Journal of Archaeological Research, Vol. 12, No. 3, September 2004 (© 2004)

Cross-Cultural Approaches in Archaeology: Comparative Ethnology, Comparative Archaeology, and Archaeoethnology

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Cross-cultural approaches have been used widely in archaeological research. Comparative ethnology has provided a number of archaeological indicators of behavior, but large segments of the archaeological record have not yet been subjected to extensive comparative analysis. Comparative archaeology has aided in exploring variation among societal types (such as chiefdoms) and categories within the archaeological record (such as settlements). Diachronic comparisons have been used frequently by archaeologists, but these have often been based on unique samples and only rarely have employed statistics to aid in the discovery or testing of hypotheses. Archaeoethnology, comparative analyses of archaeological cases employing valid samples and statistical evaluation of theories and hypotheses, is introduced.

KEY WORDS: archaeological method and theory; cross-cultural research; cultural evolution; ethnology.

INTRODUCTION

Archaeology, to the extent that it is a discipline interested in processes of cultural variation and change, must include comparative methods. One cannot identify or investigate variation unless one has examples spanning a range of variation; one cannot examine change unless one has examples spanning a range of time. And one cannot simultaneously examine a set of examples if one does not employ comparative methods. In this essay I discuss a subset of the many forms of comparison employed by archaeologists, those comparing different cultures. I consider three major types of cross-cultural comparison: comparative ethnology, the comparison

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1059-0161/04/0900-0281/0

of ethnographically known cultures or cultural features; comparative archaeology, the comparison of archaeologically known cultures or cultural features; and archaeoethnology, the comparison of archaeologically known cultures or cultural features in a diachronic mode. Each form of comparison has strengths and weaknesses, and each is more useful than the others for answering particular types of questions. I spend the latter part of this essay explaining why archaeoethnology is a particularly valuable approach for examining cultural evolution, which I also suggest should become a more focal topic in anthropological archaeology.

COMPARATIVE ETHNOLOGY VERSUS ETHNOGRAPHIC ANALOGY

In 1916 the prolific American archaeologist Clarence B. Moore noted a remarkable co-occurrence of antler hooks (which he called "netting needles") with banner stones (which he called "net spacers") in burials at the Indian Knoll site. Moore (1916, p. 12) interpreted this as evidence for the routine inclusion of net-making kits in burials at the site. A few years later, Alfred Kidder reported atlatls with polished stones attached in burials from Arizona (Kidder and Guernsey, 1919). Twenty years later William Webb reported the discovery in Kentucky of antler hooks and banner stones with identical sized holes found in alignment with one another (Webb and Haag, 1939). Webb realized that banner stones were atlatl weights (Webb and DeJarnette, 1942, p. 285) and thus solved a minor mystery in North American archaeology. The story of banner stones illustrates one of the basic problems faced by archaeologists: we have to interpret what we find, often with limited information and no modern parallels. In this section I argue that cross-cultural approaches provide a powerful method for interpreting the archaeological record and review both past uses and future directions of comparative ethnology in archaeology.

Ethnographic Analogy

Ethnographic analogy has been one of the basic methods used to interpret the archaeological record from the very beginnings of archaeology. However, systematic methods for applying ethnographic information to the interpretation and analysis of the archaeological record have been pursued only since the 1950s (see Wylie, 1985, for an overview of pre-1950s use of analogy).

One of the first to propose a systematic method for constructing analogies was Grahame Clark (1951, 1953). He suggested that analogies were most appropriately drawn from ethnographically known cultures with similar subsistence technologies and ecological settings to the archaeological culture of interest. Wylie (1985, p. 71) terms this a "neo-evolutionist" approach, since it has roots in an older method

of drawing analogies from cultures in similar positions within an evolutionary typology (particularly Morgan, 1877) but adds to it the idea that environment may play an important role in shaping a culture.

In 1961, Robert Ascher criticized Clark 's overt environmental-determinist assumptions and suggested that a method of "direct historic" analogy might be more appropriate than a neo-evolutionist one. By direct historic analogy Ascher (1961, pp. 323–324) meant that analogies should be drawn only from ethnographic cases that could be directly linked to the archaeological cultures being interpreted. Ascher believed that where cultural continuity could be demonstrated, features of prehistoric lifestyles could be expected to be retained.

Ascher won few converts, especially since the direct historic approach, in which archaeologists work back into the past from historically known cultures, basing interpretations on the previous period (see Steward, 1942), had been in use in North America for over 30 years and was beginning to be critically questioned (Trigger, 1989, pp. 300–301). Like other forms of analogy, the direct historic approach suffered from the fact that once one went past the latest prehistoric period, one was still completely removed from empirical analogy to known peoples, and one ran the danger of compiling interpretive mistakes as one moved further into the past (Trigger, 1989, pp. 391–395).

In the 1970s a movement linked to the "new" archaeology and its emphasis on middle-range research (i.e., research focused on linking artifacts and artifact patterns to human behaviors) and involving field research among living peoples was initiated. This approach was designed specifically to develop means to interpret the archaeological record. Termed "ethnoarchaeology," or "living archaeology," many saw this as the answer to the long-standing problem of ethnographic analogy in archaeological interpretation (Gould, 1980; Gould and Watson, 1982). Archaeologists (even proponents of ethnoarchaeology) soon realized that this method shared many problems with the direct historic approach (Wylie, 1982). As one moved into the past, one still became completely removed from empirical analogy to known peoples.

Comparative Ethnology

During this long debate over the use of ethnographic analogy in archaeological interpretation, few have put forward the idea that findings from comparative ethnology might provide an appropriate source for drawing inferences (Peregrine, 1996a). As McNett (1979, p. 40) succinctly puts it, "one is rather at a loss to explain why this method has not been used more for archaeological purposes." One reason McNett (1979, p. 41) offers is that archaeologists are simply unaware of the findings of comparative ethnology, a problem I hope to solve here.

Table I presents a summary of results from comparative ethnology that might be useful for interpreting the archaeological record (adapted from C. R. Ember,

Table I. Archaeological Indicators of Behavior Identified Through Comparative Ethnology

(1) Archaeologically recoverable indicators of ethnographic features in Column 2	(2) Ethnographic correlates of archaeological indicators [**Known (in bold)** suspected (not bold)] *Known correlates of ethnographic features (in italics)*
Residential floor area 14.5–42.7 m^2	**Patrilocal residence** (Brown, 1987; Divale, 1977; Ember, 1973) *Internal war (societies with internal war usually > 21,000)* (C. R. Ember, 1975; M. Ember and C. R. Ember, 1971; Divale, 1974) *Brideprice, sister exchange, or bride-service* (Ember, 1970) *Tends toward community exogamy and single kin group communities* (C. R. Ember et al., 1974; M. Ember and C. R. Ember, 1971) *In nonstate societies with warfare, patrilineal descent with territorially contiguous groups and lineages* (Ember et al., 1974)
Residential floor area 79.2—270.8 m^2	**Matrilocal residence** (Brown, 1987; Divale, 1977; Ember, 1973) *Purely external war (societies with purely external usually <21,000 population)* (C. R. Ember, 1975; M. Ember and C. R. Ember, 1971; Divale, 1974) *Nonsignificant economic transactions at marriage* (Ember, 1970) *Females do as much or more subsistence work* (C. R. Ember, 1974; M. Ember and C. R. Ember, 1971) *Tends toward community agamy or endogamy* (Ember and Ember, 1971) *In nonstate societies with warfare, matrilineal descent, mixed kin communities, clans, phratries or moieties (in populations under 9000)* (Ember et al., 1974) *Recently migrated; isolated languages* (Divale, 1974)
Square meters of total residence floor area	**6 m^2/person** (Brown, 1987; Naroll, 1962)
Rectangular dwellings only	**Fully sedentary** (Robbins, 1966; Whiting and Ayres, 1968)
Elliptical dwellings only	**More likely sedentary** (Whiting and Ayres, 1968)
Circular dwellings only	**Most are nomadic** (Binford, 1990; Robbins, 1966; Whiting and Ayres, 1968) **Most are polygynous** (converse that rectilinear are monogamous is not true) (Whiting and Ayres, 1968)
Circular as well as rectangular or elliptical dwellings	**Seminomadic** (Whiting and Ayres, 1968)
Multiroom dwellings	**Extended families or wealth distinctions** (Whiting and Ayres, 1968)
Surface dwellings	Among foragers, nomadic (Binford, 1990, but not statistically evaluated)
Roof and walls made of the same material	Among foragers, nomadic (Binford, 1990, but not statistically evaluated)
Elaborate outside house decoration	Long-distance trade (Blanton, 1993, only peasant households evaluated)

Table I. Continued

(1) Archaeologically recoverable indicators of ethnographic features in Column 2	(2) Ethnographic correlates of archaeological indicators [**Known (in bold)** suspected (not bold)] *Known correlates of ethnographic features (in italics)*
Change in settlement location more than once a year	Communal ownership; sharing; no specialized craftsmen; sporadic trade; no taxes; no classes; informal social control; spirits most important; no religious hierarchy; individual religious rites; infrequent group ceremonies; no temples (McNett, 1967, 1970)
Semipermanent settlement	Communal ownership; no specialized craftsmen; no taxes; no classes; spirits most important; no religious hierarchy; individual religious rites; infrequent group ceremonies; no temples (McNett, 1967, 1970)
Community not normally moved	Hoarding; inherited movable property; no taxes; no religious hierarchy; frequent group ceremonies; no temples; classes (McNett, 1967, 1970)
Center with surrounding satellites	Mostly private ownership; hoarding; inherited movable property; extensive trade; classes; coercive political leader; formal social control; frequent group ceremonies; temples (McNett, 1967, 1970)
Hierarchy of centers (political state)	Private ownership; hoarding; inherited movable property; specialized craftsmen; extensive trade; taxes; classes; coercive political leader; formal social control; powerful gods; religious hierarchy; common good religious rites; frequent group ceremonies; temples (McNett, 1967, 1970)
Communities less than 50 people	**Bilocal residence among foragers** (Ember, 1975)
Severe and rapid depopulation	**Bilocal residence (or alternative residence patterns)** (Ember and Ember, 1972) **First cousin marriage in societies between 1000 and 25,000 people** (Ember, 1975)
Three or more barriers to enter innermost part of a settlement (e.g., trench, outer fence, door)	**Warfare at least once every two years** (Peregrine, 1993)
Unpredictable environment that would affect food supplies adversely	**High frequency of war (including internal and external warfare** (Ember and Ember, 1992a,b).
Burials with ostentatious displays	**2–4 levels of political hierarchy beyond the local community** (Kamp, 1998) **Societal norms allow individuals to accumulate wealth or power** (Kamp, 1998)
Decorations using simple repetitive elements, symmetry, empty space, few enclosed figures	**Egalitarian social structure** (Fischer, 1961)
Complex, integrated designs, asymmetry, little empty space, enclosed figures	**Presence of wealth distinctions/ social classes/castes** (Fischer, 1961)
Money economy	**Neolocal residence** (M. Ember, 1967, 1974)

2003; also see M. Ember and C. R. Ember, 1995; McNett, 1979). Column 1 presents archaeologically recoverable indicators of ethnographic features; column 2 presents correlates of those features identified through comparative ethnology. By comparative ethnology I mean the statistical evaluation of theories or hypotheses using data from large (often worldwide) and clearly defined samples of cultures (Ember and Ember, 2001). The importance of this approach is that if one can find a strong association in a worldwide sample of cultures, then one can assume that the association fits human behavior in general and not just the customs of a particular culture or historically related group of cultures (Sanderson, 1990, pp. 211–212). And, particularly important for the archaeologist, there is no a priori reason for this generalization not to hold for prehistoric cultures as well (see Ember and Ember, 1995, pp. 95–96). Some of the findings presented in Table I have not been statistically evaluated or are from specific samples that cannot be generalized to human behavior as a whole; these are presented in plain text rather than boldface. Known correlates of the ethnographic features in bold in column 2 are presented in italics.

It is clear from Table I that comparative ethnology has generated a number of useful indicators of ethnographic features, but clearly more can be done. There has been little research in comparative ethnology focused on the two most prevalent items in the archaeological record–ceramics and lithics (but see Odell, 1988, 1998), and only a handful of studies have focused specifically on behaviors associated with artistic styles and decoration (e.g., Fischer, 1961; also Blanton, 1993). Little systematic research has been done on archaeological indicators of religious beliefs and practices (but see Peregrine, 1996b; Swanson, 1960). Comparative ethnology is a valuable method for interpreting the archaeological record, and we should be more aggressive about using its results (also see Blanton and Taylor, 1995).

COMPARATIVE ARCHAEOLOGY

Comparative research by archaeologists using the ethnographic record to interpret the archaeological record may be relatively rare, but there has been a plethora of comparative research by archaeologists employing the archaeological record. This research can be broadly defined as having taken one of two approaches. First is the comparison of societal "attributes," such as houses, ceramics, or even nonmaterial attributes such as gender relations. Before chronometric dating, such comparisons served as the basis for seriation and stratigraphy. Today the goals of this research are often aimed at getting a fuller understanding of the particular attribute and identifying and understanding variation. Second is the comparison of societal "types," such as chiefdoms or states, typically to identify and understand variation, though in recent years such comparisons also have been used to critique the very notion of the "type" itself (e.g., Feinman and Neitzel, 1984). In this section I introduce both forms of comparative archaeology but give only a very brief overview of their history. Since both forms of comparison have been used since

the beginnings of archaeology, their history in part parallels that of the discipline as a whole (see, e.g., Trigger, 2003, pp. 15–19).

Comparison of Societal "Attributes"

The comparison of societal attributes has a long history in archaeology; indeed, one could argue that such comparisons were one of the major contributions made by nineteenth-century antiquarians in shaping what would become the discipline of archaeology (Trigger, 1989). In one of the earliest examples of scientific archaeology in the New World, Thomas (1898) compared ancient earthen mounds in the eastern United States to one another and to historic accounts of mound-building and mound use. Thomas established through this comparison that there were several distinct mound-building traditions, and all appear to have been built by the ancestors of contemporary Native Americans. In Europe, Montelius (1888) traveled extensively to museums and archaeological sites comparing the artifacts found in sealed deposits such as burials and hoards. Montelius used the information about objects that were never found in association to define six major periods within the Bronze Age, each of which he posited represented a different cultural tradition that spread across all of Europe.

In contemporary archaeology the comparison of societal "attributes" for culture-historical purposes has been largely supplanted by chronometric dating techniques, although comparison as a means to perform seriation and stratigraphy still have their place (O'Brien and Lyman, 2002) More commonly, comparisons are performed to aid in the interpretation of the archaeological record or to better understand variation. For example, Penelope Allison's recent edited volume on *The Archaeology of Household Activities* (Allison, 1999) brings together case studies of the material remains of houses from archaeological contexts in both the Old and New Worlds, and from a variety of time periods, explicitly to examine variation. Part of the effort is aimed at critiquing earlier comparative studies of households that Allison argues imposed a Western perspective on the interpretation of household function (e.g., Blanton, 1993; Kent, 1990), but most of the papers focus on providing examples of the range of variation in houses and apparent household activities. In this way the comparison of houses provides both a way of looking at the archaeological record and a sense of the variation that might be expected.

Comparative studies of material attributes of the archaeological record, such as houses, are relatively common, but perhaps more interesting are comparative studies that attempt to examine nonmaterial attributes of ancient societies. For example, there have been a number of recent comparative studies considering gender roles and how they might be identified and examined in archaeological contexts. A good overview is Sarah Nelson and Myriam Rosen-Ayalon's edited book *In Pursuit of Gender* (Nelson and Rosen-Ayalon, 2002). The authors in this collection represent archaeologists working in both the Old and New Worlds,

and on time periods ranging from several thousand years ago into the historic period. All the papers focus on how gender roles might be identified through the archaeological record and how identifying those roles might aid in understanding prehistoric societies. As the editors explain, "When gender becomes a focus of explanation, the possibilities for expanding archaeological interpretation with both rigor and imagination open up new territory" (Nelson and Rosen-Ayalon, 2002, p. 2). Exploring gender for these authors is clearly a comparative endeavor in which "Multiple lines of evidence are one of the most secure ways to study gender in archaeology" (Nelson and Rosen-Ayalon, 2002, p. 5).

Another example of comparative archaeology focused on examining nonmaterial attributes of ancient societies is Paul Wason's *The Archaeology of Rank* (Wason, 1994). This is a particularly interesting work, as it begins with a carefully reasoned discussion of comparative archaeology, its weaknesses and faults, and a defense of its strengths. Wason argues that most disputes about the use of comparison in archaeology boil down to issues of scale. At a gross level, comparisons are useful, while for detailed understanding more context is needed. As Wason (1994, p. 12) puts it, "for fullest understanding we need the historically-particular context, but a cross-cultural generalization about the relationship between a pattern of material culture and an aspect of social organization can yield. . . [useful] information." Wason goes on to use ethnographic as well as archaeological cases to identify material correlates of social ranking, and, importantly, of variation in social ranking. In other words, he seeks to identify material attributes that vary along with variation in social ranking. He suggests that mortuary practices, iconography, prestige items, and settlement offer useful variables and illustrates their utility through a case study of Çatal Hüyük, which he argues had hereditary social ranking but not stratification (Wason, 1994, pp. 178-179).

While Wason attempts to examine means to identify and understand variation in ranking, he also provides a comparison of another sort—a comparison of ranked societies, what makes them similar and how they differ. The comparison of societal types became increasingly common in archaeology with the rebirth of evolutionism in the 1960s, and particularly following the publication of Elman Service's *Primitive Social Organization* (Service, 1965). But the comparison of societal types also was fostered by research on the origins of states and the recognition that early states appeared to share numerous features in common, despite being located in different parts of the world and evolving over varying spans of time.

Comparison of Societal "Types"

A key work illustrating how archaeological data could be used to understand early states was Robert McCormick Adam's *The Evolution of Urban Society* (Adams, 1966), in which Adams compared the city-states of Early Dynastic Mesopotamia with the urbanized world of Postclassic highland Mexico. Adam's purpose was "the presentation and analysis of regularities in our two

best-documented examples of early, independent urban societies," with the overarching goal of demonstrating "that both the societies in question can usefully be regarded as variants of a single processual pattern" (Adams, 1966, p. 1)—the evolution of urban society. To compare these two cases, Adams examined both historical and archaeological evidence concerning subsistence, kinship, social stratification, religion, and political organization. He found that the two cases were "fundamentally similar" but also had important differences, especially in terms of their social and environmental setting (Adams, 1966, pp. 170–175).

Another key work in the comparison of societal types was Henri Claessen and Peter Skalník's *The Early State* (Claessen and Skalník, 1978). Claessen and Skalník (1978, pp. 3–5) commissioned case studies of 21 early states from all areas of the globe with the expressed purpose of comparing them to identify similarities and differences, and to test theories of state origins. Claessen pulled the information from these case studies together (Claessen and Skalník, 1978, pp. 533–596) and identified 51 "structural characteristics" of early states, ranging from early states having territories to the rulers of early states traveling through the state territory exacting tribute. Skalník (Claessen and Skalník, 1978, pp. 597–618) modeled how these "structural characteristics" functioned together to create and maintain early states. In this way, Claessen and Skalník used comparative data to closely examine and come to a fuller understanding of a single societal type—the early state.

More recently, in *Understanding Early Civilization* (Trigger, 2003), Bruce G. Trigger has provided a comprehensive and detailed comparison of the seven best-documented early civilizations (with civilization defined as polities where class has displaced kinship as the basis of organization): Egypt, Mesopotamia, Shang, Aztec, Maya, Inka, and Yoruba. Trigger's comparison is akin to Claessen and Skalník's in that its purpose is to "establish empirically what features. . . early civilizations, on four continents, had in common and in what ways they differed from one another" (Trigger, 2003, p. 3); it is very unlike theirs in that Trigger organizes his comparison around major societal features of sociopolitical organization, economy, and the "cognitive and symbolic" realm of culture rather than the case studies themselves. Not surprisingly, he finds great variation in these societal features, but he also finds a number of interesting parallels in religions, beliefs, and cosmology (Trigger, 2003, pp. 639–647), which Trigger argues calls into question the idea that cultural evolution is the result of historical contingency rather than practical reason (Trigger, 2003, p. 650).

Trigger's interest in issues of cultural evolution is not unique in the comparative archaeology of societal types. None of these examples of the comparison of societal types can easily be divorced from questions of process and origin; indeed, it was the origin of these societal types that underlay the comparative efforts in each of these works. The authors of the works, however, while providing discussion on origins, do not delve deeply into the subject, perhaps because the type of synchronic comparison they had undertaken was not well suited to the question of origins. A better way to examine evolutionary processes, such as the origins of urban societies or states, is to examine them over time, that is, diachronically.

DIACHRONIC CROSS-CULTURAL COMPARISONS

Comparative ethnology is generally conducted with all cases taken from a single time period—the "ethnographic present." Comparative archaeology takes a similar tack, generally ignoring differences in time period in favor of similarities in attributes of interest. But there is no reason comparisons have to be synchronic. As noted above, diachronic comparisons, that is, comparisons made across time periods, also have been undertaken, although there has been little work in comparative ethnology on diachronic analysis, largely because of the limited time depth of the ethnographic record.[2] The archaeological record, on the other hand, is uniquely suited to such diachronic analyses and, indeed, has been the subject of systematic diachronic comparisons for at least 150 years. In this section I give a brief history of the use of diachronic comparison in anthropology, then provide several illustrations of contemporary works.

History of Diachronic Comparison

Diachronic comparison was a staple method among the founders of the discipline of anthropology. In *Principles of Sociology* (Spencer, 1898–1899), for example, Herbert Spencer attempted to construct a general law of cultural evolution in part by providing examples of various stages of cultural evolution that included pre-Columbian Mexico, Pharaonic Egypt, and the Roman Empire, among others. Similarly Edward B. Tylor, in *Primitive Culture* (Tylor, 1871), used diachronic comparison to trace cultural "survivals" and build evolutionary sequences. Lewis Henry Morgan used diachronic comparison in *Ancient Society* (Morgan, 1877) to establish a universal sequence of cultural evolution. Unfortunately, these early attempts at diachronic comparison were doomed to fail because the available archaeological data were crude and lacked absolute dates, preventing the establishment of an empirical sequence of change. The lack of true diachronic data was a significant flaw in the work of the early evolutionists, a flaw that was rightly seized upon by Boas and his students who launched a damning criticism of both comparative analyses and evolutionary theory (a critical perspective that continues to this day—see, for example, Giddens, 1984; Hodder, 1986; Nisbet, 1969; Pauketat, 2001; Shanks and Tilley, 1992).

Whereas the paucity of data and the Boasian reaction against these early evolutionists halted diachronic comparisons for a time, a second generation of

[2]It should be noted that among cross-cultural researchers the term diachronic analysis refers specifically to comparison of a single culture over time. I use the term more broadly, to refer to all comparative approaches that employ time differences as a variable. These time differences may be restricted to a single culture looked at over time or apply to many cultures with time differences being a grouping variable.

evolutionists followed with comparisons based on better data and more rigorous theory (see Hallpike, 1986; Harris, 1968; Sanderson, 1990; and Trigger, 1998, for reviews). Foremost among these scholars was Vere Gordon Childe whose *Social Evolution* (Childe, 1951) provided something of a blueprint for diachronic cross-cultural comparisons using archaeological data. His basic position was that "Archaeology can establish sequences of cultures in various natural regions. And these cultures represent societies or phases in the development of societies. Potentially, therefore, archaeological sequences reveal the chronological order in which kinds of society did historically emerge" (Childe, 1951, p. 17). To unleash this potential, Childe (1951, pp. 22–29) suggested that archaeologists needed to focus their efforts on clarifying archaeological sequences based on what can be most clearly observed in the archaeological record: technology and economy. Such changes in technology and economy, Childe argued, led to changes in other aspects of culture and, in turn, to cultural evolution. To illustrate this point, Childe (1951, pp. 166–179) examined and compared the archaeological sequences of temperate and Mediterranean Europe, the Nile Valley, and Mesopotamia and concluded that innovation and diffusion are the major processes underlying cultural evolution. He also pointed out that it is only through diachronic comparison that diffusion can be empirically examined and measured (Childe, 1951, p. 170).

In the United States the cultural anthropologist Julian Steward argued along similar lines. He posited that "a legitimate and ultimate objective [of anthropology] is to see through the differences of cultures to the similarities, to ascertain processes that are duplicated independently in cultural sequences, and to recognize cause and effect in both temporal and functional relationships" (Steward, 1949, p. 3). Steward made suggestions about methodology for accomplishing this objective similar to those put forward by Childe but also argued, in a manner similar to Murdock (1957), that synchronic comparison could yield valuable information about cultural regularities. Steward's major contribution to diachronic research was an examination of Karl Wittfogel's hypothesis that the control of irrigation facilities led to the rise of states (Wittfogel, 1957). Steward (1949, 1955, 1977) compared cases of state origins in Mesopotamia, Egypt, North China, Peru, and Mesoamerica and found support for the idea that control of irrigation systems was an important element in the emergence of centralized authority. Wittfogel's irrigation hypothesis has since been heavily criticized, but Steward's cross-cultural attempt to evaluate it proved influential.

Whereas Childe and Steward planted the seeds for diachronic comparison using the archaeological record, Elman Service's *Origins of the State and Civilization* (Service, 1975) brought the method to fruition. Service compared five historically known cases of state origin and six archaeologically known cases in order to test a variety of theories of state origin against the data. His sample was a grab bag and his methods of analysis wholly informal (Service [1975, p. 18] tells us, rather matter-of-factly: "There is no problem here that requires any statistical or

sampling procedures because the instances of state formation that are documented well enough to be useful are so few"), but Service conducted a clear and direct diachronic comparison of archaeological sequences in order to identify repeated patterns and processes—exactly the type of analysis envisioned by Childe. And although some of Service's conclusions have not fared well (his identification of redistribution as a central process in the origins of chiefdoms, for example), the work itself has been tremendously influential.

What Service, Steward, Childe, and others (e.g., Fried, 1967; Parsons, 1966; White, 1959, among others) demonstrated is that diachronic comparison is an excellent way to study cultural evolution (see Yoffee, 1993, for a more recent discussion). Through diachronic comparison presumed causes can be demonstrated to precede presumed effects, and evolutionary patterns and processes can be identified and studied over time.[3] These conclusions are in no way groundbreaking—indeed historians and evolutionary biologists had been working in a comparative framework for generations—but, as a consequence of the Boasian reaction against comparative research, it took anthropology much longer to realize the value of comparative methodology (see Harris, 1968; Sanderson, 1990; for further discussion of this point).

Regional and Global Comparisons

In recent years, more sophisticated cross-cultural research using the archaeological record has produced innovative studies of cultural evolution in an explicitly comparative framework. This body of work can be divided into two major types: regional comparisons and global comparisons. Regional comparisons consider the archaeological cultures within a specific region and compare them over time in order to understand similarities and differences in cultural evolutionary processes. Often the attempt is focused on understanding variation in how cultures have adapted to a particular area. Global comparisons, considering archaeological cultures from the entire globe, have typically focused on major questions in cultural evolution such as the origins of agriculture and states. Although variation is of interest in global comparative studies, the main focus is often on identifying a single or group of similar processes that led to the same result in many areas of the world.

A good example of a regional diachronic comparison is *Ancient Mesoamerica: A Comparison of Change in Three Regions* (Blanton *et al*., 1993). In this work, Richard Blanton and his colleagues examine the evolution of complex societies in Mesoamerica by comparing and contrasting the evolutionary sequences in the

[3] A somewhat different perspective is offered by Robert Carneiro. Carneiro (1962) argued that Guttman scaling can be an effective tool for examining cultural evolution, particularly with synchronic data. Carneiro (1970) put forward a methodology for performing such analyses (which included a list of 618 traits to be used in scaling) along with some promising results. More recently Peregrine *et al*. (2003) have developed a general model of cultural evolution using Guttman scaling.

Valley of Mexico, the Valley of Oaxaca, and the eastern Maya lowlands. Their efforts are explicitly diachronic and comparative: "Controlled comparison and contrast. . . can illustrate very well some of the critical features pertinent to the dynamics of early complex societies" (Blanton *et al*., 1993, p. 35). Such comparison allows Blanton and this colleagues to draw several strong conclusions about cultural evolution in Mesoamerica, for example, that population pressure was not a primary factor in the evolution of complex polities and that early states in Mesoamerica had strong commonalities that only became varied in the Classic and Postclassic periods, especially as markets systems developed and expanded (Blanton *et al*., 1993, pp. 222–242).

An example of a global comparison is Timothy K. Earle's *How Chiefs Come to Power* (Earle, 1997). Earle uses diachronic comparison to examine of the evolution of chiefs in Hawaii, the Andes, and Denmark. Unlike Blanton and his colleagues, Earle's cases are wholly independent of one another, coming from different parts of the world and from time periods when interaction was nonexistent. Thus Earle's cases are explicitly intended to elucidate common processes in cultural evolution (Earle, 1997, p. 17). What Earle finds is that while these cases vary significantly in most ways, within each of them chiefs can be seen to be actively manipulating sources of power for their own benefit. Thus, what Earle identifies as a primary process in cultural evolution is the development and manipulation of available power sources by emergent political leaders. As he puts it: "The multiplicity of lines of social evolution should not obscure the common principles and processes of power politics. Attempts to extend and resist central power characterize social evolution . . ." (Earle, 1997, p. 211).

Diachronic Comparison in Other Disciplines

Archaeologists are not the only scholars who have realized the utility of diachronic comparison using archaeological data. Historians, sociologists, political scientists, and even population geneticists have become increasingly interested what might be loosely termed "macrohistory"—patterns and process that are manifest across wide regions and long time periods (Stokes, 2001). Jared Diamond's Pulitzer prize-winning *Guns, Germs, and Steel* (Diamond, 1999), while criticized for rather simplistic theory, makes good use of diachronic comparison in arguing that environmental differences between the Old World and the New World affected the spread of agriculture and associated diseases and technologies in ways that led to the current global dominance of European-derived populations and cultures. In a somewhat similar vein, historians John R. McNeill and William H. McNeill employ diachronic comparison in *The Human Web* (McNeill and McNeill, 2003) to trace "webs" of human interaction that emerged in the Upper Paleolithic, spread and consolidated through the development of agriculture and states, and became unified in the modern world.

These works use diachronic comparison to understand how diverse cultures in antiquity came to be more similar and "globalized" over time. Population geneticists, following the advent of powerful genetic enhancement and analysis techniques and subsequent demonstration that contemporary populations are of very recent origin, also have become interested in the long-term history of the human genome and have employed diachronic comparisons with some success. Arguably the leading scholar in this field is Luca Cavalli-Sforza, who has combined archaeological and genetic data in sophisticated diachronic analyses to trace the emergence and spread of humans (Cavalli-Sforza *et al*., 1994), agriculture (Ammerman and Cavalli-Sforza, 1984), and contemporary regional populations (Cavalli-Sforza and Feldman, 2003). This pioneering work is being extended and refined by other population geneticists also pursuing diachronic comparisons to understand the spread of modern human populations (e.g., Hammer and Zegura, 2002).

Problems With Diachronic Comparisons

Although these examples certainly do not represent all the diachronic comparative studies that have been performed by archaeologists and other scholars, they do illustrate that these and other comparative studies using the archaeological record are not truly "controlled" in the way that are the studies in comparative ethnology presented in Table I. The examples given here lack a sample representing the entire range of variation—for example, Blanton and his colleagues examine only well-known Mesoamerican cases, while Earle restricts his analysis to cases on which he has personally worked.

There are two problems with this selective approach to the way in which cases were chosen for analysis. First, cases that lacked the conditions of interest, such as the presence of chiefdoms or states, are not considered. In order to know whether certain conditions generally favored the evolution of particular social forms, one has to compare areas with and without the presumed causal conditions. If one looks just at particular regions of the world where the social forms of interest did emerge, one may miss regions of the world where the same or similar presumed causal conditions emerged but the social forms did not. These other areas may be critical to identifying alternative processes that have not yet been considered.

Second, in none of these examples are the units of analysis obviously comparable. For example, although it might appear that the Valley of Oaxaca, the Maya lowlands, and the Basin of Mexico are roughly similar, two (the Valleys of Oaxaca and Mexico) were politically unified while the other (Maya lowlands) was not; similarly the Teotihuacan polity was apparently expansionistic while the Oaxaca and Maya lowland polities were less so. Thus one might reasonably question the comparability of these regions, at least in terms of political evolution. It is also important to note that none of the studies discussed above employ statistical

techniques to determine unique and significant patterns or associations. Thus these comparisons, while insightful and well conducted, are less broadly generalizable than the results presented in Table I.

The lack of controlled diachronic comparisons using archaeological data is a significant one, for as noted above, such comparisons appear to be an outstanding means to study cultural evolution. The types of diachronic comparisons being performed in archaeology today appear incapable of producing broadly generalizable results of the kind comparative ethnology is capable of producing. What the examples reviewed above seem to lack are the very things that give comparative ethnology its strength—large and well-defined samples, well-defined units of analysis, and appropriately employed statistics. In recent years, however, a number of studies have appeared that attempt to create a method for doing comparative ethnology using archaeological data—a method I refer to as archaeoethnology.

ARCHAEOETHNOLOGY

A basic problem facing research in archaeoethnology—lack of a large, well-defined sample of archaeological cases suitable for comparison—has been addressed by the Human Relations Area Files (HRAF) by their commissioning of the *Outline of Archaeological Traditions* (Peregrine, 2001a). The *Outline of Archaeological Traditions* is an attempt to catalogue all archaeologically known human societies, covering the entire globe and the entire prehistory of humankind, using comparable units of analysis termed "archaeological traditions." The current edition (periodic revisions are anticipated as knowledge of the world archaeological record improves) lists 298 traditions. The HRAF also has developed the *Encyclopedia of Prehistory* (Peregrine and Ember, 2001–2002), a nine-volume work providing descriptive information and basic references for all 298 cases in the *Outline of Archaeological Traditions* sample. Finally, HRAF is producing an annually growing Collection of Archaeology to parallel the Collection of Ethnography, arguably the most widely used tool in cross-cultural research. Like the Collection of Ethnography, the Collection of Archaeology provides indexed, searchable, full-text primary source documents for comparative research. At present this collection includes more than 60,000 pages of text on 41 archaeological traditions.

With the basic problem of a well-defined sample of comparable cases solved, scholars can now undertake more broadly generalizable diachronic comparisons using the archaeological record. I suggest that a fundamental area of this research should be the identification of cultural evolutionary trends and the testing of explanations for them. To date one set of data using the *Outline of Archaeological Traditions* sample has been published for this purpose, and a number of evolutionary trends have been identified (Peregrine, 2001b, 2002, 2003; Peregrine *et al.*, 2003). An example of such evolutionary trends is presented in Fig. 1.

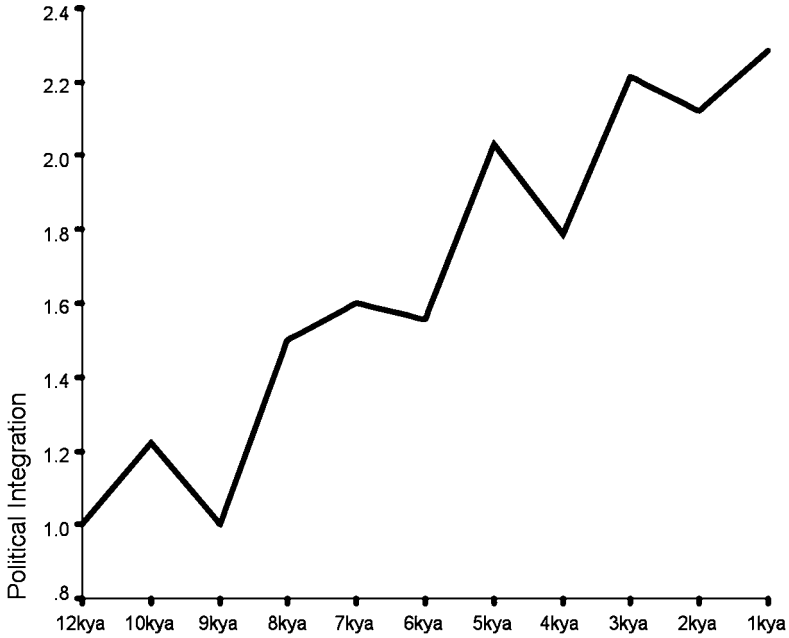

Fig. 1. Increase in political integration over the past 12,000 years.

Figure 1 displays the mean of political integration charted over the past 12,000 years. Political integration is measured on a 3-point scale of political hierarchy adapted from Murdock and Provost (1973) as listed in Table II. Scale score 3 is essentially a proxy measure for the presence of a state according to the Wright and Johnson (1975) definition. Clearly, there has been a strong trend towards increased political integration over the last 12,000 years.[4] Perhaps more significantly, a trend toward increased political integration is also clear if one breaks the archaeological record down into distinct regions, or into specific evolutionary sequences (see, e.g., Peregrine *et al*., 2003). Similar trends have been identified for a number of other variables, including reliance on agriculture, population density, technological

[4]There is an interesting statistical problem in examining cultural evolutionary trends using diachronic comparison—serial autocorrelation. Serial autocorrelation occurs when two cases are not statistically independent because changes in an earlier case causes changes in a later one. Cultural evolution in general can be thought of as a serial autocorrelation process. Change in an ancestral culture will generally lead to those changes being transmitted to descendant cultures; thus the values of a variable reflecting that change will be serially autocorrelated when viewed over time. For example, if members of an archaeological tradition develop metal casting, it is likely that their descendants also will cast metals. A variable examining metalworking technology (and using casting as an indicator of change) will thus present serial autocorrelation between the ancestral archaeological tradition and its descendants, as the development of metal casting in the ancestral tradition is causally linked to the descendant tradition having metal-casting technology. I have elsewhere presented a full discussion of this problem, its potential impact, and methods to correct for it (Peregrine, 2003, pp. 18-20).

Table II. Codes for Variables Used in the Examples

Political integration
1 = Autonomous communities.
2 = 1 or 2 levels of hierarchy above the local community.
3 = 3 or more levels of hierarchy above the local community.
Population density
1 = Less than 1 person/square mile.
2 = 1–25 persons/square mile.
3 = 26+ persons/square mile.
Importance of agriculture
1 = None.
2 = 10% or more, but secondary.
3 = Primary.
Technological specialization
1 = None.
2 = Ceramics.
3 = Metalwork (alloys, forging, casting).

specialization, and general cultural complexity, to name a few (Peregrine, 2003, pp. 11–17).

Identifying such evolutionary trends might appear trivial to most archaeologists—after all, it seems patently obvious that political integration has increased over the last 12,000 years. There are serious scholars, however, even archaeologists, who have argued that such trends do not exist. Kuper (1988, p. 7), for example, recently argued that "there is no way of reconstructing prehistoric social forms, classifying them, and aligning them in a time series." The examples above suggest that Kuper has overstated the situation, and being able to demonstrate this does not seem trivial in a time when even archaeologists can argue that cultural evolution exists more in the mind of the archaeologist than in the record of the past (e.g., Shanks and Tilley, 1992). The more interesting point to make about archaeoethnology, however, is that not only can trends in cultural evolution be empirically identified and examined, but that explanations for cultural evolution can be tested in an objective manner, employing a variety of well-established methods of analysis. In the following section I provide several examples of the types of analyses that are possible.

Explaining Cultural Evolution Through Archaeoethnology

Three variables that have been coded for the *Outline of Archaeological Traditions* sample (Peregrine, 2003) seem to be repeatedly identified as underlying cultural evolution. These are population density, reliance on agriculture, and technological specialization. Codes for these three variables are presented in Table II. Not surprisingly, all three are strongly intercorrelated, and all three correlate strongly with time in years B.P., as shown in Table III. Each has been proposed as something

Table III. Spearman's rho Correlation Coefficients for Suggested "Prime Movers" of Cultural Evolution

	Population density	Importance of agriculture	Technological specialization	Date B.P.
Population density	1.0			
Importance of agriculture	0.817	1.0		
Technological specialization	0.689	0.717	1.0	
Date B.P.	−0.420	−0.484	−0.576	1.0

as a "prime mover" underlying cultural evolution. Population density, for example, has been proposed as the cause of agriculture around the world (Cohen, 1977), and agriculture as the cause of technological innovation (Harris, 1977). These correlations alone suggest such causal relationships may exist, but, as has been said so often, correlation is not equivalent to causation.

A task that might be usefully undertaken through archaeoethnology would be to examine how these variables interrelate and to determine whether change in the value of one causes change in the values of the others. Since these data are diachronic, they should allow for us to see whether change in a presumed causal variable actually proceeded its presumed effects. In other words, one also can examine them as a time series to see whether changes in one or more of these variables precedes changes in the others. This ability to examine causal relationships diachronically is one of the unique strengths of archaeoethnology for identifying and exploring cultural evolution.

Figure 2 shows a time series plot of population density, agriculture, and technological specialization. Unfortunately, there does not seem to be a single causal or "prime mover" variable among the three—each increases at a fairly steady rate, and all tend to increase together. The time series do not appear to provide enough information to determine the causal relationships between population density, agriculture, and technology.

A different method of examining causal relationships—causal modeling—may provide a means to determine whether and how these variables affected and perhaps caused change in the others. Although not necessarily a method that allows diachronic analyses, causal modeling does provide a way to establish quantitative measures of causal connection between variables. It does not provide a means to *prove* that change in one variable causes change in another but, rather, allows for various assumptions about the possible directions of causality to be evaluated. In other words, it provides a way to test models of causal connection but does not independently identify causality (see Birnbaum, 1981).

Figure 3 shows a simple model for the relationships between population density, agriculture, and technology. The correlation coefficients are the same as those presented in Table III. Directionality is not illustrated here, because we have yet to identify causal directions. One way to do so is to examine the partial

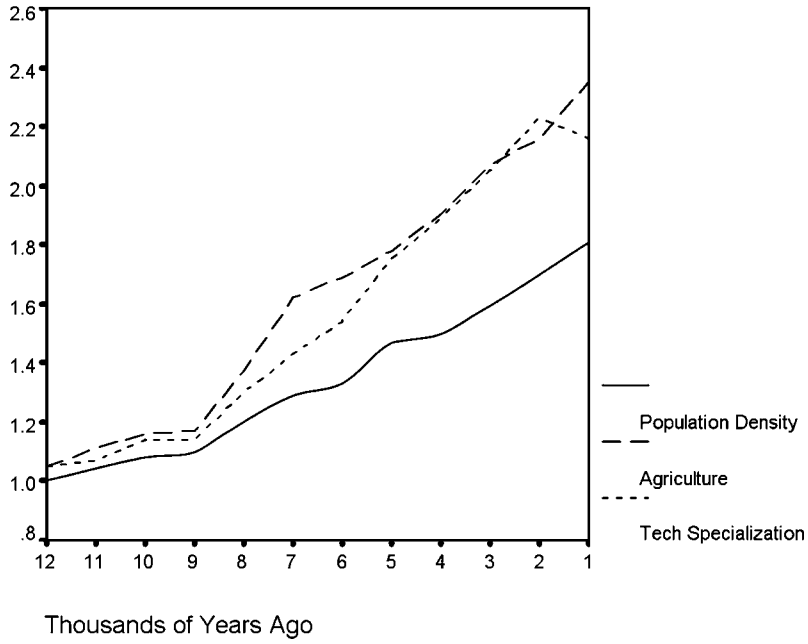

Fig. 2. Time series plot of population density, agriculture, and technological specialization.

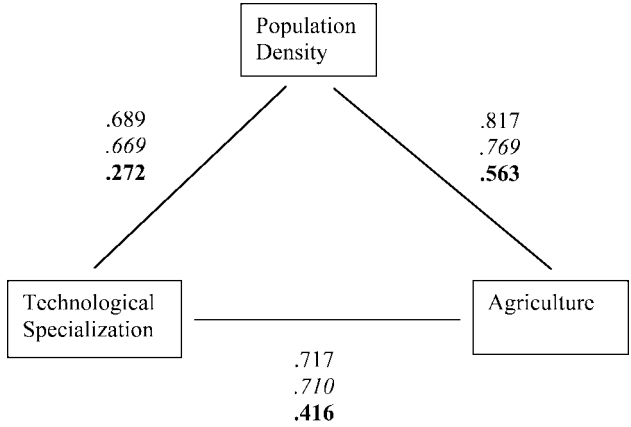

Fig. 3. Correlations between population density, agriculture, and technological specialization. (Partial correlations controlling for date are presented in italics; partial correlations controlling for the third variable in the model are presented in boldface.)

correlation coefficients between these variables when controlling for time, and when controlling for the other variable (an iterative method often referred to as the Simon-Blalock Technique—see Asher, 1983). Partial correlations are presented below the simple correlation coefficients in italics and boldface (Fig. 3).

The coefficients in italics in Fig. 3 are partial correlations controlling for date. Controlling for date seems to have little effect on the connections between these variables; that is, variation seems uninfluenced by date. This is not surprising given the time-series analyses already presented. The three variables appear to change in unison regardless of the time period. Therefore, the fact that causal modeling is not a diachronic method of analysis may not be important in this case. The coefficients in bold are partial correlations controlling for the other variable in the model. These are more interesting, as the correlation between population density and technological specialization drops precipitously when controlled for agriculture, much more than the other correlations drop when controlled for the third variable.

Using basic rules of thumb for causal modeling (e.g., Davis, 1985), we arrive at the parsimonious model presented in Fig. 4. First, because the correlation between population density and technological specialization dropped so precipitously when controlled for agriculture, we can make the assumption that changes in agriculture may be causally related to changes in both population density and technological specialization, and that the correlation between them (without controlling for agriculture) is largely spurious (but see the discussion below). Second, because we know that agriculture is required to sustain high population densities and that ceramics and metalwork are uncommon in nonagricultural societies, we might reasonably assume that agriculture causally precedes changes in the other two variables in a majority of cases. Thus we end up with a causal model in which

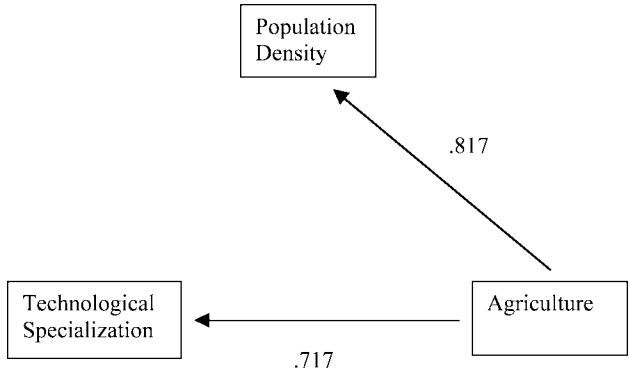

Fig. 4. A parsimonious model of the relationship between population density, agriculture, and technological specialization.

changes in agriculture cause change in population density and in technological specialization.

Once again, causal modeling cannot prove that one variable causes changes in others but provides a method to examine possible causal linkages and to identify those that appear the most likely. In this case it appears that agriculture is the more causally important variable of the three examined, suggesting that both population pressure (e.g., Cohen, 1977) and technological determinism (e.g., elements of both Harris, 1979, and White, 1959) models of cultural evolution are less satisfactory than models that propose changes in subsistence effecting changes in other areas of culture (e.g., Steward, 1955).

Log-linear modeling provides an alternative method of examining causal relationships that is more appropriate for the ordinal data used here. Log-linear modeling is essentially a form of causal modeling like that used above but explicitly designed for use with categorical data. Log-linear modeling allows variables with multiple categories to be used to calculate the odds (i.e., the ratio of favorable to unfavorable responses) that a change in one variable will cause a change in the other (Knoke and Burke, 1980). Like causal modeling, however, log-linear modeling as used here is not a diachronic method of analysis; that is, it does not examine a single case over time, although time can be used as a variable in the analysis.

A log-linear model is basically a statement of the expected frequencies in the cells of a cross-tabulation. To assess how well a given model fits the data, one determines how well the cell frequencies expected in the model approximate the observed frequencies, with goodness-of-fit calculated as odds and odds ratios (often called likelihood ratios). Table IV presents a group of log-linear models for population density, technological specialization, and agriculture, along with their associated likelihood ratios (L^2). By convention, interaction between two variables is noted with a * in describing log-linear models and noninteraction with a +. Thus the relationship between population density, technological

Table IV. Log-Linear Models for Population Density, Technological Specialization, and Agriculture

Model	L^2	df	p
1. {D*T*A}	0	0	—
2. {D*A}+{T*A}+{D*T}	11.07	8	.198
3. {D*A}+{T*A}	34.66	12	.000
4. {D*A}+{D*T}	41.50	12	.000
5. {T*A}+{T*P}	104.07	12	.000
6. {D*A}+T	203.60	16	.000
7. {T*A}+D	266.17	16	.000
8. {D*T}+A	273.02	16	.000
9. {D}+{T}+{A}	435.11	20	.000

Table V. Evaluation of the Improvement of Fit for Log-Linear Models for Population Density, Technological Specialization, and Agriculture

Model comparison	ΔL^2	Δdf	p
2–1	11.07	8	.198
3–2	23.59	4	.000
6–5	99.53	4	.000
9–8	162.09	4	.000

specialization, and agriculture presented in Fig. 3 is represented in Table IV by model 2, while the parsimonious causal model presented in Fig. 4 is represented by model 3.

Unlike ordinary evaluation of contingency tables with statistics like chi-squared, where one usually seeks to find deviations from expected patterns, in log-linear analysis one seeks the best match with expected patterns. Hence, in looking at a table like Table IV, one seeks low values of L^2 relative to the degrees of freedom rather than vice versa. Model 2 has the lowest value of L^2 (except for the "saturated" model 1, which is only used as a baseline in evaluating other models) and the highest degrees of freedom. Indeed, it is the only model that shows nonsignificant deviance from expected values. However, a critical aspect of log-linear analysis is the evaluation of alternative models. Although model 2 appears to best fit the data, it may not be the most parsimonious, nor does it match with our theoretical expectations derived from the causal modeling performed above. To better evaluate the models, one must examine the changes from model to model in L^2 and the degrees of freedom in order to determine whether those changes are statistically significant.

Table V shows the change in likelihood ratios (L^2) and degrees of freedom for four model comparisons. The changes are the simple difference in the values of L^2 and degrees of freedom for each model, while p can be calculated from a standard chi-squared table using the values of ΔL^2 and Δdf. Looking at these it would appear that model 2 may indeed be the most parsimonious. Model 2 shows a significant change in L^2 relative to the change in the degrees of freedom when compared with model 3, and it provides an acceptable fit with the expected values. On the other hand, the change in L^2 from model 2 to the "saturated" model 1 is not statistically significant. Hence, model 2 appears to be the most parsimonious.

Causal modeling suggested that the relationship between population density and technological specialization was not important and could be dropped from the model. Log-linear modeling suggests the opposite, that including the interaction between population density and technological specialization significantly increases the fit of the model despite the loss of degrees of freedom. Why is there a difference between the results of these exercises in modeling? The simple answer may be that the techniques used are different and therefore yield somewhat

different results. It may simply be that the results of the time-series analyses gave the clearest picture—that these variables mutually affect one another over short periods of time, and it may be impossible to identify a clear causal or "prime mover" variable among them.

Cultural evolution appears to be multicausal, and as we move toward explaining cultural evolution, we must avoid the desire to overly simplify what appears to be a complex, multivariate set of relationships. The point I hope I have made here is that archaeoethnology provides a way to begin exploring this complex set of relationships using empirically based statistical and modeling techniques.

CONCLUSIONS

My purpose in the above section was to introduce the field of archaeoethnology—comparative ethnology employing archaeological cases—and illustrate some of the methods that might be employed to identify cultural evolutionary patterns and to evaluate theories of cultural evolution. Archaeoethnology is a new field, and few results have been published. However, in terms of cross-cultural approaches in archaeology, archaeoethnology appears to be among the most promising avenues for future research. Other promising avenues for future research exist in comparative ethnology, particularly identifying additional archaeological indicators of behavior and refining those that have already been proposed, and in comparative archaeology, especially to gain a better understanding of variation in prehistoric cultures and archaeological attributes. Cross-cultural approaches employing simple ethnographic analogy, although commonly used, appear to be laden with problems and perhaps should be curtailed. This seems true for some areas of ethnoarchaeology as well, particularly when research is not aimed at evaluating specific theories or hypotheses. Simple analogies are untrustworthy because they are not generalizable. The main point of this paper is to illustrate the fact that there are cross-cultural approaches in archaeology that can provide generalizable results, and their use should be encouraged

ACKNOWLEDGMENTS

Many of the ideas and examples presented here are adapted from previous articles in *Annual Review of Anthropology* (Peregrine, 2001a), *Cross-Cultural Research* (Peregrine, 1996a; Peregrine *et al*., 2003), and *World Cultures* (Peregrine, 2003). Table I was adopted from a version presented by Carol Ember at the Santa Fe Institute in April 2003. Various portions of this paper were read and commented on by Richard Blanton, Robert Carniero, William Divale, Timothy Earle, Carol Ember, Melvin Ember, Gary Feinman, Robert Graber, J. Patrick Gray, and three

anonymous reviewers. Not all of their suggestions were incorporated, but their efforts are deeply appreciated.

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