding may take place.

One early example bears mentioning here because it operationalizes an alternative approach and speaks directly to the topic from which the concept of the anthropogenic arose. Sauer (1950) noted that patterns of climate and vegetation could be—and often were—used circularly to produce maps of purportedly "natural" biomes. Ellis & Ramankutty (2008, p. 446), observing that biomes are still mapped as though human influences were irrelevant, have used satellite imagery and a range of other data to map 18 "anthropogenic biomes of the world." They found that "most of 'nature' is now embedded within anthropogenic mosaics of land use and land cover" (Ellis & Ramankutty 2008, p. 446). Anthropologists will surely appreciate the importance of classification systems in shaping human perceptions and actions. Studies of the political and social implications of these new scientific practices—or Earth system governmentality (Lövbrand et al. 2009)—are urgently needed.

CLIMATE SCIENCE

One of the most remarkable things about AGW is that it has been detected at all, let alone explained and attributed to human activities. Weather can be observed directly, but climate is the average of weather and can be discerned only through prolonged accumulation of weather data. Global climate, in turn, requires such data from around the world, all standardized sufficiently to enable robust aggregation. Explanation and attribution involve enormously complex analyses of these data in relation to physical and biochemical laws and theories (Stott et al. 2000, Stott 2003, Lean & Rind 2008). I cannot here review the vast literature of climate science and policy; reasonably accessible summaries are available (Cowie 2007, Houghton 2009, Blockstein & Wiegman 2010, Schneider et al. 2010), and a valuable compendium of landmark original scientific papers is found in Archer & Pierrehumbert (2011).

Sociology of Climate Science

The history of climate science is eloquently told by Weart (2008). He highlights the profoundly social nature of the achievement, resulting as it did from the efforts of hundreds of scientists working on all manner of problems, in many cases only inadvertently, or much later, contributing a piece to the huge, cumulative puzzle. Another fact that becomes quite clear is that the Cold War was, historically speaking, a contingent but critical condition of possibility for the discovery of global warming. The

US military, looking for ways to track radioactive fallout from aboveground nuclear testing, almost accidentally developed the tools—and provoked scientists to ask the questions—that made the discovery possible: "The U.S. Navy had bought an answer to a question it had never thought to ask" (Weart 2008, p. 30).

Conveying climate science to lay audiences requires a great deal of translation from highly technical to more accessible language. This is true of many scientific topics, but particularly so in this case because climate change spans scales of space and time whose vastness is unprecedented in human experience (Sayre 2010). A large literature combines expositions of the basic findings of climate science, journalistic or biographical narratives of scientists at work, and accounts of ordinary people confronting the vagaries of changing local climates. One theme that emerges from these works is that the scientists are deeply alarmed and truly scared of what is coming—even more so than environmental activists have often been about any number of issues—and that they struggle to contain their concerns within the norms of scientific demeanor (see, e.g., Hunter 2003, Kolbert 2006).

Several prominent climate scientists have written popular or crossover books aimed at persuading the general public of the urgency of the issue, blending autobiography with scientific information and practical suggestions for addressing the problem. Hansen (2009) is at the more alarmed end of the spectrum (the subtitle is "The Truth about the Coming Climate Catastrophe and our Last Chance to Save Humanity"). Broecker & Kunzig (2008) end with a plea for rapid technological innovation. Hulme (2009, p. 326) is more philosophical and cautiously optimistic: "I suggest we need to reveal the creative psychological, ethical and spiritual work that climate change is doing for us." A recent variation is Bradley's (2011) account of being swept up in a Congressional inquiry cum witch hunt for his role in producing the now-famous "hockey stick" figure of average temperatures over the past millennium (Mann et al. 1999). Scholars other than climate scientists have also weighed in with books for broad audiences (Hillman et al. 2007, Hamilton 2010, Powell 2011).

Many science journalists have produced similar books. Kolbert (2006) adapted a series of excellent articles for the *New Yorker* into *Field Notes from a Catastrophe*. A longer and more comprehensive treatment is provided by Flannery (2005). Lynas (2008) organized his book into chapters of projected scenarios for each 1°C increase in global temperatures; by the time he gets to six, the projections are highly uncertain but truly terrifying. Kunstler (2005) extended alarmism to near apocalypticism by twinning global warming with peak oil. Motavelli (2004) assembled stories by a team of reporters on climate change in various places around the world. Parenti (2011) also toured the world, with an eye to diagnosing wars and other violence as products of climate change. By contrast, Paskal (2010) deduced widespread climate change–related warfare in the years to come from a macrogeopolitical analysis. Kozloff (2010) and deBuys (2011) provided regional analyses of climate change for the Amazon basin and the U.S. Southwest, respectively.

Climate Denialism

Perhaps the most disturbing facet of this literature concerns the politicization of climate science by those seeking to oppose the consensus view that global warming is, in fact, anthropogenic (Gelbspan 2004, Union of Concerned Scientists 2007, Hoggan 2009, Dunlap & McCright 2010, Powell 2011). Oreskes (2004), who demonstrated the consensus in a widely cited article in *Science*, subsequently published a powerful book (Oreskes & Conway 2010) detailing the activities of a small group of Cold War scientists who lent their authority to a series of efforts to "manufacture doubt" regarding tobacco, DDT, acid rain, and climate change. Funded by corporate donations from ExxonMobil and other polluting industrial interests, funneled through conservative foundations and think tanks and disseminated through white papers, public relations experts, and lobbying campaigns, these men adopted the strategy the

tobacco industry had pioneered of confusing the public with repeated invocations of scientific uncertainty. Oreskes & Conway (2010) interpreted their actions not merely as self-interested, but also as ideologically motivated by a free-market fundamentalism that likens environmental regulation to communism.

Relatively little scholarship exists regarding so-called climate denialism, especially in light of the exposés provided by these authors. Boykoff & Boykoff (2004) documented the role of the mainstream media, who lent credence to the skeptics' views by routinely presenting "both sides" of the climate change story, even when one side had little or no scientific authority on the subject. Jacques et al. (2008) documented the importance of conservative think tanks in fomenting skepticism in Washington, DC, and the public at large. Nerlich (2010) focused on the twisted logic and metaphors of skeptics' arguments as revealed in the "Climategate" episode: how calls for "sound science" impute unsoundness to the views of actual scientists and how complete consensus among climate scientists is taken as proof that their views are religious rather than scientific. Levett-Olson (2010) considered skepticism in relation to religious worldviews. But more anthropological treatments of climate denial are almost wholly lacking: Why do ordinary people doubt climate change, especially when the evidence of misinformation campaigns by the skeptics is readily available? Norgaard (2011) provided an exemplary study along these lines, based on research in a small town in Norway. Although she theorizes her case more sociologically (and psychologically) than anthropologically, Norgaard's approach is unmistakably ethnographic; she also wove Gramscian political economy elegantly into her analysis. She found a kind of dual consciousness or double reality, in which the patterns of everyday life, collectively lived and reproduced in both thought and action, prevent knowledge of climate change from resulting in concrete actions to stop it. Anthropologists have a key role to play in exploring these issues further.

THE POLITICS OF THE ANTHROPOGENIC?

Perhaps the only place where the anthropogenic explicitly finds political expression is in the UNFCCC (of which the United States is a signatory). Defining "dangerous anthropogenic interference with the climate system" (UNFCCC 1992, article 2) cannot be considered merely a scientific question; although if it were, the answer would appear to be that the limit has already been passed and the UNFCCC has failed (Kriegler 2007, Ramanathan & Feng 2008). As climate scientists recognize, however, "Defining DAI [dangerous anthropogenic interference with the climate system] begs the question, for example, '*Dangerous* to whom?'" (Mann et al. 2009, p. 4,065, emphasis in original). The fundamental problem is that, although the atmosphere is a genuinely global commons, both the sources of greenhouse gases and the effects of climate change are profoundly unevenly distributed in space and time; for both biophysical and socioeconomic reasons, the areas that have contributed most to causing global warming are not the ones most likely to suffer the soonest or the most (Parry et al. 2004). Achieving "atmospheric justice" requires wrestling with this core issue (Vanderheiden 2008). Although countless initiatives are under way at smaller scales (Bailey 2007), coordinated global action has been stymied, principally by the United States (by far the largest source of cumulative historical emissions) and China (the largest current source).

The *Routledge Handbook of Climate Change and Society* (Lever-Tracy 2010) and the *Oxford Handbook of Climate Change and Society* (Dryzek et al. 2011) provide the best full overviews of the social scientific issues surrounding climate change. As a first cut into the myriad dimensions of social change that are needed, Roberts et al. (2003) regressed national greenhouse gas emissions rates against a range of variables and found significant correlations with levels of national debt, total exports, military spending, population growth rates, nonunion labor, and political repression.

Demeritt (2001) incisively analyzed the politics surrounding the failure to translate climate science into policy. The best that science can do is to make projections of future climate based on extremely complex models validated against past climate data. These models must necessarily simplify reality, and they cannot incorporate thresholds or feedbacks that have never occurred in the past—even though Earth is already in a no-analogue state. There cannot be certainty about these models in any strong sense. "Given the immensely contentious politics, it is tempting for politicians to argue that climate policy must be based upon scientific certainty. This absolves them of any responsibility to exercise discretion and leadership" (Demeritt 2001, p. 328).

Giddens (2009, p. 4, emphasis in original) went so far as to assert that "at present, *we have no politics of climate change*." By this he means that a real, effective political engagement with the issue has scarcely begun and will unavoidably be radically new. He provided a useful overview of what is being done and what remains to be done. Interestingly, the countries that have done the most are those that took the 1970s oil crisis seriously and began to reduce their dependence on oil for reasons other than climate.

Urry (2011) began from the premise that AGW is a fundamentally social issue for which economics—the social science field that has thus far had the most visible role in climate policy debates—is wholly inadequate. He grouped views of the problem into three types: skepticism, gradualism, and catastrophism. His own views seem to fall into the gradualist camp, while acknowledging that catastrophic outcomes are possible and rapid changes are urgently needed. He called for an end to neoliberal (or disorganized) capitalism, to be replaced by resource capitalism, in which "nature would not be regarded as separate from the economy and hence would not be available for transformation through short-term profit maximization... Overall, economies shift the measurement of success from that of GDP to minimizing the impact on energy, materials and land" (Urry 2011, p. 119). An "ensuring state" would regulate all aspects of the economy and refuse to discount future generations relative to present ones. "Perceptions, practices and policies must develop fast and furiously along the lines of a resource capitalism" if there is to be any capitalist solution to climate change (Urry 2011, p. 120).

A question arises, however: Would resource capitalism still be capitalism? Huber (2008, p. 106) theorized fossil energy as internal to capitalism, calling for a "move from conceptions that understand energy as a 'thing' or a 'resource' towards a conception of energy as a 'social relation' enmeshed in dense networks of power and socioecological change." Similar to Urry (2011), Huber (2008, p. 113) recognized that "energy issues are at the epicenter of not only the geopolitics of empire and the global climate crisis, but also the more banal, everyday reproduction of capitalist social life." Even some very mainstream, establishment environmental advocates, such as Speth (2008), have begun to conclude that the fundamental threat to the global environment is capitalism itself.

CONCLUSION

In view of the historical correlation between industrial capitalism and fossil fuel combustion, it becomes evident that the problem with the anthropogenic is that it is too abstract a category. It treats humans transhistorically and thus cannot distinguish between different societies over space and time. Even Tansley (1939, p. 128), who coined the term, recognized something unique about the "destructive activity [that] has spread during recent centuries, and at an increasing rate, all over the face of the globe," but he mistook it as a matter of civilization versus primitivism, rather than a function of the social and ecological relations of production unique to recent centuries. The corollary of a too-abstract concept of the anthropogenic is a too-abstract concept

of nature: one that cannot abide any sign of human influence and remain truly "natural."

In the Anthropocene, both of these abstractions become impossible to sustain. The question is not if, but how much anthropogenic change has occurred. Perhaps "[s]cientists are coming to a sobering realization: There may be no such thing left on Earth as a natural forest" (Gillis 2011, p. A13). If so, then it is equally true that attributing such facts to humans is wholly inadequate. It is instructive to consider a case in which the circumstances are reversed. Synthetic chemicals such as TCDD (dioxin) have always been assumed to be unique combinations of elements not found in nature. But as analytic equipment and methods have progressed, scientists can now detect naturally produced TCDD (Hoekstra et al. 1999). This has profound and direct implications for people suffering from complications resulting from exposure to Agent Orange or other industrial pollutants, because if reasonable doubt of the source can be established, chemical companies can argue, as many do, that the pollution is not their fault. The politics of the anthropogenic must give way to a politics that identifies which people have caused which changes, with what consequences to whom, and demands a justice that is indistinguishably social and environmental at the same time.

The challenge for both scholarship and politics is to think, study, and act across the vast spatial and temporal scales of climate change and its complex web of causes and consequences. Even as climate denialists continue to hold sway among elected officials in the United States and elsewhere, governments are pouring resources into the science of the Anthropocene to develop and refine technologies of high-resolution global data collection, modeling, and analysis. High-level policy prescriptions, meanwhile, supported by scientific assessments (Millennium Ecosystem Assessment 2006, Intergovernmental Panel on Climate Change 2007), propound basically economistic approaches to understanding and regulating the global environment through enclosure and commodification of the atmosphere and other common resources. Even if such a system were to become technologically and institutionally feasible, it cannot answer the underlying social and ethical questions that are central to the politics of the anthropogenic.

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LITERATURE CITED

Archer D, Pierrehumbert R. 2011. *The Warming Papers*. Oxford: Wiley-Blackwell

Bailey J. 2007. *Lessons from the Pioneers: Tackling Global Warming at the Local Level*. Minneapolis: Inst. Local Self-Reliance

Balee W. 2006. The research program of historical ecology. *Annu. Rev. Anthropol.* 35:75–98

Balzter H. 2009. Remote sensing and earth observation. See Castree et al. 2009, pp. 315–35

Blockstein DE, Wiegman L. 2010. *The Climate Solutions Consensus*. Washington, DC: Island

Bond P. 2012. *Politics of Climate Justice: Paralysis Above, Movement Below*. Durban: Univ. KwaZulu-Natal Press

Boykoff MT, Boykoff JM. 2004. Balance as bias: global warming and the US prestige press. *Glob. Environ. Change* 14:125–36

Bradley RS. 2011. *Global Warming and Political Intimidation*. Amherst/Boston: Univ. Mass. Press

Broecker S, Kunzig R. 2008. *Fixing Climate*. New York: Hill & Wang
Caro T. 2007. The Pleistocene re-wilding gambit. *Trends Ecol. Evol.* 22(6):281–82
Caro T, Darwin J, Forrester T, Ledoux-Bloom C, Wells C. 2011. Conservation in the Anthropocene. *Conserv. Biol.* 26:185–88
Castree N, Demeritt D, Liverman D, Rhoads B, eds. 2009. *A Companion to Environmental Geography*. Oxford: Blackwell
Clements FE. 1916. *Plant Succession*. Washington, DC: Carnegie Inst. Wash.
Cowie J. 2007. *Climate Change: Biological and Human Aspects*. Cambridge, UK: Cambridge Univ. Press
Crate SA. 2011. Climate and culture: anthropology in the era of contemporary climate change. *Annu. Rev. Anthropol.* 40:175–94
Cronon W. 1983. *Changes in the Land*. New York: Hill & Wang
Cronon W. 1996. The trouble with wilderness: or, getting back to the wrong nature. *Environ. Hist.* 1(1):7–28
Crumley CL. 1994. *Historial Ecology*. Santa Fe, NM: Sch. Am. Res. Press
Crutzen PJ. 2002. Geology of mankind. *Nature* 415:23
Crutzen PJ, Steffen W. 2003. How long have we been in the Anthropocene era? *Clim. Change* 61:251–57
Crutzen PJ, Stoermer EF. 2000. The "Anthropocene." *IGBP Newsl.* 41:17–18
deBuys W. 2011. *A Great Aridness: Climate Change & the Future of the American Southwest*. Oxford: Oxford Univ. Press
Demeritt D. 2001. The construction of global warming and the politics of science. *Ann. Assoc. Am. Geogr.* 91(2):307–37
Donlan CJ, Berger J, Bock CE, Bock JH, Burney DA, et al. 2006. Pleistocene rewilding: an optimistic agenda for twenty-first century conservation. *Am. Nat.* 168(5):660–81
Donlan CJ, Greene HW, Berger J, Bock CE, Bock JH, et al. 2005. Re-wilding North America. *Nature* 436:913–14
Dryzek JS, Norgaard RB, Schlosberg D. 2011. *Oxford Handbook of Climate Change and Society*. Oxford: Oxford Univ. Press
Dunlap RE, McCright AM. 2010. Climate change denial: sources, actors and strategies. See Lever-Tracy 2010, pp. 240–59
Economist. 2011a. A man-made world. *The Economist* 399:81–83
Economist. 2011b. Welcome to the Anthropocene. *The Economist* 399:13
Ellis EC, Ramankutty N. 2008. Putting people in the map: anthropogenic biomes of the world. *Front. Ecol. Environ.* 6:439–47
Fisher CT, Feinman GM. 2005. Introduction to "Landscapes over Time." *Am. Anthropol.* 107(1):62–69
Fisher CT, Pollard HP, Israde-Alcántara H, Garduño-Monroy VH, Banerjee SK. 2003. A reexamination of human-induced environmental change within the Lake Pátzcuaro Basin, Michoacán, Mexico. *Proc. Natl. Acad. Sci. USA* 100:4957–62
Flannery T. 2005. *The Weather Makers*. New York: Atl. Mon.
Gelbspan R. 2004. *Boiling Point*. New York: Basic Books
Giddens A. 2009. *The Politics of Climate Change*. Cambridge, UK: Polity
Gillis J. 2011. The threats to a crucial canopy. *New York Times*, Oct. 1, pp. A1, A12–13
Gillison L, Ekblom A. 2009. Untangling anthropogenic and climatic influence in riverine forest in the Kruger National Park, South Africa. *Veg. Hist. Archeobot.* 18:171–85
Glacken CJ. 1967. *Traces on the Rhodian Shore*. Berkeley: Univ. Calif. Press
Glaser B, Woods WI. 2004. *Amazonian Dark Earths: Explorations in Space and Time*. Dordrecht/London: Springer
Hall M. 2005. *Earth Repair: A Transatlantic History of Environmental Restoration*. Charlottesville: Univ. Va. Press
Hames R. 2007. The ecologically noble savage debate. *Annu. Rev. Anthropol.* 36:177–90
Hamilton C. 2010. *Requiem for a Species: Why We Resist the Truth about Climate Change*. London: Earthscan
Hansen J. 2009. *Storms of My Grandchildren*. New York: Bloomsbury
Headland TN. 1997. Revisionism in ecological anthropology. *Curr. Anthropol.* 38(4):605–30
Heckenberger MJ, Russel JC, Fausto C, Toney JR, Schmidt MJ, et al. 2008. Pre-Columbian urbanism, anthropogenic landscapes, and the future of the Amazon. *Science* 312:1214–17

Hillman M, Fawcett T, Rajan SC. 2007. *The Suicidal Planet*. New York: Thomas Dunne
Hoekstra EJ, De Weerd H, De Leer EWB, Brinkman UAT. 1999. Natural formation of chlorinated phenols, dibenzo-*p*-dioxins, and dibenzofurans in soil of a Douglas fir forest. *Environ. Sci. Toxicol.* 33:2543–49
Hoggan J. 2009. *Climate Cover-Up: The Crusade to Deny Global Warming*. Vancouver: Greystone
Houghton J. 2009. *Global Warming: The Complete Briefing*. Cambridge, UK: Cambr. Univ. Press. 4th ed.
Huber MT. 2008. Energizing historical materialism: fossil fuels, space and the captitalist mode of production. *Geoforum* 40:105–15
Hulme M. 2009. *Why We Disagree about Climate Change*. Cambridge, UK: Cambridge Univ. Press
Hunter R. 2003. *Thermageddon: Countdown to 2030*. New York: Arcade
Intergovernmental Panel on Climate Change. 2007. *IPCC Fourth Assessment Report: Climate Change 2007* (*AR4*). Cambridge/New York: Cambr. Univ. Press
Jacques PJ, Dunlap RE, Freeman M. 2008. The organization of denial: conservative think tanks and environmental scepticism. *Environ. Polit.* 17:349–85
Kirch PV. 1996. Late Holocene human-induced modifications to a central Polynesian island ecosystem. *Proc. Natl. Acad. Sci. USA* 93:5296–300
Kolbert E. 2006. *Field Notes from a Catastrophe: Man, Nature, and Climate Change*. New York: Bloomsbury
Kozloff N. 2010. *No Rain in the Amazon: How South America's Climate Change Affects the Entire Planet*. New York: Palgrave
Kriegler E. 2007. On the verge of dangerous anthropogenic interference with the climate system? *Environ. Res. Lett.* 2:011001
Kunstler JH. 2005. *The Long Emergency: Surviving the Converging Catastrophes of the Twenty-First Century*. New York: Atl. Mon.
Lazrus H. 2012. Sea change: island communities and climate change. *Annu. Rev. Anthropol.* 41:285–301
Lean JL, Rind DH. 2008. How natural and anthropogenic influences alter global and regional surface temperatures: 1889 to 2006. *Geophys. Res. Lett.* 35:L18701
Lever-Tracy C, ed. 2010. *Routledge Handbook of Climate Change and Society*. London: Routledge
Levett-Olson L. 2010. Religion, worldview and climate change. See Lever-Tracy 2010, pp. 230–39
Lövbrand E, Stripple J, Wiman B. 2009. Earth system governmentality: reflections on science in the Anthropocene. *Glob. Environ. Change* 19:7–13
Lynas M. 2008. *Six Degrees: Our Future on a Hotter Planet*. Washington, DC: Natl. Geogr.
Mann CC. 2005. *1491*. New York: Vintage
Mann ME, Bradley RS, Hughes MK. 1999. Northern hemisphere temperatures during the past millennium: inferences, uncertainties, and limitations. *Geophys. Res. Lett.* 26(6):759–62
Marris E. 2011. The end of the wild. *Nature* 469:150–52
Marris E, Kareiva P, Mascaro J, Ellis EC. 2011. Hope in the age of man. *New York Times*, Dec. 8, p. A31
Martin PS. 2005. *Twilight of the Mammoths: Ice Age Extinctions and the Rewilding of America*. Berkeley: Univ. Calif. Press
Metcalfe SE, Street-Perrot FA, Brown RB, Hales PE, Perrot RA, Steininger FM. 1989. Late Holocene impact on lake basins in central Mexico. *Geoarcheology* 4:119–41
Millennium Ecosystem Assessment. 2006. *Millennium Ecosystem Assessment synthesis reports*. **http://maweb.org/en/Synthesis.aspx**
Motavelli J, ed. 2004. *Feeling the Heat: Dispatches from the Frontlines of Climate Change*. New York: Routledge
Nerlich B. 2010. 'Climategate': paradoxical metaphors and political paralysis. *Environ. Values* 19:419–42
Norgaard KM. 2011. *Living in Denial: Climate Change, Emotions, and Everyday Life*. Cambridge, MA: MIT Press
Oreskes N. 2004. The scientific consensus on climate change. *Science* 306:1686
Oreskes N, Conway EM. 2010. *Merchants of Doubt*. New York: Bloomsbury
Parenti C. 2011. *Tropic of Chaos: Climate Change and the New Geography of Violence*. New York: Nation
Parry ML, Rosenzweig C, Iglesias A, Livermore M, Fischer G. 2004. Effects of climate change on global food production under SRES emissions and socio-economic scenarios. *Glob. Environ. Change* 14:53–67
Paskal C. 2010. *Global Warring: How Environmental, Economic, and Political Crises Will Redraw the World Map*. New York: Palgrave

Powell JL. 2011. *The Inquisition of Climate Science*. New York: Columbia Univ. Press
Pyne SJ. 1982. *Fire in America*. Seattle: Univ. Wash. Press
Pyne SJ. 1986. *The Ice: A Journey to Antarctica*. Seattle: Univ. Wash. Press
Pyne SJ. 1991. *Burning Bush: A Fire History of Australia*. Seattle: Univ. Wash. Press
Pyne SJ. 1995. *World Fire: The Culture of Fire on Earth*. Seattle: Univ. Wash. Press
Pyne SJ. 1997. *Vestal Fire*. Seattle: Univ. Wash. Press
Pyne SJ. 2007. *Awful Splendor: A Fire History of Canada*. Vancouver: Univ. B.C. Press
Ramanathan V, Feng Y. 2008. On avoiding dangerous anthropogenic interference with the climate system: formidable challenges ahead. *Proc. Natl. Acad. Sci. USA* 105:14245–50
Roberts JT, Grimes PE, Manale JL. 2003. Social roots of global environmental change: a world-systems analysis of carbon dioxide emissions. *J. World-Syst. Res.* 9(2):277–315
Rubenstein DR, Rubenstein DI, Sherman PW, Gavin TA. 2006. Pleistocene Park: Does re-wilding North America represent sound conservation for the 21st century? *Biol. Conserv.* 132:232–38
Ruddiman WF. 2003. The anthropogenic greenhouse era began thousands of years ago. *Clim. Change* 61:261–93
Ruddiman WF. 2005. *Plows, Plagues and Petroleum: How Humans Took Control of Climate*. Princeton, NJ: Princeton Univ. Press
Sauer CO. 1950. Grassland climax, fire, and man. *J. Range Manag.* 3(1):16–21
Sayre NF. 2010. Climate change, scale, and devaluation: the challenge of our built environment. *Wash. Lee J. Energy Clim. Environ.* 1:93–105
Schneider SH, Rosencranz A, Mastrandrea MD, Kuntz-Duriseti K. 2010. *Climate Change Science and Policy*. Washington, DC: Island
Smith NJH. 1980. Anthrosols and human carrying capacity in Amazonia. *Ann. Assoc. Am. Geogr.* 70:553–66
Speth JG. 2008. *The Bridge at the Edge of the World: Capitalism, the Environment, and Crossing from Crisis to Sustainability*. New Haven, CT: Yale Univ. Press
Steffen W, Crutzen PJ, McNeil JR. 2007. The Anthropocene: Are humans now overwhelming the great forces of nature? *Ambio* 36:614–21
Stott PA. 2003. Attribution of regional scale temperature changes to anthropogenic and natural causes. *Geophys. Res. Lett.* 30(14):1728
Stott PA, Tett SFB, Jones GS, Allen MR, Mitchell JFB, Jenkins GJ. 2000. External control of 20th century temperature by natural and anthropogenic forcings. *Science* 290:2133–37
Tansley AG. 1923. *Practical Plant Ecology*. London: George Allen & Unwin
Tansley AG. 1939. *The British Isles and Their Vegetation*. Cambridge, UK: Cambr. Univ. Press
Tilley C, Hamilton S, Harrison S, Anderson E. 2000. Nature, culture, clitter: distinguishing between cultural and geomorphological landscapes; the case of hilltop tors in South-West England. *J. Mater. Cult.* 5:197–224
Turner BL II. 2009. Land change (systems) science. See Castree et al. 2009, pp. 168–80
Union of Concerned Scientists. 2007. *Smoke, Mirrors and Hot Air: How ExxonMobil Uses Big Tobacco's Tactics to Manufacture Uncertainty on Climate Science*. Cambridge, MA: Union Concern. Sci.
United Nations Framework Convention on Climate Change (UNFCCC). 1992. *United Nations Framework Convention on Climate Change*. Bonn, Germ.: UNFCCC. **http://unfccc.int/resource/docs/convkp/conveng.pdf**
Urry J. 2011. *Climate Change and Society*. Cambridge, UK: Polity
Vanderheiden S. 2008. *Atmospheric Justice: A Political Theory of Climate Change*. Oxford: Oxford Univ. Press
Veblen TT, Kitzberger T, Donnegan J. 2000. Climatic and human influences on fire regimes in Ponderosa Pine forests in the Colorado Front Range. *Ecol. Appl.* 10(10):1178–95
Vitousek PM, Mooney HA, Lubchenco J, Melillo JM. 1997. Human domination of Earth's ecosystems. *Science* 277:494–99
von Storch H, Stehr N. 1997. Climate research: the case for the social sciences. *Ambio* 26(1):66–71
Wainwright J. 2009. Earth-system science. See Castree et al. 2009, pp. 145–67
Weart SR. 2008. *The Discovery of Global Warming*. Cambridge, MA: Harvard Univ. Press. Rev. ed.
White R. 1999. The nationalization of nature. *J. Am. Hist.* 86(3):976–86
Williams R. 1980. Ideas of nature. In *Problems in Materialism and Culture*, pp. 67–85. London: Verso
Zalasiewicz J, Williams M, Steffen W, Crutzen P. 2010. The new world of the Anthropocene. *Environ. Sci. Technol.* 44:2228–31

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