

# Environmental Anthropology: Systemic Perspectives\*

Yancey Orr,<sup>1</sup> J. Stephen Lansing,<sup>2,3,4</sup>  
and Michael R. Dove<sup>5</sup>

<sup>1</sup>School of Social Science, University of Queensland, St. Lucia, Brisbane, Queensland 4072, Australia; email: y.orr@uq.edu.au

<sup>2</sup>Complexity Institute, Nanyang Technological University, Singapore 639798; email: jlansing@ntu.edu.sg

<sup>3</sup>Santa Fe Institute, Santa Fe, New Mexico 87501

<sup>4</sup>Stockholm Resilience Center, SE-106 91 Stockholm, Sweden

<sup>5</sup>School of Forestry and Environmental Studies, and Peabody Museum of Natural History, and Department of Anthropology, Yale University, New Haven, Connecticut 06511; email: michael.dove@yale.edu

Annu. Rev. Anthropol. 2015. 44:153–68

First published online as a Review in Advance on July 31, 2015

The *Annual Review of Anthropology* is online at [anthro.annualreviews.org](http://anthro.annualreviews.org)

This article's doi:  
10.1146/annurev-anthro-102214-014159

Copyright © 2015 by Annual Reviews.  
All rights reserved

\*This article is part of a special theme on Resources. For a list of other articles in this theme, see <http://www.annualreviews.org/doi/full/10.1146/annurev-an-44-themes>

## Keywords

systems ecology, political ecology, complexity, indigenous environmental knowledge, Anthropocene, multispecies ethnography, phenomenology

## Abstract

Our brief overview of developments in environmental anthropology since 1980 and their antecedents is organized around three themes: systems ecology, political ecology, and cognitive science. In some areas, the context is familiar. As Latour recently observed, the intellectual themes captured by the emergent concept of the Anthropocene have long been familiar to anthropologists. After decades of research on human–environmental interactions, anthropology, and more particularly environmental anthropology, suddenly finds itself pushed into prominence. A vibrant and kaleidoscopic research agenda has ensued and borrows extensively from other disciplines. This agenda coincides with increased interest in coupled human and natural systems from both the social and the natural sciences. Such attention is not solely the product of academic integration or the analytical reflection of empirical realities; it also stems from growing concern over the role of humans in the global transformation of the environment.

[C]hoosing the name Anthropocene brings together three features fairly familiar to anthropologists: the concentration on human agency; the necessity to tackle again the connection between what used to be called “physical” and “cultural” anthropology; and the reopening of the key question of what is common and what is specific in the various ways of inhabiting the earth. Is this enough of a gift? Or are you still worried that it might be a poison in disguise?

– Bruno Latour (2014)

It is as if determining the border between human and animal were not just one question among many discussed by philosophers and theologians, scientists and politicians, but rather a fundamental meta-physico-political operation in which alone something like ‘man’ can be decided upon and produced.

– Giorgio Agamben, *The Open: Man and Animal*

The nets of his weaving cast afar,  
and his Thought, in the midst of them circlet full

– Sophocles, *Antigone*

## INTRODUCTION

The last *Annual Review of Anthropology* article to summarize ecological anthropology was written by Ben Orlove and published in 1980. His excellent review spanned the major issues and changes in ecological anthropology from approximately 1950 to 1980 and has been widely influential. Since then, although the *Annual Review of Anthropology* has published a handful of more focused articles on topics within environmental anthropology,<sup>1</sup> there has been no comparable attempt at a broad synthesis. Thirty-five years on, today’s ecological anthropology is a very different field. Orlove organized his article around developmental stages in ecological anthropology, of which the last was “processual ecological anthropology” circa 1970. But since that time, ecological anthropology has not experienced incremental changes in a single paradigm. Rather, new ideas have proliferated, which we treat here as framed within three topics or subfields: systems ecology, political ecology, and cognitive and phenomenal ecology.

Following the current inclination in anthropology, in this review we have replaced the term “ecological” with “environmental.” Some anthropologists have used “environmental” to connote an applied and problem-oriented study of coupled human and environmental systems. But rather than narrowing the scope of such research, our use of this term appropriately signals the broadening of studies of coupled human and natural systems to include questions about discourse and power as well as cognitive science. These topics connect nature and societies, but they do not clearly fit within the conventional meaning of ecology in the natural sciences. However, combining anthropology and ecology with related fields is consistent with the etymological and original meaning of “ecology.” The term was first used by the nineteenth-century zoologist Ernst Haeckel, who joined biology and the visual arts to illustrate the aesthetic, anatomical, and evolutionary principles that connected multiple forms of life. In *Generelle Morphologie der Organismen* (Haeckel 1866), he combined the Greek words “οικος” (oikos: household, dwelling, family) with “λογος” (logos: word, reason) to form *oecologie* in German, later translated as *ecology* in English (Schwarz & Jax 2011). Haeckel was motivated to show that entities may be better understood if they are

<sup>1</sup>These include “Toward an Ecology of Materials” (Ingold 2012), “Human Behavioral Ecology” (Cronk 1991), “Indigenous People and Environmental Politics” (Dove 2006), “The Research Program of Historical Ecology” (Balée 2006), “Complex Adaptive Systems” (Lansing 2003), and “Climate and Culture: Anthropology in the Era of Contemporary Climate Change” (Crate 2011).

examined in their relationships with other entities and processes. It is in this broad sense of the term that we provide an ecological approach within the discipline of environmental anthropology.

Our goal here is to offer a synthetic view of the engagement of environmental anthropology with related fields over the past 35 years. In some areas, the context is familiar. As Latour recently observed, the intellectual themes captured by the concept of the Anthropocene have long been familiar to anthropologists. Indeed, conservation movements flourished for most of the twentieth century, and their antecedents can be traced back to Romanticism in the eighteenth and nineteenth centuries (Barzun 1975). Both “second nature” and labor’s ability to shape consciousness, often attributed to Marx, have cogent antecedents in Cicero and Sophocles in the first and fifth centuries BC. “It is as clear as noon-day,” wrote Marx, “that man, by his industry, changes the forms of materials furnished by Nature, in such a way as to make them useful to him” [Marx 1961 (1844)]. Today, as we contemplate the consequences of human industry on the chemical, physical, and biological composition of the earth (Barnosky et al. 2012), these ancient writings seem foreshadowing.

Yet the tenor of contemporary environmental thought is marked by a pathos that Sophocles would have recognized in his own tragedies: the concern over one’s ability to radically alter the world; the dread that such transformations may prove irrevocably damaging for all; and a foreboding sense that although this potential future is of our own making, we are paradoxically powerless to avoid it. Although Greek tragedy is a wellspring of the Western historical imagination, rarely in history has there been a sense of tragedy about our relationship with the natural world. Except during the height of the Cold War, neither would such a view have been based so strongly in fact. Still, at such a unique juncture in social and natural history, we must also recognize that we have more knowledge about our relationship with nature than we have had at any previous time. The complex material transfers between the social and natural worlds, the relationships between individuals and communities that shape the use of resources, and our experiences of these interactions—all subjects within the purview of environmental anthropology—are essential to any conscious effort to prevent a Sophoclean final act. As our nets have been cast, it may be providential that our thoughts about nature “circleth full.”

## SYSTEMS ECOLOGY

Anthropology’s engagement with ecology, unique in the social sciences, has a long history and developed in a curious way. In “Primitive Classification,” Durkheim & Mauss (1903) argued that the relationship between nature (macrocosm) and culture (microcosm) is the primordial foundation for both human cognition and social organization. This insight was taken up by generations of ethnographers. In the initial Durkheimian formulation, social categories are projected onto environments, giving them universal significance, and the resulting system of thought is encoded in religion. But are environments merely *tabulae rasae*? This question was addressed by many ethnographers, perhaps most famously by E.E. Evans-Pritchard (1940) in his study of the Nuer. Evans-Pritchard argued that the Nuer adapt to their savannah environment by apprehending relevant ecological processes and integrating “ecological time” with the “structural time” intrinsic to their kinship system. In this way, the Nuer conception of time expresses the salient connections between ecology and social life in a pastoralist society. Elsewhere, ethnographers found more examples of Durkheimian functional integration in the calendrical systems of tribal and agrarian societies.

In retrospect, Durkheim’s stress on the congruence of natural and social classification systems was one of the most influential ideas in twentieth-century anthropology. Although Durkheim’s focus was on cognition, culture, and social organization, the need to provide some account of nature-as-macrocosm drew generations of ethnographers into engagement with the question of

how societies related to their environments. This question was also inescapable for archaeologists. Mutual borrowings took place as archaeologists sought ethnographic models for past societies, whereas ethnographers pursued antecedents for the snapshots recorded in their fieldwork. Such borrowings sometimes ventured further afield into the natural sciences. Geology was indispensable for archaeology; ethnographers occasionally dipped into astronomy, botany, ecology, or evolutionary theory. Interest in the environment was ancillary to anthropology's core questions about culture and society, but it was consistent with the discipline's place in the division of labor within the social sciences. The traditional subject matter of anthropology was the *natuurvolken*, traditional or primitive cultures assumed to be closer to nature. Modernity, the domain of the other social sciences, could be seen as the product of the progressive separation of the social world from the natural world.

How times have changed. As noted above, the concept of the Anthropocene turns this story on its head by framing the growth of modernity as the intensification of society's impact on the natural world. Latour's intellectual pirouette (quoted above) is symptomatic of a sudden, convulsive recognition that while the end of history may or may not coincide with the triumph of freedom, our most enduring legacy on the natural world is likely to be mass extinctions. "How can we simultaneously be part of such a long history," asks Latour (2004), "and yet be so late in realizing what has happened?" As the social science with the longest record of research on human-environmental interactions, anthropology, and more particularly environmental anthropology, suddenly finds itself pushed into prominence, having pursued "coupled human and natural systems" as they were *avant la lettre*.

A similar shift is also under way in ecology, a field whose role in the biological sciences resembles that of anthropology in the social sciences. Like anthropologists, ecologists study community-scale patterns and interactions. Within ecology, the smallest subfield is systems ecology, which seeks to quantify such interactions by tracing flows of energy, nutrients, and information. Typical examples are quantitative models of ponds, grasslands, and coastal estuaries. Not infrequently, humans are included in these models, for example in the study by Coughenour et al. (1985) of energy flows in a nomadic pastoral society in East Africa. In recent years, systems ecology has found itself sidelined by the growth of other subfields of biology, notably genetics. But now, if the Anthropocene is indeed well under way, and the study of coupled human and natural systems (CHNS) is destined to move to the forefront of the research agenda, are fields such as environmental anthropology and systems ecology up to the job?

At a first approximation, the answer to this question may appear to hinge on the issue of scale. The Anthropocene is a planetary-scale phenomenon, whereas the methods of anthropologists and systems ecologists are suited to studies of local, community-scale processes. Still, variation begins at the local scale, and it is not obvious that shifting to a coarse-grained, averaged-up perspective will be insightful. Furthermore, in recent years both anthropologists and ecologists have begun to explore new models of emergent and nonlinear processes. Nonlinear dynamic models are also coming into prominence in the other social sciences. But the starting place for anthropologists is almost always a richly detailed ethnographic case study, whereas other social scientists are likely to begin with a formal model and look for ways to test it.

Within anthropology, studies of CHNS vary in how much they focus on human, natural, or coupled dynamics. The study of fully coupled systems is quite rare; there have been few attempts to replicate Rappaport's analysis of adaptive cycles among the Maring (Rappaport 1968). But that is beginning to change. In ecology, C.S. Holling's (1973) study of resilience and stability in ecosystems revived interest in adaptive cycles. Holling argued that the useful measure of resilience is the size of stability domains: the amount of disturbance an ecosystem can take before its controls shift to another set of variables and relationships that dominate another stability region.

Holling's ideas dovetailed with studies of bifurcations in dynamic systems and phase transitions in statistical physics. Lovelock's elegant Daisyworld model illustrated the relevance of these ideas for planetary-scale ecology (Lenton & Lovelock 2001). Interest in resilience soon spread from ecology to the environmental social sciences (Folke 2006). Berkes et al. (2003) documented how humans across a wide range of cultural settings have adapted to ecosystem changes in ways that influence the resilience of the combined social-ecological system. Dasgupta & Mäler (2004) explored the economic implications of state changes in ecosystems, and Janssen et al. (2006) introduced a network perspective to highlight the structure of interactions between identifiable components of socioecological systems. But for the most part the social sciences lacked sufficient empirical data to pursue quantitative analyses of resilience and regime shifts.

These intellectual currents vied with several others to shape the recent research agenda of environmental anthropology. Systems ecology provides tools to investigate the consequences of decisions but has nothing to say about decision-making processes. Behavioral ecology fills this gap with an expanding repertoire of models for decisions, linking outcomes with their consequences for fitness. Examples of coupled models that link behavioral models with environmental change include studies of Western Australian aboriginal peoples (Bliege Bird et al. 2009), Madagascar (Tucker 2012), and many others. These studies trace the effects of aggregate decisions on habitat structure and how those decisions feed back over the long term to influence individual subsistence strategies. Social networks offer another perspective on decisions, explored in a coupled model of the dynamics of swidden cultivation among the Q'eqchi' Maya (Downey 2010) and in the investigation by Moritz et al. (2014) of social, ecological, and hydrological regime shifts in the floodplains of northern Cameroon. The socioecology of deforestation and attendant consequences for climate change have been a major research topic in Borneo (Curran et al. 2004) and the Amazon (Moran 2010), and the ethnography of protected marine areas is an emerging field of research (Clifton & Majors 2012). These studies have in common a firm empirical foundation, and most also share a concern for advocating indigenous perspectives on environmental issues (Palmer 2015). They collectively illustrate the point recently articulated by Leslie & McCabe (2013) that "the range, prevalence, and spatial and temporal distributions of different responses may be crucial to the resilience or the transformation of a social-ecological system" (p. 114).

The most powerful methods for studying CHNS require longitudinal data, as well as a theoretical framework such as niche construction (Lansing & Fox 2011). Archaeology offers a unique opportunity to "look for the future in the past" (Barton et al. 2012) and provides a framework for comparative studies (Scarborough & Burnside 2010), often in the context of agent-based models (Beekman & Baden 2005). Local ecosystems can shift abruptly from one state to another when they are forced across critical thresholds, and growing evidence indicates that this shift can occur at regional or planetary scales (Barnowsky et al. 2012). Glaciologists were among the first to discover that the causes of such change are increasingly anthropogenic. Today anthropologists are making the same discovery: It turns out that we are all *natuurvolken*.

## CONCEPTUAL AND PHENOMENAL ECOLOGY

No single term encompasses the study of an individual's or group's knowledge, perceptions, and experiences of their environment within anthropology. Varied terms such as ethnoscience, traditional ecological knowledge, folk biology, the cognized environment, and symbolic ecology have been used from the postwar period until the present but do not perfectly overlap; each refers only to a certain set of human faculties and information about the environment. The absence of an overarching term for this line of anthropological research reflects the diverse modalities of

human cognition and phenomenal experience that elude a single word. Despite the lack of lexical cohesion, such research has shaped the field for more than one century.

Three theoretical and research agendas within anthropology shaped the study of indigenous environmental knowledge and experience from the postwar period until 1980. Within cultural ecology, environmental knowledge and values were understood to be cultural adaptations to specific environments (Steward 1955, Rappaport 1968, Netting 1977). In the 1950s and 1960s, cognitive anthropology focused on how natural processes and biological entities were named and organized into hierarchical classificatory systems (phylogenies) (Werner 1972). These studies aimed to discover universal forms and patterns of cognition (Frake 1962). Structuralism, although sharing the same goals as cognitive anthropology, may be treated as a distinct intellectual current partly because of its extraordinary impact on the social and psychological sciences, as well as its bias toward dyadic systems of classification that link culture and nature.

Studies of environmental knowledge and experience in these three subfields have not undergone uniform or comparable changes in the past 30 years. The importance of environmental knowledge for adaptation emphasized by cultural ecology has diminished during this period, yet in the study of adaptation to climate change and environmental stewardship, it has seen a reemergence. The attempt to outline the characteristics of human cognition and the influence of culture remains a core agenda in studying environmental knowledge. Structuralism's influence in cultural anthropology has faded over this period, but the analysis of environmental symbols has combined with insights from philosophy and psychology to produce some of the more compelling recent ethnographies. Ethnographies and ethnologies based on insights from phenomenology into the sensorial experience of nature have few antecedents in earlier decades of environmental anthropology.

The environmental knowledge of prescientific cultures has been the focus of cognitive anthropology and psychology's attempts to find the universal characteristics of cognition for two reasons. Like other projects to identify human universals, cognitive anthropology sought common forms of knowledge across multiple contexts, thus making a broad comparison between cultures necessary. Knowledge of an environment, unlike knowledge of electronic media, is ubiquitous across cultures. Additionally, because human cognition evolved while interacting with the natural world in the environment of evolutionary adaptedness (Foley 1995), cognitive universals may be more apparent in environmental knowledge than in other forms of knowledge (Atran 1998). The question of how the mind apprehends natural processes and entities was referred to as ethnosciences through the 1980s. Ethnosciences' foundational works by Berlin (Berlin & Kay 1969) and Conklin (1955) were almost exclusively focused on a culture's nomenclature and taxonomy for environmental entities, processes, and percepts. This reflected the ascension of cognitive psychology (Colby et al. 1981) during this period, which focused on representations and the processing of symbols (Neisser 1966, Palmer 1978) rather than behavior or perceptual experience. In retrospect, considering the breadth of human cognitive faculties, this perspective on environmental knowledge and human cognitive universals was limited. In addition to the focus on taxonomy and representation, ethnosciences used cultures, generally defined in geographic or linguistic terms, as units of analysis and rarely captured changes in knowledge (Ellen 1979).

Following a pattern of renaming nonscientific forms of knowledge in anthropology (Hunt 2007), systematic examination of nonwestern taxonomy of the natural world since the 1980s has been referred to as "folk biology." The universals identified by ethnosciences, beginning with the recognition that all cultures have terms for species in their environment reflecting common phylogenetic operations (Berlin 1992), were expanded by folk biology into other forms of knowledge. Recent studies (Atran & Medin 2008) show that taxonomic structures connecting multiple species encourage deductive reasoning about functional similarities of species. Thus taxonomic information is not simply ordering the world but creating an actionable landscape in which the



behavior, utility, and danger of entities in the environment can be generalized and shared. Beyond the content of analysis, folk biology has also altered the focus of what creates such knowledge. The debate about whether culture (Berlin et al. 1974) or utility (Hunn 1982) shapes biological knowledge has transitioned to examining how knowledge differs within communities (Shafto & Coley 2003), is subject to change (Ross 2002), and arises in childhood (Inagaki 1990).

Political ecology's criticisms of cultural ecology, reviewed in the next section, pushed the study of the adaptive role of knowledge to the edges of anthropological theory, where its integration into the field was minimal. Since 1980, the most influential examinations of culture and the environment through adaptationist perspectives have been conducted within human behavioral ecology. Until recent studies (Hill & Kintigh 2009), this Ockhamian transition reduced the importance of environmental knowledge in favor of strict behavioral parsimony (Cronk 1991). Aspects of cultural ecology, including the view that nonwestern cultures may use resources more responsibly and preserve biodiversity, have been adopted by conservation and sustainability activists and deployed to support the rights and cultures of noncapitalist peoples (Maffi 2001). Along a similar trajectory that combines activism, conservation, and the academy, indigenous environmental knowledge has been celebrated as a potential source of inspiration for adapting to climate change (Crate 2011, Taylor et al. 2012). The problem of the long timeframe required to observe adaptations to new environmental conditions in knowledge systems has been addressed by mixing archaeological findings with ethnography (Balée 1998) and in conjectural studies (Stoffle et al. 2003).

Although it could be considered a part of cognitive anthropology, unlike ethnoscience and folk biology, structuralism was not solely a research topic because it advanced a comprehensive theoretical perspective on the relationship between mind and culture. Because it is important for other forms of culture such as the visual arts (Lévi-Strauss 1970), kinship (Lévi-Strauss 1971), and myth (Lévi-Strauss 1955), the study of how the environment was understood and experienced was never again to be as important for social theory as it was during the 1960s and 1970s following the inspiration of Lévi-Strauss. Although generally referred to as a mentalist perspective (Sahlins 1966, Harris 1976), linking the mind to the material world through dyadic principles that arose in tandem with experience meant that mind and nature were in a dialectic interaction through the transformation of nature into culture (Lévi-Strauss 1973, Descola 2013). Since the 1980s, such analysis has broadened in symbolic environmental anthropology to incorporate studies using other theories of mind such as metaphor (Bird-David 1990), identification (Rival 1998), objectification (Naveh & Bird-David 2014) and the phenomenology of embodied experience (Valeri 1999) to understand the emergence of dispositions toward nature.

Still, in the past 30 years the phenomenology of environmental experience has seldom been included in environmental anthropology. Ethnoscience, folk biology, and structuralism focused on symbols, taxonomy, and other conceptual forms of lexical knowledge (Ellen 1999), whereas cultural ecology examined values, behaviors, and beliefs that were often transmitted through language. The prominence of symbols and language at the expense of embodiment and nondiscursive processes in the study of culture was criticized within anthropology (Bloch 1991, Jackson 1996). The foundation for an alternative was drawn from developments in twentieth-century philosophy [Heidegger 1971 (1954), Husserl 1960 (1931), Merleau-Ponty 1978 (1945)], psychology (Gibson 1979), and unorthodox approaches to anthropology during the 1970s (Bateson 1973). Although a philosophical theory based on how the body and mind experience the world would seem to have been ideally fitted to anthropology's research methods of participant observation, it was not until the past few decades that such research began to flourish.

This phenomenological exploration of environmental experience rests largely on the foundational work of Tim Ingold. Built on his ethnographic studies of arctic hunting and pastoral communities, his analysis moved from social relationships and conceptual knowledge of the

environment (Ingold 1980) to an examination of questions that have their origins in Kantian perspectives on the philosophy of perceptual, peripatetic, and temporal experience. Extending beyond an ethnography of bodily experience, Ingold argues that the processes that shape experience, cognition, and culture are neither material nor symbolic in anthropology's traditional formulation of either concept. But Ingold (2000) does not explicitly refute dualism, arguing instead that anthropology has erroneously approached the relationship between culture and lived experience. According to Ingold's concept of "sentient ecology," experience is the medium through which individuals and thus cultures emerge and not the reverse, as anthropologists as diverse as Harris, Bourdieu, and Lévi-Strauss had assumed. This inversion refreshed the significance of the quotidian for environmental ethnography.

Ingold's later research expanded beyond human relationships with the biotic environment to phenomenological studies of movement (Ingold 2008), praxis (Ingold 2011), and the built environment (Ingold 2013). The resulting combination of eclectic ethnography with the transcendence of quotidian experience is reminiscent of the impetus structuralism once gave to the social sciences and humanities. Following these insights, recent ethnographies, such as Legat's study of the Dene (2012), have explored the construction of space as it relates to perambulation, whereas others such as Anderson's (2000) Siberian ethnography championed cognition as the critical conduit between subjective experience and social identity.

The recent emergence of the environmental humanities as a distinct field focusing on the meaning of environmental experience in a highly degraded environment (Morton 2009) has also attracted the interest of environmental anthropologists. Collected volumes in landscape studies (Benediktsson & Lund 2010) and material culture (Hallam & Ingold 2014) have woven threads of environmental anthropology into humanistic studies, and this perspective has begun to resonate within postprocessual archaeology (Tilley 1997).

## POLITICAL ECOLOGY

The development of political ecology, which has been a major theoretical current in environmental anthropology for a generation now, postdates Orlove's review of the field in 1980. Interest in political organization is, of course, far older within anthropology, dating to foundational works by the likes of Morgan (1877) and figuring prominently in some of the twentieth century's canonical ethnographies, including Evans-Pritchard (1940) and also Leach (1954). Leach's work was especially important because it naturalized the idea of chronic instability in political organization, which he partly linked to ecological constraints, thus anticipating the influential work by Rappaport (1968) a decade later.

At the time Leach was writing, an efflorescence of close studies of local environmental relations was beginning to take place in anthropology, human ecology, geography, and allied fields. These studies in the 1960s and 1970s made a radical break with traditional studies of ecology by bringing human beings into the study of the natural environment; however, with their strict focus on local communities—human as well as nonhuman—they left out power, politics, and the state. This limited scope set the stage for the subsequent emergence of studies of politics and the environment, notably by the geographers Blaikie (1985) and Blaikie & Brookfield (1987), with their groundbreaking thesis that environmental relations at the local level are incomprehensible without understanding these relations at the regional level.<sup>2</sup> World systems theorists

---

<sup>2</sup>Geographers have continued to play a prominent role in political ecology (Zimmerer & Bassett 2003, Robbins 2004), dominating it along with anthropologists.



widened the scope of study still further by revealing the myriad and previously unrecognized ways that the global affects the local (Wolf 1982), effectively ending the paradigmatic focus within anthropology on local communities as autonomous and thus comprehensible in and by themselves.

The world systems vision of all-powerful global forces eventually came to be seen as overdrawn because it seemed to locate all agency at the level of global actors and none at the level of the local communities (Solway & Lee 1990). A powerful early effort to restore recognition of local agency involved the concept of peasant “resistance” to central state authority (Scott 1985); however, in time others suggested that resistance studies were “ethnographically thin” (Ortner 1995) and did not do full justice to the proactive stance of many marginal subjects, which might, for example, be more accurately characterized as “collaboration” (Tsing 1999). An analogous debate has recently emerged in studies of the adaptation and resilience of local communities in the face of climate change (compare Holling 1973), which some criticize as overly emphasizing questions of local impacts and underemphasizing the role of wider political-economic drivers of climate change (Cameron 2012).

Influenced by the poststructural turn in the social sciences and humanities, and especially Foucault’s (1980) work on governmentality, anthropology developed more subtle understandings of the ways that power can work (Ferguson 1990). In place of unimpeded and delocalizing global “flows,” anthropologists began to see more complex “assemblages” (Ong & Collier 2005) and “friction” (Tsing 2005). Investigators carried out nuanced studies of the interactions of global actors and local communities in conservation projects (West 2006), infrastructure development (Carse 2014), and, increasingly, global climate change debates (Lahsen 2004, Broad & Orlove 2007).

The most recent theoretical development in this study of power and agency comes out of the ontological turn, the idea that anthropologists have not merely a multiplicity of belief systems to study, but a multiplicity of actual worlds (Descola 2004). As Kohn (2013, p. 94) puts it, this is about “how forests think, not how natives think, about forests.” Some of the most important work in this field takes aim at human exceptionalism by proposing a posthumanist anthropology. Proponents pursue multispecies ethnography (Kirksey & Helmreich 2010), which gives equal standing in our studies to the perspectives of nonhuman life-forms and even nonlife forms. Reprising Spivak’s (1988) question, “Can the subaltern speak,” has led to provocative studies including not only how forests think, but also “Can the Mosquito Speak” (Mitchell 2002) and “Do Glaciers Listen” (Cruikshank 2005). Of course, anthropologists from Malinowski (gardens) to Evans-Pritchard (1940, cattle), Conklin (plants), Bateson (1972, dolphins), and Rappaport (1968, pigs and marsupials) have studied other life-forms for almost a century—efforts by ecologists such as Janzen’s (1979) “How to Be a Fig” and Leopold’s [1989 (1949)] classic “Thinking Like a Mountain” also merit mention here—but they did not do so primarily to query what it is to be human, as reflected in the epigraph from Agamben [2004 (2002), p. 21]. Some critics see this new scholarship as a retreat from anthropology’s political responsibilities (Bessire & Bond 2014). Whether taking the perspective of elephants (Hathaway 2013), cats (Lestel et al. 2014), or mushrooms (Tsing 2015), however, multispecies ethnography reaches out to other disciplines, it decenters traditional approaches to human agency and politics, and it can help us to see the world in a different way. As Kohn (2013, pp. 22–23) expansively writes, “This reach beyond the human changes our understanding of foundational analytical concepts such as context but also others, such as representation, relation, self, ends, difference, similarity, life, the real, mind, person, thought, form, finitude, future, history, cause, agency, relation, hierarchy, and generality.” Not of least importance, it can theorize and empower discourses of animal rights in unexpected ways (Derrida 1994), thereby also revealing the inescapable linkages to issues of human rights [Agamben 2004 (2002), p. 37].

Since its inception with Blaikie's (1985) critique of orthodox views of soil erosion, an important thread in political ecology has been the deconstruction of discourses of environmental degradation (Fairhead & Leach 1996). These analyses have been theoretically underpinned by the "new ecology" (Scoones 1999), which problematizes stability not instability, equilibrium not disequilibrium. Work in this field has contributed to a "constructivist" vision of nature—as a realm inseparable from human thought and practice—as has also work in historical ecology that has revealed the anthropogenic character of many landscapes that had been seen as strictly natural (Balée 1998). Insofar as this research problematized the ideal of untouched nature that was the traditional goal of environmental protection or restoration, it has had important and much debated implications for conservation theory and practice (Cronon 1996).

The environmental historian Cronon (1992) elegantly showed how environmental histories all have implicit teleological structures, which greatly affect their meaning and political import. These issues have come to the fore once again in the contemporary discourse of climate change. Some see the human impact on global climate as geological in magnitude, which has led to the declaration of a new geological era, the Anthropocene (Crutzen 2002). The precise onset of the Anthropocene is disputed. Some argue that it is not a modern phenomenon at all (Ruddiman 2013). Others argue that it elides the politics of the "anthropogenic" (Sayre 2012). Most intriguingly, the concept of the Anthropocene appears to exalt humanity precisely as posthumanist scholars are trying to do the opposite. Nonetheless, this name and this act of naming have caught the imagination of many—witness this article's epigraph by Latour—and they have put anthropologists into conversation with scholars in diverse other disciplines.

The historian Chakrabarty (2009) has declared that the Anthropocene signifies an "end to history." Although the idea of a "clean break" with humanity's climatic past is problematic in many ways (Dove 2014), a shared belief in an "end time" prevails across many of the fault lines in the climate change debate. Climate change activists see an atmospheric carbon threshold of no return drawing nigh, and climate change deniers in evangelical Christian communities see the idea of anthropogenic climate change as a blasphemous conceit and distraction from the coming and divinely ordained apocalypse (Webster 2013). Many observers now believe that apocalyptic rhetoric is not helpful to educating and motivating the concerned publics to back the policy measures needed to redress climate change (Masco 2009).

Studies of climate change are part of a robust new generation of political ecological studies of disaster. The afore-mentioned replacement of equilibrium-based models with nonequilibrium-based ones helped anthropologists and others to see disasters as less exceptional and as more social in origin (Oliver-Smith 1986). Hurricane Katrina was a pivotal event in this regard because it brought disaster and understandings of disaster home to a domestic US audience. Its location within a major US city proved critical to the development of the concept of disaster capitalism, meaning "[t]he constellation of government and economic [policies and practices that have found new ways to make 'disasters' profitable as a new source of capital]" (Adams et al. 2009, p. 624).

Disaster studies are now dominated by the topic of global climate change, which has displaced such erstwhile foci as deforestation, underdevelopment, and biodiversity loss, albeit with little attention to the sedimentation from these prior interests (McElwee 2015). Environmental anthropologists are keenly interested in the topic (Strauss & Orlove 2003, Crate 2011), including the study of historic proxies for climate change such as the Little Ice Age and the El Niño–Southern Oscillation phenomenon (McIntosh et al. 2000). There is special interest in historic cases of societal collapse that might have been driven by extreme climatic or other environmental events, partly stimulated by Diamond's (2005) popular work and the abundant critiques of it (McAnany & Yoffee 2010).

Finally, there has been enduring interest in hermeneutics within political ecology. Early examples include the articulation of indigeneity as a response to modern marginalization of the identity of anthropological subjects, the subsequent debate about the authenticity of the indigenous, and an examination of the ethics of our stance on the subject (Agrawal 1995). The dilemmas of anthropological study have perhaps been made clearest with respect to environmental and indigenous rights movements, where questions arise about how our findings might be misused and about the ethics of our taking sides (Brosius 1999, Kirsch 2002).

Similar questions are now being raised in climate change debates; some climate scientists themselves fault the field (Hulme 2011). The political stakes are so high in this case, however, that questions are raised regarding the wisdom of critique itself (Latour 2004). The climate change debate challenges us not only with respect to climate scientists, but also with respect to climate change deniers. Especially in the United States, this group is affecting not merely climate change politics but also climate change scholarship (Lewandowsky et al. 2013), and yet it is practically unstudied to date, perhaps reflecting an example of what Ortner (1995, p. 190) calls “ethnographic refusal,” a “failure of nerve” to recognize the “cultural authenticity” of another group. The current ontological turn may serve us well here by helping us to more productively engage with the lived reality of other members of our own species.

## CONCLUSION

This brief overview of environmental anthropology developments since 1980 has focused on three large topics: systems ecology, political ecology, and cognitive science. Frequent borrowings from other disciplines within environmental anthropology reflect the reality that human and natural systems are coupled along multiple modalities. Given this diversity, is there enough coherence to sustain and justify a single field called environmental anthropology? If so, does the field benefit from this heterogeneity? These are legitimate concerns in the context of a professional organization. In response, one could cite the vibrancy and ascension to prominence of *Human Ecology: An Interdisciplinary Journal* in the social and natural sciences. Cross-disciplinary journals such as *Society and Nature*, *Ecology and Society*, *Environment and Society*, *Economic Botany*, *Ecological Economics*, and *Environmental Humanities* also attest to the benefit of integrating environmental anthropology with other disciplines. Stepping back, in the grander context of our search for an understanding of ourselves, the natural world, and the relationship between the two, it is difficult to imagine that environmental anthropology could be anything but multifaceted. The environment, culture, and human cognition are the three most complicated systems of which we have tangible knowledge. The examination of any one of these has proven an endless source of learning and growth. Why would the study of their interaction not require a protean discipline?

## DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

## ACKNOWLEDGMENTS

The authors acknowledge the valuable feedback initially provided by M.R. Dove’s doctoral lab in anthropology and environmental studies at Yale University, Y.A. Orr’s environment and society

seminar at the University of Alberta, and J.S. Lansing's colleagues at the Stockholm Resilience Center and Santa Fe Institute.

## LITERATURE CITED

- Adams V, Van Hattum T, English D. 2009. Chronic disaster syndrome: displacement, disaster capitalism, and the eviction of the poor from New Orleans. *Am. Ethnol.* 36(4):615–36
- Agamben G. 2004 (2002). *The Open: Man and Animal*, transl. K Attell. Stanford, CA: Stanford Univ. Press
- Agrawal A. 1995. Dismantling the divide between indigenous and scientific knowledge. *Dev. Change* 26:413–39
- Anderson D. 2000. *Identity and Ecology in Arctic Siberia*. Oxford, UK: Oxford Univ. Press
- Atran S. 1998. Folk biology and the anthropology of science: cognitive universals and cultural particulars. *Behav. Brain Sci.* 21:547–609
- Atran S, Medin D. 2008. *The Native Mind and the Cultural Construction of Nature*. Cambridge, MA: MIT Press
- Balée W. 1998. *Advances in Historical Ecology*. Hist. Ecol. Ser. New York: Columbia Univ. Press
- Balée W. 2006. The research program of historical ecology. *Annu. Rev. Anthropol.* 35:75–98
- Barnosky AD, Hadly EA, Bascompte J, Berlow EL, Brown JH, et al. 2012. Approaching a state shift in Earth's biosphere. *Nature* 486:52–56
- Barton M, Ullah II, Bergin SM, Mitasova H, Sarjoughian H. 2012. Looking for the future in the past: long-term change in socioecological systems. *Ecol. Model.* 241:42–53
- Barzun J. 1975. *Classic, Romantic and Modern*. Chicago: Univ. Chicago Press
- Bateson G. 1972. *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. Chicago: Univ. Chicago Press
- Beekman C, Badin W, eds. 2005. *Nonlinear Models for Archaeology and Anthropology*. London: Ashgate
- Benediktsson K, Lund KA, eds. 2010. *Conversations with Landscape*. Farnham, Surrey, UK: Ashgate Press
- Berkes F, Colding JF, Folke C, eds. 2003. *Navigating Nature's Dynamics: Building Resilience for Complexity and Change*. Cambridge, UK: Cambridge Univ. Press
- Berlin B. 1992. *Ethnobiological Classification; Principles of Categorization of Plants and Animals in Traditional Societies*. Princeton, NJ: Princeton Univ. Press
- Berlin B, Breedlove DE, Raven PH. 1974. *Principles of Tzeltal Plant Classification: An Introduction to the Botanical Ethnography of a Mayan-Speaking People of Highland Chiapas*. New York: Academic
- Berlin B, Kay P. 1969. *Basic Color Terms; Their Universality and Evolution*. Berkeley: Univ. Calif. Press
- Bessire L, Bond D. 2014. Ontological anthropology and the deferral of critique. *Am. Ethnol.* 41(3):440–56
- Bird-David N. 1990. The giving environment: another perspective on the economic system of gatherer-hunters. *Curr. Anthropol.* 31(2):189–96
- Blaikie PM. 1985. *The Political Economy of Soil Erosion in Developing Countries*. New York: Longman
- Blaikie PM, Brookfield H, eds. 1987. *Land Degradation and Society*. London: Methuen
- Bliege Bird R, Codding BF, Bird DW. 2009. Determinants of gendered foraging and production inequalities among Martu. *Hum. Nat.* 20:105–29
- Bloch M. 1991. Language, anthropology and cognitive science. *Man* 26(2):183–98
- Broad K, Orlove B. 2007. Channeling globality: the 1997–1998 El Niño climate event in Peru. *Am. Ethnol.* 34(2):285–302
- Brosius JP. 1999. Locations and representations: writing in the political present in Sarawak, East Malaysia. *Identities* 6(2–3):345–86
- Cameron ES. 2012. Securing indigenous politics: a critique of the vulnerability and adaptation approach to the human dimensions of climate change in the Canadian Arctic. *Glob. Environ. Change* 22(1):103–14
- Carse A. 2014. *Beyond the Big Ditch: Politics, Ecology, and Infrastructure at the Panama Canal*. Cambridge, MA: MIT Press
- Chakrabarty D. 2009. The climate of history: four theses. *Crit. Inq.* 35:197–222
- Clifton J, Majors C. 2012. Culture, conservation and conflict: perspectives on marine protection amongst the Bajau of south-east Asia. *Soc. Nat. Resour.* 25:716–25
- Colby BN, Fernandez JW, Kronenfeld DB. 1981. Toward a convergence of cognitive and symbolic anthropology. *Am. Ethnol.* 8:422–50

- Conklin H. 1955. Hanunóo color categories. *Southwest. J. Anthropol.* 11(4):339–44
- Coughenour MB, Ellis JE, Swift DM, Coppock DL, Galvin K, et al. 1985. Energy extraction and use in a nomadic pastoral ecosystem. *Science* 230:619–25
- Crate S. 2011. Climate and culture: anthropology in the era of contemporary climate change. *Annu. Rev. Anthropol.* 40:175–94
- Cronk L. 1991. Human behavioral ecology. *Annu. Rev. Anthropol.* 20:25–53
- Cronon W. 1992. A place for stories: nature, history and narrative. *J. Am. Hist.* 78(4):1347–76
- Cronon W, ed. 1996. *Uncommon Ground: Rethinking the Human Place in Nature*. New York: W.W. Norton
- Cruikshank J. 2005. *Do Glaciers Listen? Local Knowledge, Colonial Encounters, and Social Imagination*. Vancouver/Seattle: Univ. B.C. Press/Univ. Wa. Press
- Crutzen P. 2002. Geology of mankind. *Nature* 415:23
- Curran LM, Trigg S, McDonald A, Astiani D, Hardiono YM, et al. 2004. Lowland forest loss in protected areas of Indonesian Borneo. *Science* 303:1000–3
- Dasgupta P, Mäler KG, eds. 2004. The economics of non-convex ecosystems. *Environ. Resour. Econ.* 26:499–525
- Derrida J. 1994. *Spectres of Marx*. New York: Routledge
- Descola P. 2013. *The Ecology of Others*. Chicago: Univ. Chicago Press
- Diamond J. 2005. *Collapse: How Societies Choose to Fail or Succeed*. New York: Viking
- Dove MR. 2006. Indigenous people and environmental politics. *Annu. Rev. Anthropol.* 35:191–208
- Dove MR. 2014. *The Anthropology of Climate Change: A Historical Reader*. Malden, MA: Wiley/Blackwell
- Downey SS. 2010. Can properties of labor-exchange networks explain the resilience of swidden agriculture? *Ecol. Soc.* 15(4):15
- Durkheim E, Mauss M. 1903. De quelques formes primitives de classification. *Ann. Sociol.* 6:1–72
- Ellen R. 1979. Omniscience and ignorance: variation in Nuauulu knowledge, identification and classification of animals. *Lang. Soc.* 8(3):337–64
- Ellen R. 1999. Models of subsistence and ethnobiological knowledge: between extraction and cultivation in Southeast Asia. In *Folk Biology*, ed. S Atran, pp. 91–117. Boston: MIT Press
- Evans-Pritchard EE. 1940. *The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic People*. Oxford, UK: Clarendon
- Fairhead J, Leach M. 1996. *Misreading the African Landscape: Society and Ecology in a Forest-Savanna Mosaic*. Cambridge, UK: Cambridge Univ. Press
- Ferguson J. 1990. *The Anti-Politics Machine: “Development,” Depoliticization and Bureaucratic Power in Lesotho*. Cambridge, UK: Cambridge Univ. Press
- Foley R. 1995. The adaptive legacy of human evolution: a search for the environment of evolutionary adaptiveness. *Evol. Anthropol.* 4(6):194–203
- Folke C. 2006. Resilience: the emergence of a perspective for social–ecological systems analyses. *Glob. Environ. Change* 16:253–67
- Foucault M. 1980 (1972). *Power/Knowledge: Selected Interviews and Other Writings 1972–1977*, ed. C Gordon, transl. C Gordon, L Marshall, J Mepham, K Soper. New York: Pantheon Books
- Frake C. 1962. The ethnographic study of cognitive systems. In *Anthropology and Human Behavior*, ed. T Gladwin, WC Sturtevant, pp. 72–93. Washington, DC: Soc. Wash.
- Gibson JJ. 1979. *The Ecological Approach to Visual Perception*. Boston, MA: Houghton Mifflin
- Haeckel EH. 1866. *Generelle Morphologie der Organismen*. Berlin: Verlag Von George Reimer
- Hallam E, Ingold T. 2014. *Making and Growing: Anthropological Studies of Organisms and Artefacts*. Farnham, Surrey, UK: Ashgate
- Harris M. 1976. Lévi-Strauss et la palourde: réponse à la Conférence Gildersleeve de 1972. *Homme* XVI (2–3):5–22
- Hathaway M. 2013. *Environmental Winds: Making the Global in Southwest*. China. Berkeley: Univ. Calif. Press
- Heidegger M. 1971 (1954). Building dwelling and thinking. In *Poetry, Language, Thought*, transl. A Hofstadter. New York: Harper Colophon
- Hill K, Kintigh K. 2009. Can anthropologists distinguish good and poor hunters? Implications for hunting hypotheses, sharing conventions, and cultural transmission. *Curr. Anthropol.* 50(3):369–78



- Holling CS. 1973. Resilience and stability of ecological systems. *Annu. Rev. Ecol. Syst.* 4:1–23
- Hulme M. 2011. Reducing the future to climate: a story of climate determinism and reductionism. *Osiris* 26:245–66
- Hunn E. 1982. The utilitarian factor in folk biological classification. *Am. Anthropol.* 84(4):830–47
- Hunt R. 2007. *Beyond Relativism: Comparability in Cultural Anthropology*. Walnut Creek, CA: AltaMira
- Husserl E. 1960 (1931). *Cartesian Meditations: An Introduction to Phenomenology*, transl. D. Cairns. The Hague: Nijhoff
- Inagaki K. 1990. The effects of raising animals on children’s biological knowledge. *Br. J. Dev. Psychol.* 9:119–29
- Ingold T. 1980. *Hunters, Pastoralists and Ranchers: Reindeer Economies and Their Transformations*. Cambridge, UK: Cambridge Univ. Press
- Ingold T. 2000. *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*. London: Routledge
- Ingold T. 2008. *Ways of Walking: Ethnography and Practice on Foot*. Aldershot, UK: Ashgate
- Ingold T. 2011. *Redrawing Anthropology: Materials, Movements, Lines*. Aldershot, UK: Ashgate
- Ingold T. 2012. Toward an ecology of materials. *Annu. Rev. Anthropol.* 41:427–42
- Ingold T. 2013. *Making: Anthropology, Archaeology, Art and Architecture*. London: Routledge
- Jackson M. 1996. *Things as They Are: New Directions in Phenomenological Anthropology*. Bloomington: Indiana Univ. Press
- Janssen MA, Bodin Ö, Anderies JM, Elmqvist T, Ernstson H, et al. 2006. A network perspective on the resilience of social-ecological systems. *Ecol. Soc.* 11(1):15
- Janzen DH. 1979. How to be a fig. *Annu. Rev. Ecol. Syst.* 10:13–51
- Kirksey SE, Helmreich S. 2010. The emergence of multispecies ethnography. *Cult. Anthropol.* 25(4):545–76
- Kirsch S. 2002. Anthropology and advocacy: a case study of the campaign against the OK Tedi Mine. *Crit. Anthropol.* 22(2):175–200
- Kohn E. 2013. *How Forests Think: Toward An Anthropology Beyond the Human*. Berkeley: Univ. Calif. Press
- Lahsen M. 2004. Transnational locals: Brazilian experience of the climate regime. In *Earthly Politics: Local and Global in Environmental Governance*, ed. S Jasanoff, ML Martello, pp. 151–72. Cambridge, MA: MIT Press
- Lansing JS. 2003. Complex adaptive systems. *Annu. Rev. Anthropol.* 32:183–204
- Lansing JS, Fox K. 2011. Niche construction on Bali: the gods of the countryside. *Phil. Trans. R. Soc. B* 366:927–34
- Latour B. 2004. Why has critique run out of steam? From matters of fact to matters of concern. *Crit. Inq.* 30(2):225–48
- Latour B. 2014. Distinguished lecture: *Anthropology at the time of the Anthropocene: a personal view of what is to be studied*. Presented at Annu. Meet. Am. Anthropol. Assoc., 113th, Washington, DC
- Leach E. 1954. *Political Systems of Highland Burma: A Study of Kachin Social Structure*. Cambridge, MA: Harvard Univ. Press
- Lenton TM, Lovelock JE. 2001. Daisyworld revisited: quantifying biological effects on planetary self-regulation. *Tellus Ser. B—Chem. Phys. Meteorol.* 53(3):288–305
- Leopold A. 1989 (1949). Thinking like a mountain. In *Sand County Almanac, and Sketches Here and There*, pp. 129–33. New York: Oxford Univ. Press
- Leslie P, McCabe JT. 2013. Response diversity and resilience in social-ecological systems. *Curr. Anthropol.* 54(2):114–43
- Lestel D, Bussolini J, Chrulow M. 2014. The phenomenology of animal life. *Environ. Humanit.* 5:125–48
- Lévi-Strauss C. 1955. The structural study of myth. *J. Am. Folk.* 68(270):428–44
- Lévi-Strauss C. 1966. *The Savage Mind*. Paris: Librairie Plon
- Lévi-Strauss C. 1970. *The Raw and the Cooked*. London: Jonathan Cape
- Lévi-Strauss C. 1971. *The Elementary Structures of Kinship*. Boston, MA: Beacon
- Lévi-Strauss C. 1973. Structuralism and ecology. *Soc. Sci. Inf.* 12:7
- Lewandowsky S, Cook J, Oberauer K, Marriott M. 2013. Recursive fury: conspiracist ideation in the blogosphere in response to research on conspiracist ideation. *Front. Psychol.* 4:1–15 (Retracted)
- Maffi L. 2001. *On Biocultural Diversity: Linking Language, Knowledge and the Environment*. Berkeley: Univ. Calif. Press



- Marx K. 1961 (1844). *Capital: A Critique of Political Economy*. Volume I: *Book One: The Process of Production of Capital*, transl. S Moore, E Aveling. Moscow: F.L.P.H.
- Masco J. 2009. Bad weather: on planetary crisis. *Soc. Stud. Sci.* XXIX:1–34
- McAnany PA, Yoffee N. 2010. *Questioning Collapse: Human Resilience, Ecological Vulnerability, and the Aftermath of Empire*. New York: Cambridge Univ. Press
- McElwee P. 2015. From conservation and development to climate change: anthropological engagements with REDD+ in Vietnam. In *Climate Cultures: Anthropological Perspectives on Climate Change*, ed. J Barnes, MR Dove, pp. 82–104. New Haven, CT: Yale Univ. Press
- McIntosh R, Tainter JA, McIntosh SK, eds. 2000. *The Way the Wind Blows: Climate, History and Human Action*. New York: Columbia Univ. Press
- Merleau-Ponty M. 1978 (1945). *The Phenomenology of Perception*, transl. C Smith. Abingdon, Oxford, UK: Routledge
- Mitchell T. 2002. Can the mosquito speak? In *The Rule of Experts: Egypt, Techno-Politics, Modernity*, pp. 19–53. Berkeley: Univ. Calif. Press
- Moran EF. 2010. *Environmental Social Science: Human–Environment Interactions and Sustainability*. Malden, MA: Wiley-Blackwell
- Morgan LH. 1877. *Ancient Society: Or, Researches in the Lines of Human Progress from Savagery, Through Barbarism to Civilization*. New York: Holt
- Moritz M, Hamilton IM, Chen YJ, Scholte P. 2014. Mobile pastoralists in the Logone Floodplain distribute themselves in an ideal free distribution. *Curr. Anthropol.* 55(1):115–22
- Morton T. 2009. *Ecology Without Nature: Rethinking Environmental Aesthetics*. Cambridge, MA: Harvard Univ. Press
- Naveh D, Bird-David N. 2014. How persons become things: economic and epistemological changes among Nayaka hunter-gatherers. *J. R. Anthropol. Inst.* 20:74–92
- Neisser U. 1966. *Cognitive Psychology*. New York: Appleton
- Netting R. 1977. *Cultural Ecology*. Long Grove, IL: Waveland
- Oliver-Smith A. 1986. *The Martyred City: Death and Rebirth in the Andes*. Albuquerque: Univ. N. M. Press
- Ong A, Collier SJ, eds. 2005. *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems*. Malden, MA: Blackwell
- Ortner S. 1995. Resistance and the problem of ethnographic refusal. *Comp. Stud. Soc. Hist.* 37(1):173–93
- Palmer L. 2015. *Water Politics and Spiritual Ecology: Custom, Governance and Development*. London: Routledge
- Palmer S. 1978. Fundamental aspects of cognitive representation. In *Cognition and Categorization*, ed. E Rosch, BL Lloyd, pp. 259–303. Hillsdale, NJ: Erlbaum
- Rappaport R. 1968. *Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People*. New Haven, CT: Yale Univ. Press
- Rival L. 1998. *The Social Life of Trees: Anthropological Perspectives on Tree Symbolism*. London: Bloomsbury Acad.
- Robbins P. 2004. *Political Ecology: A Critical Introduction*. Malden, MA: Blackwell
- Ross N. 2002. Cognitive aspects of intergenerational change: mental models, cultural change and environmental behavior among the Lacandon Maya of Southern Mexico. *Hum. Organ.* 61(2):125–37
- Ruddiman WF. 2013. The Anthropocene. *Annu. Rev. Earth Planet. Sci.* 41:45–68
- Sahlins M. 1966. On the Delphic writings of Claude Lévi-Strauss. *Sci. Am.* 215(6):131–36
- Sayre NF. 2012. The politics of the anthropogenic. *Annu. Rev. Anthropol.* 41:57–70
- Scarborough VL, Burnside W. 2010. Complexity and sustainability: perspectives from the Ancient Maya and the Modern Balinese. *Am. Antiq.* 75:327–63
- Schwarz A, Jax K. 2011. *Ecology Revisited: Reflecting on Concepts, Advancing Science*. Dordrecht, The Neth.: Springer
- Scoones I. 1999. New ecology and the social sciences: what prospects for a fruitful engagement? *Annu. Rev. Anthropol.* 28:479–507
- Scott JC. 1985. *Weapons of the Weak: Everyday Forms of Peasant Resistance*. New Haven, CT: Yale Univ. Press
- Shafto P, Coley JD. 2003. Development of categorization and reasoning in the natural world: novice to experts, naive similarity to ecological knowledge. *J. Exp. Psychol. Learn. Mem. Cogn.* 29(4):641–49

- Solway JS, Lee RB. 1990. Foragers, genuine or spurious? Situating the Kalahari San in history. *Curr. Anthropol.* 31(2):109–46
- Spivak GC. 1988. Can the subaltern speak? In *Marxism and the Interpretation of Culture*, ed. C Nelson, L Grossberg, pp. 271–313. Urbana: Univ. Ill. Press
- Steward J. 1955. *Theory of Culture Change: The Methodology of Multilinear Evolution*. Urbana: Univ. Ill. Press
- Stoffle R, Toupal R, Zedeño N. 2003. Landscape, nature and culture: a diachronic model of human-nature adaptations. In *Nature Across Cultures: Views of Nature and the Environment in Non-Western Cultures*, ed. H Selin, pp. 97–114. Dordrecht, The Neth.: Kluwer Acad.
- Strauss S, Orlove B, eds. 2003. *Weather, Climate, Culture*. Oxford/New York: Berg
- Taylor D, Brokensha D, Castro P. 2012. *Climate Change and Threatened Communities: Vulnerability, Capacity and Action*. Warwickshire, UK: Pract. Action Press
- Tilley C. 1997. *A Phenomenology of Landscape: Places, Paths and Monuments*. Oxford, UK: Oxford Univ. Press
- Tsing AL. 1999. Becoming a tribal elder and other green development fantasies. In *Transforming the Indonesian Uplands: Marginality, Power and Production*, ed. TM Li, pp. 159–202. London: Berg
- Tsing AL. 2005. *Friction: An Ethnography of Global Connection*. Princeton, NJ: Princeton Univ. Press
- Tsing AL. 2015. *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton, NJ: Princeton Univ. Press
- Tucker B. 2012. Do risk and time experimental choices represent individual strategies for coping with poverty or conformity to social norms? Evidence from rural southwestern Madagascar. *Curr. Anthropol.* 53(2):149–80
- Valeri V. 1999. *The Forest of Taboos: Morality, Hunting, and Identity among the Huaulu of Moluccas*. Madison: Univ. Wis. Press
- Webster J. 2013. The eschatology of global warming in a Scottish fishing village. *Camb. Anthropol.* 31(1):68–84
- Werner O. 1972. Ethnoscience. *Annu. Rev. Anthropol.* 1:271–308
- West P. 2006. *Conservation Is Our Government Now: The Politics of Ecology in Papua New Guinea*. Durham, NC: Duke Univ. Press
- Wolf ER. 1982. *Europe and the People Without History*. Berkeley: Univ. Calif. Press
- Zimmerer K, Bassett TJ, eds. 2003. *Political Ecology: An Integrative Approach to Geography and Environment-Development Studies*. New York: Guilford Press



# Contents

## Perspective

Some Things I Hope You Will Find Useful Even if Statistics Isn't Your Thing <i>George L. Cowgill</i> .....	1
--	---

## Archaeology

Pleistocene Overkill and North American Mammalian Extinctions <i>David J. Meltzer</i> .....	33
The Archaeology of Ritual <i>Edward Swenson</i> .....	329
Recent Developments in High-Density Survey and Measurement (HDSM) for Archaeology: Implications for Practice and Theory <i>Rachel Opitz and W. Fred Limp</i> .....	347

## Biological Anthropology

The Evolution of Difficult Childbirth and Helpless Hominin Infants <i>Holly Dunsworth and Leah Eccleston</i> .....	55
Health of Indigenous Peoples <i>Claudia R. Valeggia and J. Josh Snodgrass</i> .....	117
Energy Expenditure in Humans and Other Primates: A New Synthesis <i>Herman Pontzer</i> .....	169
An Evolutionary and Life-History Perspective on Osteoporosis <i>Felicia C. Madimenos</i> .....	189
Disturbance, Complexity, Scale: New Approaches to the Study of Human-Environment Interactions <i>Rebecca Bliege Bird</i> .....	241
Fallback Foods, Optimal Diets, and Nutritional Targets: Primate Responses to Varying Food Availability and Quality <i>Joanna E. Lambert and Jessica M. Rothman</i> .....	493

Resource Transfers and Human Life-History Evolution <i>James Holland Jones</i> .....	513
An Evolutionary Anthropological Perspective on Modern Human Origins <i>Curtis W. Marean</i> .....	533
<b>Anthropology of Language and Communicative Practices</b>	
How Postindustrial Families Talk <i>Elinor Ochs and Tamar Kremer-Sadlik</i> .....	87
Chronotopes, Scales, and Complexity in the Study of Language in Society <i>Jan Blommaert</i> .....	105
Linguistic Relativity from Reference to Agency <i>N. J. Enfield</i> .....	207
Politics of Translation <i>Susan Gal</i> .....	225
Breached Initiations: Sociopolitical Resources and Conflicts in Emergent Adulthood <i>Norma Mendoza-Denton and Aomar Boum</i> .....	295
Embodiment in Human Communication <i>Jürgen Streeck</i> .....	419
The Pragmatics of Qualia in Practice <i>Nicholas Harkness</i> .....	573
<b>Sociocultural Anthropology</b>	
Virtuality <i>Bonnie Nardi</i> .....	15
Anthropology and Heritage Regimes <i>Haidy Geismar</i> .....	71
Urban Political Ecology <i>Anne Rademacher</i> .....	137
Environmental Anthropology: Systemic Perspectives <i>Yancey Orr, J. Stephen Lansing, and Michael R. Dove</i> .....	153
The Anthropology of Life After AIDS: Epistemological Continuities in the Age of Antiretroviral Treatment <i>Eileen Moyer</i> .....	259
Anthropology of Aging and Care <i>Elana D. Buch</i> .....	277

Anthropology of Ontologies <i>Eduardo Kohn</i> .....	311
Oil and Anthropology <i>Douglas Rogers</i> .....	365
The Post–Cold War Anthropology of Central America <i>Jennifer L. Burrell and Ellen Moodie</i> .....	381
Risks of Citizenship and Fault Lines of Survival <i>Adriana Petryna and Karolina Follis</i> .....	401
Siberia <i>Piers Vitebsky and Anatoly Alekseyev</i> .....	439
Of What Does Self-Knowing Consist? Perspectives from Bangladesh and Pakistan <i>Naveeda Khan</i> .....	457
Addiction in the Making <i>William Garriott and Eugene Raikbel</i> .....	477
Waste and Waste Management <i>Joshua Reno</i> .....	557
<b>Theme: Resources</b>	
Virtuality <i>Bonnie Nardi</i> .....	15
Pleistocene Overkill and North American Mammalian Extinctions <i>David J. Meltzer</i> .....	33
Urban Political Ecology <i>Anne Rademacher</i> .....	137
Environmental Anthropology: Systemic Perspectives <i>Yancey Orr, J. Stephen Lansing, and Michael R. Dove</i> .....	153
Energy Expenditure in Humans and Other Primates: A New Synthesis <i>Herman Pontzer</i> .....	169
Disturbance, Complexity, Scale: New Approaches to the Study of Human–Environment Interactions <i>Rebecca Bliege Bird</i> .....	241
Anthropology of Aging and Care <i>Elana D. Buch</i> .....	277
Breached Initiations: Sociopolitical Resources and Conflicts in Emergent Adulthood <i>Norma Mendoza-Denton and Aomar Boum</i> .....	295

Recent Developments in High-Density Survey and Measurement (HDSM) for Archaeology: Implications for Practice and Theory <i>Rachel Opitz and W. Fred Limp</i> .....	347
Oil and Anthropology <i>Douglas Rogers</i> .....	365
Resource Transfers and Human Life-History Evolution <i>James Holland Jones</i> .....	513
Waste and Waste Management <i>Josbua Reno</i> .....	557

## Indexes

Cumulative Index of Contributing Authors, Volumes 35–44 .....	591
Cumulative Index of Chapter Titles, Volumes 35–44 .....	595

## Errata

An online log of corrections to *Annual Review of Anthropology* articles may be found at <http://www.annualreviews.org/errata/anthro>