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Reviewed work(s):

Source: *American Antiquity*, Vol. 67, No. 4 (Oct., 2002), pp. 597-605

Published by: [Society for American Archaeology](#)

Stable URL: <http://www.jstor.org/stable/1593793>

Accessed: 18/02/2012 09:05

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FORUM

PLACING ARCHAEOLOGY AT THE CENTER OF SOCIO-NATURAL STUDIES

Sander van der Leeuw and Charles L. Redman

Changing patterns of university and government research and training in this country and abroad force us, as archaeologists, to regularly reevaluate our disciplinary methods and goals. In the absence of careful consideration of these issues, the relative prominence of archaeology may stagnate or even diminish. From our own experience directing large multidisciplinary research projects, we believe that one particularly productive avenue for future archaeological research will be as collaborators in seeking to better understand contemporary socioenvironmental problems. We argue that current environmental research based in life, earth, and social sciences pays inadequate attention to the long time span and slow-moving processes that often underlie environmental crises. Archaeologists, as purveyors of the past, are well equipped to bring this long-term perspective to bear on contemporary issues. Moreover, we are also trained to work in multiple scales of time and space as well as with scientists from various disciplines. The primary obstacles to achieving the type of transdisciplinary research recommended here emanate from distinct vocabulary, concepts, and practices of each disciplinary tradition. We believe that the time is right and our colleagues are willing to see an enhanced role for archaeologists in the study of contemporary environmental issues.

El cambio de los patrones en la investigación e instrucción universitaria y gubernamental en este país y fuera del mismo, nos obliga como arqueólogos a evaluar regularmente los métodos y objetivos de nuestra disciplina. La posición relativamente sobresaliente de la arqueología puede estancarse o incluso disminuir si no se tiene una consideración cuidadosa de estos temas. A partir de nuestra propia experiencia al dirigir proyectos grandes de investigación interdisciplinaria, creemos que un camino particularmente productivo para la investigación arqueológica futura es la de la colaboración entre disciplinas que busquen un mejor entendimiento de los problemas socio-ambientales contemporáneos. Argumentamos que la investigación actual del medioambiente por parte de las ciencias biológicas, las ciencias de la tierra, y las ciencias sociales presta una atención inadecuada a los intervalos de larga duración y a los procesos lentos que con frecuencia se encuentran detrás de las crisis medioambientales. Como proveedores del pasado, los arqueólogos estamos bien preparados para aplicar esta perspectiva de largo plazo a temas contemporáneos. Igualmente, también estamos entrenados para trabajar con escalas múltiples de tiempo y espacio, así como con científicos de otras disciplinas. Los principales obstáculos para alcanzar el tipo de investigación transdisciplinaria recomendada aquí emanan de las diferencias en el vocabulario, los conceptos, y las prácticas de cada tradición disciplinaria. Creemos que nuestros colegas están dispuestos a ver una mayor participación de arqueólogos en el estudio de los temas del medioambiente contemporáneo y que este es el momento para llevar a cabo estos estudios.

As the social and cultural context of archaeological research and teaching evolves, we must note these changes and adjust our concerns. In this paper we hope to stimulate further discussion on promoting archaeological involvement in transdisciplinary research addressing environmental issues. We are not suggesting that all archaeologists eschew their current undertakings to pursue the tra-

jectory defined in this paper. Rather, we are identifying an important niche within the intellectual and scientific world that appropriately inclined archaeologists can fill. We believe this involvement provides a promising avenue for reinvigorating archaeology. That belief is based on the fact that both of us, as archaeologists, coordinate large transdisciplinary field projects dealing with present-day environmen-

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tal problems in which we have experienced both the promise and the difficulties of such research.

The ARCHAEOEDEDES research program, coordinated by Sander van der Leeuw, began in 1992. In the decade of its existence, it has focused on desertification, land degradation, and land abandonment in southern European countries. To understand these problems, it has brought together a team of 65 researchers from seven countries, ranging from mathematicians, physicists, modelers, geologists, geochemists, soil scientists, and life scientists, to geographers, sociologists, anthropologists, and archaeologists. Together, they developed an integrative perspective bridging the "nature-culture" gap, an approach that profited from the study of very long time-scales that archaeology makes possible, and articulated that perspective with nine case studies in regions along the northern Mediterranean rim. Well over a hundred papers, books, and theses have been, or are being, published (e.g., among others ARCHAEOEDEDES 1998; van der Leeuw 1998, 2000).

The Central Arizona–Phoenix Long-Term Ecological Research project (CAP LTER), codirected by Charles Redman, began in 1997 as part of a 24-site National Science Foundation program to monitor the biological health of the United States (Callahan 1984). CAP LTER focuses on an arid-land ecosystem profoundly influenced by the presence and activities of humans and is one of only two LTER sites that specifically study the ecology of urban systems. Over 30 biological, physical, and social scientists, 12 technicians, 50 graduate students, 25 undergraduates, and 20 community partners are currently working together to better understand the structure and function of the urban ecosystem and assess the effects of urban development on surrounding agricultural and desert lands (Grimm et al. 2000). Deep-time trajectories, legacies of past land use, paleoecological reconstructions, and comparisons with prehistoric settlement systems are being integrated into what traditionally would have been only a contemporary study.

Coming to Terms with "The Other"

Ever since the nineteenth century, anthropologists and archaeologists sought to create a distance between the society they lived in and the societies they studied and to position themselves as the ones bridging this gap. This distance is a special case of

the general opposition of "subject" and "object" that for anthropologists translates into "us" and "them" and is actualized by archaeologists as the dichotomy between past and present. Serving in that role worked as long as the sociocultural context favored an attitude that saw "others" as distant and unconnected and as long as research did not require major funding from a wide taxpayer base that demanded practical applications.

Time and social contexts change—at present, the relationships between Western societies and non-Western nations, indigenous peoples, and the past are very different from what they were over a century ago. Anthropology's traditional focus on investigating the colonial and postcolonial condition has become increasingly less relevant (Kottak 1999). So far, the study of our own multicultural societies and the reconsideration of the relationships between past and present have only partially repositioned the discipline. The concomitant loss of intellectual focus has fractured both anthropology and archaeology. For archaeology, this loss of focus has prompted some to shift away from scientific research to attempt a richer description of the past (e.g., Hodder 1985, 1986; Miller 1984; Shanks and Tilley 1987a, 1987b). For others who retained their scientific approach, cultural resource management has provided a legal mandate and a political following to ensure the discipline's financial future (Lipe and Redman 1996). Although we recognize the value of both accomplishments, neither has provided the much-needed rallying point around which most academic archaeologists are willing to redefine their intellectual approaches.

Society maintains academic research and rewards university departments for a variety of reasons. At the top of the list is that research may help solve present-day problems or enhance our standards of living. Also important is that research may enrich our lives through a deeper appreciation of fundamental issues. Although it could be argued that archaeology contributes in various ways to the second of these objectives, we are almost never asked to contribute our knowledge and perspective to the solution of present-day problems.

The challenge, therefore, is to identify issues of widely recognized importance that archaeology can contribute to in a meaningful manner and then to pursue those issues with energy and creativity. We cannot expect decision-makers outside our discipline,

who are already involved in the intriguing issues of our day, to identify our contribution for us—that is up to us. The penalty for not doing so is the marginalization of our discipline. Few among us do not already recognize that our academic departments are losing their relative prominence within the university structure and that government funding for archaeological research has not kept pace with the money available for disciplines deemed more relevant. If we continue on our current trajectory, it is inevitable that the decline of our relative position will continue. A second, more ominous threat is that archaeology will attract a decreasing proportion of the most creative students, as they feel the need to be engaged in solving the crushing problems facing society today. Ultimately, the stagnation of archaeology as an intellectually active discipline would be disappointing to us as practitioners, but more importantly it would lead to the erosion of one of the tenuous links our modern societies have established with the past.

To avoid all that, we should tackle present-day issues, such as topics in which the fact that we “live” at two points in time and space is an asset. One such subject is the collision toward which the interaction of our societies with their natural environments seems to be moving. Although this issue has only attracted wide public attention in recent decades, the underlying, worldwide trends are millennia old. These trends can only be understood from a perspective that takes those long-term dynamics into account and that integrates the study of both human societies and their biophysical environment (McIntosh et al. 2000; Redman 1999). In theory, archaeology and anthropology are ideally suited to make an invaluable contribution in this area. In practice, however, few synergies have materialized. There is a rich intellectual history of archaeologists interested in human-environmental relations. Among them are the cultural ecologists who contributed a series of important studies (Butzer 1982; Crumley 1994; Steward 1955; Vayda 1969; Watson and Watson 1969). Despite this active intellectual tradition within archaeology and anthropology, few funding agencies or colleagues in the life or earth sciences think of archaeologists as essential collaborators when designing large-scale environmental research programs (see Barker [1996]; Church [1997]; and Sisk and Noon [1995] for similar calls to action). This lack of engagement is due to both intellectual and prac-

tical barriers, and we will attempt to analyze both kinds in turn. But before we do so, let us briefly look at some of the consequences of the fact that environmental study focuses on the present.

Most Forecasts of Future Socioenvironmental Relations Are Deficient

Key studies of environmental dynamics that contribute to important policy decisions focus on instrumental data (i.e., direct observation of biophysical conditions) and hence usually take several decades, or at most one or two centuries into account (International Panel on Climate Change: see Houghton et al. 1992; Houghton et al. 1996). As a result, their conclusions are scientifically on shaky ground, because they:

- study only the tail-end of a complete process of socioenvironmental interaction, omitting its genesis and part of its trajectory;
- consider only a very small number of the available case studies on human-environmental interaction;
- look at a sample of situations that are either heavily under human influence or even completely dependent on human action for their survival, ignoring other situations that are eclipsed by the present dominance of humankind;
- exclude many infrequent processes (such as tectonics or floods) from study by not embracing the relevant spatiotemporal scales;
- do not consider the change of change (changes in the dynamics) except on very short time scales.

All these limitations result in a biased understanding of the dynamics studied and, at best, incomplete models on which to base environmental forecasting! The incompleteness of this approach is being recognized by scientists from many disciplines (especially those in the Resilience Alliance, e.g., Gunderson and Holling [2002])

Identifying Some of the Intellectual Barriers

The fragmented way in which our intellectual tradition conceives of the world seems to constitute the main intellectual barrier to a better understanding of socio-natural interaction. Tables 1–3 summarize key oppositions responsible for this fragmentation and suggest how some are being overcome, and others are shifting.

Table 1. Dimensions of the Shift Toward an Interactive Approach Regarding the Nature-Culture Opposition.

Pre-1980s	1980s	1990s
Humans are reactive to the environment	Humans are proactive in the environment	Humans interact with the environment
Culture is natural	Nature is cultural	Nature and culture have a reciprocal relationship
Environment is dangerous to humans	Humans are dangerous for the environment	Neither is dangerous if handled carefully, both if that is not the case
Adaptation Apply technofixes	Sustainability No new technology	Resilience Minimalist, balanced use of technology

Table 2. Differences Between the "Culture-History" and the "Natural-History" Approaches to the Past.

"Culture-History" ("Historical") Approach	"Natural-History" ("Natural Science") Approach
Principal interest is the past	Principal interest is the present
Understanding of the present based on that of the past	Understanding of the past based on that of the present
Time and process are irreversible	Time and process are reversible, cyclical, or reproducible
Accentuates differences	Accentuates similarities
Case studies	Generalizations
No coherence between events	Coherence between events
Focus on interscale interaction	Focus on intrascale interaction

Table 3. Various Aspects of the Opposition between "Analytical" and "Synthetic" Ways to Approach Research (after Holling 1998).

Attribute	Analytical	Synthetic
Philosophy	Narrow and targeted Disproof by experiment Parsimony the rule	Broad and exploratory Multiple lines of converging evidence Requisite simplicity the goal
Perceived organization	Biotic interactions Fixed environment Single scale	Biophysical interactions Self-organization Multiple scales with cross-scale interactions
Causation	Single and separable	Multiple and only partially separable
Hypotheses	Single hypotheses and nulls Rejection of false hypotheses	Multiple, competing hypotheses Separation among competing hypotheses
Uncertainty	Eliminate uncertainty	Incorporate uncertainty
Statistics	Standard statistics Experimental	Nonstandard statistics
Evaluation goal	To reach unanimous agreement	To reach a partial consensus
The danger	Correct answer to an irrelevant question	Correct but trivial question yielding a useless answer

Since the fourteenth century, the realms of nature and society have increasingly been studied in fundamentally different ways, leading ultimately to C. P. Snow's (1993) "two cultures." Although most environmental research is still undertaken from either the social or the natural perspective, the debate is changing (Wylie 2000). The role accorded human beings in socioenvironmental relations has gone from reactive, via proactive, to interactive, so that humans have become "just another unique species" (Foley 1987) and take part of the responsibility for the outcome of the socio-natural dynamic. Human beings distinguish themselves from other species in their capacity to learn how to learn (Bateson 1972) and the fact that they can change their behavior as a result of their observations. Thus, humanity interacts not directly with nature, but with its perceptions of nature. Hence, to a human population, an environmental crisis is primarily a matter of the social realm, implying an adaptive failure rather than a breakdown in the environment alone (McIntosh et al. 2000:6).

In the emergence of this new angle to the nature-culture debate, understanding the evolution of the environment and the landscape plays a special role, as it results from a direct confrontation between social and natural dynamics. Some other dimensions of this relatively recent shift in perspective are summarized in Table 1.

Cultural and social historians attempt to understand the past by studying processes and events leading up to the episode that they seek to explain. Most of the natural sciences, on the other hand, try to explain the past from their knowledge of the present. Once they "know how things work" in the present, they assume that past dynamics must have been more or less the same. As a consequence, their observations about the past are couched in terms of facts and laws and given the status of "scientific knowledge" rather than the less absolute "historical understanding" (e.g., Jonas 1982).

Compounding the differences between the cultural-history and the natural-history approach is the fundamental asymmetry between human perceptions of the past and the future. Whereas the past is conceived in terms of closed categories and assessed in terms of events, causes, and trajectories, the future is conceived in terms of open categories and assessed in terms of uncertainties, potentials, risks, and scenarios (Selby and El Guindi 1976; van der Leeuw 1989).

In a recent editorial, Holling (1998) contrasts those practitioners of ecology who view their aim as the detailed study of parts of complex phenomena (i.e., the analytical perspective) with those who aim to understand the whole either directly or by assembling many studies done on isolated details (i.e., the synthetic perspective). This division is rooted in the seventeenth- and eighteenth-century opposition between the Cartesians and the Empiricists and occurs in many disciplines. It can be the most insidious of the three oppositions to deal with and demands that we correctly balance our perspective on, and our investigation of, entities and the components that constitute them, particularly in the case of multilevel interactive processes such as complex socio-natural dynamics.

Although there probably are other oppositions hidden among the ways in which scholars approach socio-natural research, these three often lead to highly pernicious misunderstandings. If we are to develop a truly coherent way to study socio-natural phenomena, we must find a perspective that will enable us to integrate these different points of view constructively.

Practical Obstacles to Transdisciplinary Integration

Some of the practical conditions under which socioeconomic issues are to be investigated also bear on the difficulty of obtaining good results. What would it take, in practice, to shift the course of research in a transdisciplinary direction? The changes that are needed seem to us to fall into three categories: (1) changes in attitude; (2) adoption of other research tools and strategies; and (3) changes in working conditions and career structure.

A primary intellectual obstacle to transdisciplinary integration has been our tendency to study "the other" for its own sake. In archaeology, looking at the present has been confined to postmodern critiques of archaeology, to ethnoarchaeology, and to actualistic studies used to calibrate our understanding of the archaeological record. The relationship between the self and the other is not at the core of our thinking, where it belongs.

Relating to this need for a change in attitude is the need to take political responsibility for our work and its implications for modern society. The attitude that there is a separation between "science" and "politics," a leftover from positivism, is fortunately dis-

appearing in many areas. But in our discipline many scholars are still reluctant to assume their responsibilities in this area. And when they accept them, it is principally in a critical sense ("Where have we gone wrong?") rather than in a constructive one ("What can we do?").

Archaeologists should be defining their own research agenda. Without clear aims relevant to our disciplines as well as to the wider issues concerned, we will never motivate the people necessary to investigate these wider issues on the scale required. Nor will we, without demonstrable achievements, obtain the funds needed for these investigations.

The second category of changes needed to achieve transdisciplinary integration involves developing successful new research tools and strategies. From our own experience, we can suggest several practical ways to encourage scientists with different backgrounds and perspectives to collaborate. Well-defined core research areas, in otherwise large and dispersed research programs, have provided a foundation for identifying and prioritizing research. Place-based problem-solving helps to focus discussions and develop hypotheses, defining what to research and how to investigate it. Comparative studies make us share experiences that can be used to promote integrated research and strive for answers to elusive "why" questions. Geographic Information Systems can be effective as heuristic devices and in forging integrated thinking about social and ecological processes. Simple dynamical models force us to articulate linkages and serve to test theories against data (Carpenter et al. 1999). Finally, working simultaneously at multiple scales reinforces the need to consider the linkages among approaches developed at different scales and to verify the predicted relationships among physical, biological, and social variables (Gunderson and Holling 2002).

If there is a growing recognition among funding agencies that the big questions facing society can only be answered by transdisciplinary teams, why does this type of research not occur more regularly, and why are so few archaeologists involved when it does? The structure of present-day academic research and the career structure that underpins it provide the third major obstacle to transdisciplinary research.

Each discipline trains its future practitioners in its own unique vocabulary, methodology, and choice of acceptable interpretations, making it difficult to communicate effectively. As students advance in academe,

they are effectively corralled into disciplines as they receive the training on which their professional behavior will be based. Disciplines limit research to issues negotiated by the community that is imposing a "discipline" upon itself.

Furthermore, professional rewards are built around disciplinary success. Faculty members are promoted by committees of their disciplinary peers, who value articles in their own disciplinary journals and contribute to the teaching missions of their own departments. This structure carries right down to student training, where rewards are given to those students who emulate accomplished scholars in their discipline. If we, as mentors, are to train a generation of collaborative scientists, then we must ourselves collaborate. We must fundamentally rearrange our own playing field.

Living Up to a Rare Occasion

We believe that there is a window of opportunity to develop a transdisciplinary approach to the study of socio-natural phenomena that bridges the divide among social and natural scientists.

First, the interest is there on the part of the physical or earth scientists and life scientists. Many ecologists, in particular, have come to realize the importance of the long term if one is to deal with the future. The rise of historical ecology as a discipline in Europe and the United States and the huge international research effort on the history of climate change testify to this interest. But the opening is also visible in other disciplines. Thus, the geographer Georges Bertrand (1991) argues that geography must use archaeology in order to gain time-depth, and the influential work of Fernand Braudel (1979) demonstrates that history and archaeology need to look at the varying spatial scales of socio-natural interactions.

The shift in perspective on socio-natural relations has also opened the way to a number of science-policy attempts to bridge the gap between the nature and culture perspectives (e.g., Kinzig et al. 2000; Scoones 1999). Various initiatives of the NSF testify to this trend, such as the Urban Long-Term Ecological Research projects (Grimm et al. 2000) and the Bio-complexity in the Environment initiative (Michener et al. 2001). Elsewhere, one might mention the International Human Dimensions of Global Change Program and the inclusion of socioeconomic aspects in any environmental research undertaken under the

Fifth (2000–2004) Research and Technology Development Program of the European Union.

Last but not least, public awareness of the urgency and the sheer size of the issues at stake is growing. The United Nations conventions attempting to deal with environmental matters are milestones marking this growing awareness (e.g., the Kyoto Protocol and the Convention to Combat Desertification).

The Contribution of Archaeology Is Difficult to Overestimate

We believe that archaeology is uniquely suited to play an important role in the transformation of socio-natural studies. On the one hand, the discipline has a relatively strong tradition of multidisciplinary that combines the social and the natural sciences. The questions archaeologists have asked, and the answers suggested, provided insights about many different areas of human endeavor that are the traditional purview of nonhistorical disciplines. On the other hand, as both our past and our future are our own constructs, there is no future for us without a past. Our dealings with the future are predominantly determined by experience and perceptions acquired in the past. That is not to say that the transition from studying the past to gaining a preview of the future is an easy task, but the need to cope with that problem is more compelling than ever.

Anthropologists and archaeologists have a substantive contribution to make, as they can fill many gaps in our understanding of long-term human-environment relationships. Anthropologists have long studied the ways in which communities negotiate, maintain, and adapt certain kinds of perceptions, beliefs, and techniques. More recently they have turned their attention to the ways in which different cultures conceptualize their interactions with the environment (e.g., Descola 1996; Krech 1999; McIntosh et al. 2000). Archaeologists, on the other hand, have developed appropriate ways to extract from the record increasingly precise data about past socio-natural dynamics (Barker and Gilbertson 2000; McIntosh et al. 2000; Redman 1999; van der Leeuw 1998). At the same time, some ecologists have begun to work more closely with social scientists and their data, thereby enriching their own research in ways we are recommending here (Alvard 1998; Berkes and Folke 1998; Carpenter et al. 2001).

There is, thus, a convergence of thought that is laying the groundwork for a new generation of col-

laborations. Though investigating the past is informative for social and ecological scientists whose primary focus is the functioning of the contemporary system, that may not advance their careers. Similarly, archaeologists are not accorded sufficient credit for studying the present. Hence, projects that encompass both the present and the past are a fruitful arena for mutual collaboration among researchers from different disciplines.

Conclusion: Archaeology Engaged

The time is right for archaeology to assume a more central role in understanding human-environmental relations and addressing problems of broad significance to the sustainability of our society. The future growth, and perhaps even maintenance, of the discipline is at risk if we continue to isolate ourselves or link only with sister disciplines that are also threatened. Moreover, without engaging intellectual problems associated with some of the great challenges facing society today, we also risk losing the interest of the many talented students who want to make the world a better place.

One promising route to revitalizing our discipline is by working together with life and earth scientists who are concerned with human-environmental relationships. Through this type of collaborative effort we can, together, define a common approach to understanding the socio-natural systems of the past and present. Bridging the disciplinary divide will require us to contemplate new substantive issues, employ challenging new models, and overcome complex methodological problems. This active engagement to address problems deemed relevant to contemporary society promises to reinvigorate our own discipline and to add important new dimensions to the research of our life and earth scientist collaborators.

One might wonder why, even if we choose to pursue a collaborative, transdisciplinary approach to socio-natural systems, archaeologists should be allocated leadership roles in this endeavor. First, our data offer unique contributions from a diversity of case studies that cover long-term dynamics and potentially broad geographic scales. Second, integrating these data in our own research has forced us to work at varying spatial and temporal scales, providing the flexibility of approach essential for studying socio-natural systems. Third, many of us already have experience working in broad interdisciplinary teams,

often for sustained periods. And finally, the incompleteness and complexity of the data have led us to rely on others because we know we cannot solve most of the significant problems about the human past with data from our discipline alone.

Acknowledgments. The research was made possible by a series of contracts with the Directorate-General of Research of the European Union, as part of its "Climate and Natural Hazards" research program <http://mtiba.univ-fcomte.fr/archaeomedes> and grants from the National Science Foundation (DEB 9714833) to the Central Arizona-Phoenix Long-Term Ecological Research (CAP LTER <http://caplter.asu.edu>) Program. Any opinions, findings, and conclusions or recommendation expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation or the European Union.

References Cited

- Alvard, M. S.
1998 Evolutionary Ecology and Resource Conservation. *Evolutionary Anthropology* 7:62–74.
- ARCHAEOMEDES
1998 *Des Oppida aux Métropoles*. Collection Villes. Anthropos, Paris.
- Barker, J. P.
1996 Archaeological Contributions to Ecosystem Management. *SAA Bulletin* 14(2):19–21.
- Barker, G., and D. Gilbertson (editors)
2000 *Living on the Margins: The Archaeology of Drylands*. Routledge, London.
- Bateson, G. A.
1972 *Steps to an Ecology of Mind*. Ballantine Books, New York.
- Bertrand, G.
1991 Preface. In *Pour une archéologie agraire*, edited by J. Guilaine, pp. 1–4. Armand Colin, Paris.
- Berkes, F., and C. Folke (editors)
1998 *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. With the editorial assistance of J. Colding. Cambridge University Press, London.
- Braudel, F.
1979 *La Méditerranée et le Monde Méditerranéen à l'Époque de Philippe II*. 4th ed. Armand Colin, Paris.
- Butzer, K. W.
1982 *Archaeology as Human Ecology: Method and Theory for a Contextual Approach*. Cambridge University Press, Cambridge, U.K.
- Callahan, J. T.
1984 Long-Term Ecological Research. *BioScience* 34:363–367.
- Carpenter, S. R., W. A. Brock, and P. C. Hanson
1999 Ecological and Social Dynamics in Simple Models of Ecosystem Management. *Conservation Ecology* 3(2):4. Electronic Document, <http://139.142.203.66/pub/www/Journal/vol3/iss2/art4/index.html>
- Carpenter, S. R., B. Walker, J. M. Anderies, and N. Abel
2001 From Metaphor to Measurement: Resilience of What to What? *Ecosystems* 4:765–781.
- Church, T.
1997 Ecosystem Management and CRM: Do We Have a Role? *SAA Bulletin* 15(2):25–26.
- Crumley, C. C. (editor)
1994 *Historical Ecology: Cultural Knowledge and Changing Landscapes*. School of American Research, Santa Fe, New Mexico.
- Descola, P.
1996 Les Cosmologies des Indiens d'Amazonie. *La Recherche* 292:62–67.
- Foley, R. A.
1987 *Just Another Unique Species*. Cambridge University Press, Cambridge, U.K.
- Grimm, N. B., J. M. Grove, S. T. A. Pickett, and C. L. Redman
2000 Integrated Approaches to Long-Term Studies of Urban Ecological Systems. *BioScience* 70:571–584.
- Gunderson, L. H., and C. S. Holling (editors)
2002 *Panarchy: Understanding Transformations in Human and Natural Systems*. Island Press, Washington, D.C.
- Hodder, I.
1985 Post-Processual Archaeology. In *Advances in Archaeological Method and Theory*, vol. 8, edited by M. B. Schiffer, pp. 1–26. Academic Press, Orlando.
- 1986 *Reading the Past*. Cambridge University Press, Cambridge, U.K.
- Holling, C. S.
1998 Two Cultures of Ecology. *Conservation Ecology* 2(2):4. Electronic Document, <http://www.consecol.org/vol2/iss2/art4>
- Houghton, J. T., B. A. Callander, and S. K. Varney (editors)
1992 *Climate Change 1992: The Supplementary Report to the IPCC Scientific Assessment*. Cambridge University Press, Cambridge, U.K.
- Houghton, J. T., L. G. Meira Filho, B. A. Callander, N. Harris, A. Kattenberg, and K. Maskell (editors)
1996 *Climate Change 1995: The Science of Climate Change*. Cambridge University Press, Cambridge, U.K.
- Jonas, H.
1982 *The Phenomenon of Life*. University of Chicago Press, Chicago.
- Kinzig, A. P., J. Antle, W. Ascher, W. Brock, S. Carpenter, F. S. Chapin III, R. Costanza, K. L. Cottingham, M. Dove, H. Dowlatabadi, E. Elliot, K. Ewel, A. Fisher, P. Gober, N. Grimm, T. Groves, S. Hanna, G. Heal, K. Lee, S. Levin, J. Lubchenco, D. Ludwig, J. Martinez-Alier, W. Murdoch, R. Naylor, R. Norgaard, M. Oppenheimer, A. Pfaff, S. Pickett, S. Polasky, H. R. Pulliam, C. Redman, J. P. Rodriguez, T. Root, S. Schneider, R. Schuler, T. Scudder, K. Segersen, M. R. Shaw, D. Simpson, A. A. Small, D. Starrett, P. Taylor, S. van der Leeuw, D. H. Wall, and M. Wilson
2000 *Nature and Society: An Imperative for Integrated Environmental Research*. Electronic Document, <http://lsweb.la.asu.edu/akinzig/report.htm>.
- Kottak, C. P.
1999 The New Ecological Anthropology. *American Anthropologist* 101:23–35.
- Krech, S.
1999 *The Ecological Indian: Myth and History*. W. W. Norton, New York.
- Lipe, W., and C. Redman
1996 Conference on "Renewing Our National Archaeological Program." *SAA Bulletin* 14(4):14–17.
- McIntosh, R., J. Tainter, and S. McIntosh (editors)
2000 *The Way the Wind Blows: Climate, History and Human Action*. Columbia University Press, New York.
- Michener, W. K., T. J. Baerwald, P. Firth, M. A. Palmer, J. L. Rosenberger, E. A. Sandlin, and H. Zimmerman
2001 Defining and Unraveling Biocomplexity. *BioScience* 51:1018–1023.

- Miller, D.
1984 Modernism and Suburbia as Material Ideology. In *Ideology, Power, and Prehistory*, edited by D. Miller and C. Tilley, pp. 37–49. Cambridge University Press, Cambridge, U.K.
- Redman, C. L.
1999 *Human Impacts on Ancient Environments*. University of Arizona Press, Tucson.
- Scoones, I.
1999 New Ecology and The Social Sciences: What Prospects for a Fruitful Engagement? *Annual Review of Anthropology* 28:479–507.
- Selby, H. A., and F. El Guindi
1976 Dialectics in Zapotec Thinking. In *Meaning in Anthropology*, edited by K. H. Bason and H. A. Selby. University of New Mexico Press, Albuquerque.
- Shanks, M., and C. Tilley
1987a *Archaeology, Theory and Practice*. Cambridge University Press, Cambridge. UK.
1987b *Social Theory and Archaeology*. Polity Press, Cambridge, UK.
- Sisk, T. D., and B. R. Noon
1995 Land Use History of North America—An Emerging Project of the National Biological Service. *SAA Bulletin* 13(3):21.
- Snow, C. P.
1993 *The Two Cultures*. Cambridge University Press, London.
- Steward, J. H.
1955 *Theory of Culture Change*. University of Illinois Press, Urbana.
- van der Leeuw, S. E.
1989 Risk, Perception, Innovation. In *What's New? A Closer Look at the Processes of Innovation*, edited by S. E. van der Leeuw and R. Torrence, pp. 300–329. Unwin Hyman, London.
- 1998 *The ARCHAEOMEDES Project—Understanding the Natural and Anthropogenic Causes of Land Degradation and Desertification in the Mediterranean Basin*. Office of Publications of the European Union, Luxemburg.
- 2000 Land Degradation as a Socio-Natural Process. In *The Way the Wind Blows: Climate, History, and Human Action* edited by R. J. McIntosh, J. A. Tainter, and S. K. McIntosh, pp. 357–383. Columbia University Press, New York.
- Vayda, A. P. (editor)
1969 *Environment and Cultural Behavior: Ecological Studies in Cultural Anthropology*. Published for American Museum of Natural History by Natural History Press, Garden City, New York.
- Watson, R. A., and P. J. Watson
1969 *Man and Nature: An Anthropological Essay in Human Ecology*. Harcourt, Brace and World, New York.
- Wylie, A.
2000 Questions of Evidence, Legitimacy, and the (Dis)Union of Science. *American Antiquity* 65:227–237.

Received May 31, 2001; Revised March 27, 2002; Accepted April 1, 2002.