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Author(s): Hartmut Tschauner

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ARCHAEOLOGICAL SYSTEMATICS AND CULTURAL EVOLUTION: RETRIEVING THE HONOUR OF CULTURE HISTORY

HARTMUT TSCHAUNER

Harvard University

This article attempts to show how archaeological systematics can be predicated on evolutionary theory, and to determine what kind of theories of cultural evolution would be best suited to provide a theoretical framework for archaeological classification. Appropriate Darwinian models of cultural evolution are briefly outlined. This is followed by a discussion of biological taxonomy and its relation to evolutionary theory. Binford's processualist 'new systematics' and culture-historical space-time systematics are then examined from a Darwinian culture-evolutionary perspective. Despite its explicitly evolutionist rhetoric, processual archaeology is found to be fundamentally non-evolutionary. However, elements from culture-historical space-time systematics can be used in the construction of a framework for archaeological systematics informed by Darwinian cultural-evolutionary theory, in a manner similar to the way species-level classification in biology is informed by biological evolutionary theory.

Introduction

Few archaeologists will deny that their discipline deals with evolutionary processes. 'Evolution' is a very common theoretical framework for those whose ultimate goal is the explanation of culture change. However, the specific concepts of cultural evolution in the archaeological literature vary widely. Seldom are they compatible with Darwinian evolutionary theory, though such compatibility would appear to be desirable for explanations of the interface between biological and cultural evolution and of the evolution of culture itself (cf. Flannery 1972: 399-400). This article takes an explicitly Darwinian stance, though this should not be confused with biological reductionism: selectionist explanatory frameworks may have great heuristic value in the explanation of purely cultural processes by postulating mechanisms central to the generation of change and maintenance of stability (Cullen 1990: 61; Shennan 1989: 344).

Classification, like evolution, is also fundamental to the archaeologist's conceptual repertoire. Yet the specific approaches to archaeological systematics are very heterogeneous, as the extensive literature on archaeological typology bears out.

The interrelation between cultural evolution, and archaeological classification may not be immediately obvious. In biology, taxonomy is inseparably

tied to evolutionary theory. The archaeological literature on typology, on the other hand, generally lacks a theoretical framework that gives meaning to classificatory units (cf. Dunnell 1986: 150). For this reason, it is cogent to examine the relationship between evolutionary theory and systematics in order to determine whether evolutionary theory can provide a theoretical rationale for archaeological classification.

The purpose of this article, then, is twofold. It attempts to show how archaeological systematics can be predicated on evolutionary theory, and to determine what kind of theories of cultural evolution would be best suited to provide a theoretical framework for archaeological classification. I present appropriate Darwinian models of cultural evolution and discuss the relationship between biological taxonomy and evolutionary theory. I then examine Binford's 'new systematics' and culture-historical time-space systematics from a Darwinian culture-evolutionary perspective, before considering the relationship between evolution and classification in archaeology.

Models of biological and cultural evolution

The term 'evolution' has been part of the vocabulary of anthropologists and archaeologists for a long time. However, most models of cultural evolution ultimately stem from Spencer, rather than from Darwin. They are transformational (i.e., they regard the evolution of culture or cultural systems as analogous to the ontogeny of an organism), and thus represent empirical generalizations about the record of change. As such, they lack the crucial element of Darwin's theory of evolution (cf. Ayala 1970: 2) – that is, the mechanism that explains how change is generated (see, for example, Blute 1979; Dunnell 1980; Rindos 1984 for extensive discussion of the distinction between Darwinian and transformational models of evolution). These transformational models therefore cannot be regarded as explanatory, scientific or evolutionary theories.

Only recently have some social scientists begun to take steps towards an explicitly Darwinian theory of cultural evolution, as an outgrowth of the sociobiology debate (e.g., Campbell 1975; Cavalli-Sforza & Feldman 1981; Durham 1976a; 1976b; 1982; Pulliam & Dunford 1980; Richerson & Boyd 1978; Boyd & Richerson 1985; Rindos 1984; 1985). Darwinian evolutionary theory explains change as differential persistence of discrete variability. As implied in the terms change and persistence, the phenomena being examined are supposed to be historically and empirically related to one another. Change is viewed as a selective and not as a transformational process (except for the transformations of higher-order entities, see Hull 1980: 327). It is accomplished by alterations of the frequency of discrete variants through selection, rather than alterations in the form of a particular variant (Dunnell 1980: 38).

In Darwinian models of cultural evolution, culture is understood as an inheritance system, parallel to and not directly controlled by the genetic inheritance system, and with potentially different life cycles and patterns of

transmission.¹ To predict the phenotype of a cultural organism (at least in principle) one must know its genotype, its environment and its culture-type, i.e., the cultural message that the individual inherited from other individuals and whose transmission depends on the phenotype of individuals in the previous generation (Richerson & Boyd 1978: 128). Culture is defined as 'information capable of affecting individuals' phenotypes which they acquire from other conspecifics by teaching or imitation' (Boyd & Richerson 1985: 33). The key elements of this definition are information and social learning. The 'cultural repertoire' which an individual inherits is analogous to and supplements his or her genotype. In Boyd and Richerson's model, selection refers to the differential 'reproductive success' of cultural models. This is brought about by certain 'forces' in the processes of transmission. There are several forces, since cultural transmission can obviously be oblique (i.e., not only transgenerational). These include stochastic variation and guided variation; that is, modification of inherited cultural instructions through individual trial-and-error learning. Another force is biased transmission; this comprises direct bias, indirect bias and frequency-dependent bias, i.e., preference for some cultural variant through direct evaluation of that variant, indirect evaluation based on some indicator trait, or conformist acceptance of the most frequent variant. The final force is natural selection; that is, heritable phenotypic cultural variation is associated with variation in individual survival and reproduction so that the frequency of the variants with the highest probability of being transmitted to the following generation will tend to increase (see Boyd & Richerson 1985: chs 4-8).

Boyd and Richerson's theory belongs to the group of models which Rindos (1984) has labelled cultural selectionism. Other authors (Cloak 1975; Cullen 1990; cf. Durham 1976*a*: 105; Rindos 1984: 78-9; Shennan 1991: 207) have proposed idealist, yet strictly Darwinian variants of this approach. In this latter view, cultural instructions or memes are likened to viruses, differentially reproducing in purely symbolic, cultural environments within human minds. Fitness is thus defined in terms of psychological appeal to human culture bearers. It is the instructions themselves which are selected (i.e., differentially reproduce), not the individuals who have acquired them and who are more or less successful as models in their transmission to culturally naive individuals. In the idealist view, this is the only process of cultural evolution. It is addressed by the Boyd and Richerson model which acknowledges that many cultural traits are not directly related to reproduction and survival; psychology, rather than natural selection, therefore needs to be invoked to account for the persistence of such traits (cf. Rindos 1989*b*: 19, 25).

Systematics and evolution in biology

Let us now examine the interrelationship between evolution and systematics in biology (the following discussion draws heavily on Mayr [1981; 1982] and Bock [1977]). The early histories of biology and of archaeology were

characterized by heated debate over the 'reality' of taxonomic units, an issue which continues to be controversial. Darwin must be given credit for settling the early disputes and for founding the modern theory of biological classification. His theory of 'descent with modification' accounts for most of the similarities and differences between organisms and is thus the explanatory framework on which biological taxonomic hierarchies are grounded; these taxa work because the processes of organic evolution led to a branching tree – the phylogeny that actually occurred in history. Nevertheless, this does not mean that biological classifications are 'natural' in the sense of being biological categories inherent in nature and awaiting 'discovery' by biologists. One approach that operated on this inductivist assumption was numerical phenetics, i.e., grouping according to overall similarity based on a maximum number of unweighted 'unit characters' (see Sneath & Sokal 1973: 74). However, the attempts of this approach to develop methods for grouping species into 'natural', objective, repeatable, phenetic macrotaxa turned out to be futile and invalid.² There can be no 'natural classification', if a natural classification is 'a concept that presumes an order in the environment of a system which can be perceived and understood by that system without being influenced or defined by it' (Voorrips 1982: 98). Yet evolutionary biologists evidently do hypothesize that their taxonomic units are adequate descriptions of real entities in the natural world, and of the genealogical history and relatedness of species.

The principal purpose of species-level classifications in biology is to establish monophyletic taxa, i.e., taxa consisting of the descendants of a common ancestor. The intimate relation of classification to evolutionary theory is most evident in cladistic analysis: characters of related taxa are partitioned into ancestral (plesiomorph) and uniquely derived (synapomorph), and the uniquely derived characters are traced backwards in order to find branching points in the phylogeny of those taxa. Of course, it is problematic to determine synapomorphy; the joint possession of uniquely derived characters can mean either common ancestry or convergence, and the direction of evolution is not self-evident. Cladistic classifications are classifications of traits rather than of organisms. Mayr's (1981) 'evolutionary taxonomy', on the other hand, builds upon cladistic analysis, but gives considerable weight to characters due to subsequent evolutionary changes of the split lines; in this way additional evolutionary principles can be incorporated (e.g., inferences on selective pressures, rates of evolutionary divergence, etc.).

The minimal unit of biological macrotaxonomy is the species. Individuals are identified – that is, assigned – to an appropriate species (microtaxonomy). Species taxa are groups of populations, not typological units. They are not defined by their degrees of similarity and dissimilarity, but by their distinctness, i.e., reproductive isolation from one another. Reproductive isolation is the feature that distinguishes biological species from cultures: cultures are comparable to species in so far as they are particular 'lineages' of culturally transmitted information that have temporal and geographic boundaries

(Rindos 1989b: 7), but they are never isolated, since there is inevitably a flow of information between them. In addition to having developed reproductive isolating mechanisms, a species occupies a specific ecological niche, since in the process of speciation it needs to acquire certain specific adaptations which permit its coexistence with potential competitors. As the basic unit of biological systematics, the species is thus not a formally defined classificatory unit; its definition is genuinely biological.

Biological classification, in short, is inextricably intertwined with evolutionary theory. It is a hypothetico-deductive procedure testing the proposition that the members of each taxon are each other's closest relatives and descendants of a common ancestor (monophyly). Classification is the biologist's method of inferring the phylogenetic relationships postulated by evolutionary theory, the ordering of organisms by origin. These relationships are measured by classifications in that discrete units of variability are assigned to classes³ derived from evolutionary theory. Classes are designed to reflect natural relations between the classified organisms as hypothesized by the theory of descent with modification. Biological classes, in brief, are observer-generated propositions about nature. In this sense, biological classification is the implementation of Darwin's theory of descent with modification. Since biological classifications are hypotheses, they can be right or wrong; they are falsifiable because their units have a well-defined meaning in the theory of evolution. Mayr (1981) concludes that for these reasons the classification of living organisms is not similar to that of inanimate items (cf. Brew 1946: 46-57).

Evolution and Binford's 'new systematics'

The revival of evolutionism is identified by Willey and Sabloff (1980: 181, 186) as one of the predominant characteristics of the 'New Archaeology' of the 1960s. 'Processual archaeology' has gained general acceptance as the name of this school, since this conveys that the explanation of culture change is its principal goal (cf. Renfrew 1973; Hill 1977). In one of his early programmatic articles, Binford (1972) explicitly linked archaeological systematics and the study of culture process. A consideration of this article provides revealing insights into the relationship of the 'New Archaeology' and its systematics to evolutionary theory.

Binford (1972: 196-7) criticizes the normativist view of culture for conceiving of cultural products as objectifications of normative ideas which the archaeologist then has to infer from material items; the formation of units of classification is dependent upon assumptions about the 'dynamics of ideational transmission', that is, the passing down of cultural information from generation to generation and its diffusion between social groups not linked by regular breeding behaviour, culture in this approach being viewed as a great, internally undifferentiated 'whole'. Change over time is explained as the result of 'drift' or of innovations, both of which are held to be natural to culture. The assumptions of culture history criticized by Binford, as far as

(selectively) summarized here, are fairly compatible with modern models of cultural evolution (except for the notion of culture as a 'great whole'; moreover, the units of cultural transmission remain enigmatic).

The alternative which Binford (1972: 198) proposes confirms the nonevolutionary tone of his critique of culture history. Explaining artefact variability in ecological terms, Binford assumes a direct link between behaviour and environment and thereby attributes overriding importance to individual trial-and-error learning rather than cultural transmission (Shennan 1991: 205). Binford's systematics does not deal with culture, that is, with information, but with sociocultural systems (cf. Binford 1982: 162). These comprise material things, many of which are not, or are only in part, objectifications of culture (most importantly, human beings themselves). Furthermore, sociocultural systems are treated as components in a field that also consists of environmental and other sociocultural subsystems. In such an all-encompassing systemic perspective, change cannot of course be viewed as selective; it has to be intrasystemic and hence transformational. Evolution becomes the unfolding of a system or organism whose identity is preserved in the process. Binford is entirely within the Whitean-Spencerian tradition. The systematics he proposes follows the same functional line:

Culture is not a univariate phenomenon, nor is its functioning to be understood or measured in terms of a single variable – the spatial-temporal transmission of ideas. On the contrary, culture is multivariate, and its operation is to be understood in terms of many causally relevant variables which may function independently or in varying combinations. It is our task to isolate these causative factors and to seek regular, stable and predictable relationships between them. Our taxonomies should be framed with this end in mind. We should partition our observational fields so that we may emphasize the nature of variability in artifact populations and facilitate the isolation of causally relevant factors. Our categories should be relevant in terms of possessing common structural or functional properties in the normal operation of cultural systems. These categories should then be analysed in terms of their behavior in various systems and in situations of systemic change (Binford 1972: 199; cf. 1968: 22-4).

This is a classical formulation of synchronic, ecological-functional proximate causality as opposed to evolutionary ultimate causality (cf. Pianka 1978: 15). Explanations are couched in functional terms, change is conceived of as a transformation of those comprehensive systems of which culture is but a subsystem (cf. Binford 1962: 217), and equilibrium and disturbance to equilibrium are the forces which explain all change. This view of culture, analogous to mixing up evolution and succession in biological systems, is totally incompatible with Darwinian models of cultural evolution. Binford's systematics accordingly aims at the reconstruction of past cultural systems and their functioning. Although the study of culture process became its hallmark, the rise of the 'New Archaeology' can also be interpreted as a shift in the time scale of archaeological objectives from diachronic culture history to synchronic systemic reconstruction, reflecting the (supposedly) better chronological resolution that archaeology had achieved by that time (cf. Shennan 1989: 330). The artefact is seen as participating in various cultural and natural subsystems; the purpose of systematics is to isolate these diverse

sources of variability and thus to contribute to an understanding of the functioning of the entire system (cf. Binford & Binford 1983: 74).

Nothing is wrong with an understanding of the sources of artefact variability; the lack of such an understanding was the single greatest weakness of culture history. Nor is there anything wrong with the reconstruction of sociocultural systems and their functioning. But unless we are willing to work on the assumption of relatively large-scale group selection (which, although no longer popular in biology, cannot be discarded from the outset in cultural evolution), and unless we exclude the natural environment from the definition of the systems whose trajectories we seek to explain (slipping into an easily misunderstood transformational language), change cannot be selective, and our models are not compatible with Darwinian evolution. Functionalism, systems theory, adaptation, transformation and reconstruction have become the dominant themes in the processualist approach to the explanation of culture change (see Dunnell 1980: 75-82). The examples of such models are countless, the best known probably being Flannery (1972). None of the basic characteristics of Darwinian evolution (selective process, discrete variability, changes as alteration in the relative frequencies of discrete variants through selection) can be found here. Despite the explicitly evolutionist rhetoric of the processualist school, the systematics proposed by Binford does not have anything to do with evolution. Neither does 'culture process'.

Culture-historical systematics and evolution

As we saw, in biology there is a single best, though imposed and not 'natural', classification because biological classification has a well-defined goal and builds upon a well-defined theory – Darwinian evolution, i.e., descent with modification. Attribute evaluation is guided by this goal and theory. Conceptual classes are used to measure the distribution of units created by the theory. If our goal is to construct a framework for archaeological systematics informed in a similar fashion by evolutionary theory, rather than creating an entirely new approach, we may retrieve elements from culture-historical space-time systematics. This is what the following section intends to show. Thus, the section is deliberately ahistorical, focusing as it does on a few rather recent and sophisticated culture historians and extracting from their methodological writings only those elements suitable for the present purpose.

In his analysis of culture-historical classification method, Dunnell (1986: 167-76) concludes that this method assumes etic classes embedded in a materialist, as opposed to essentialist, notion of variability; the world is not conceived as a finite set of 'pre-packaged' discontinuities. Variability can thus be described both qualitatively and quantitatively. The method produced problem-oriented and hence testable classifications whose goal and criterion for evaluation was historical significance (independently verifiable ordinal

chronologies). Behavioural, cultural interpretations, according to Dunnell, were superimposed *ex posteriori* on this scheme.

Dunnell's analysis is accurate so far as the materialist notions of variability, problem orientation and testability are concerned. But behavioural interpretations were an essential part of culture-historical reasoning and were not as unwarranted as Dunnell would have us believe. It is my contention that culture history was based on a rudimentary theory of cultural evolution, not unrelated to modern versions of such theories, and its classification method was derived from that theory.

The works of Rouse and Krieger, eminent and influential culture historians, bear this out. Although Krieger's position is somewhat ambiguous (1944: 271-2, 277-8, 280-1), Rouse (1939: 14; 1944: 202; 1962: 89) clearly defines types as classes – i.e., conceptual categories or attribute clusters (see Dunnell 1971) – because only classes are not contingency-bound and are thus appropriate as measurement scales. Types are constructed by the archaeologist, that is, they are observer-generated. Yet it is *hypothesized* that the type replicates an emic unit in the classificatory system of the culture under study (Rouse 1939: 15, 19-20; Krieger 1944: 278). This is analogous to biological species except for the species' reproductive isolation. It is the ideational elements that are cultural, not the artefacts themselves which are studied by the archaeologist as the material manifestations of cultural instructions. Artefacts are the products of culturally transmitted information working upon material found in the environment, with phylogenies existing in the transmission of this information and selection working on the information and/or the product (Rindos, pers. comm.). From a cultural-selectionist point of view, this constitutes a difference between archaeological and biological classifications, because the latter are made of whole organisms while the former are made only of parts of the human phenotype. This is not the case, however, in the virus models of the evolution of cultural ideas discussed above.

The behaviour that leads to the production of an artefact is induced by cultural instructions and is also influenced by stochastic and environmental factors, physical capacities of the artefact makers and individual habits (Rouse 1939: 17-18; 1960: 313-14; cf. Taylor 1983: 117-32). 'Historical significance' is the criterion used by Krieger to test the type hypothesis; that is, a class is a type only if the group of artefacts defined by it can be shown to have been produced during a particular span of time at a particular location inferred from its associations or outside evidence. Classes are formed in a trial-and-error procedure, a primitive form of 'variable construction' (Voorrips 1982), until a spatial-temporal distribution has been reached which meets the above condition. From the distribution it is inferred that the type is culturally or behaviourally emic (Krieger 1944: 272; 1960: 149; see also Sabloff & Smith 1969: 278; Smith & Gifford 1965: 501; Smith *et al.* 1960: 332). Culture historians' often rather far-reaching sociological statements (about the details of cultural transmission, in Darwinian parlance) clearly could not be corroborated by such a test. Rouse (1960: 313-14) proposes to isolate cultural

from noncultural modes following the step-by-step decision-making process of the artisan in producing an artefact. Chronology, even though it is the culture historians' proclaimed goal, is not all there is to culture history.

Modes and types are believed to be handed down from generation to generation. Cultural traits originate by invention or diffusion; they persist and their relative frequencies may change through selection by people's preferences and/or interaction with the environment, and eventually they get extinguished or replaced (Rouse 1939: 15; Krieger 1944: 272; cf. Taylor 1983: 143). Thus culture change is viewed as the alteration of relative frequencies of cultural traits or selection (cf. Ford's [1962] seriation method) and 'the phenomena examined are historically and empirically related to one another' (Dunnell 1980: 38), since culture is treated as an inheritance system. Hence the basic tenets of evolutionary theory are satisfied.

According to Krieger (1944: 272), the purpose of typology is the retracing of cultural developments and the relatedness of cultures: the 'proof of evolution in cultural products by means of exhaustive historical study' (Krieger 1944: 283), in short, cultural phylogeny, the essence of evolutionary culture theory (Durham 1990: 189; cf. Shennan 1989: 331-2). Krieger himself is somewhat reluctant to call this 'evolution', and proposes 'replacement of types' as a better term, the latter being distinctly more 'evolutionary' than the transformational model behind his usage of the term 'evolution'.

Up to this point the evolutionary interpretation of culture history holds. However, Rouse's and Krieger's normativist assumptions do not fit in. Rouse (1939: 17-18; 1960: 313; 1962: 89) views modes and types as community-wide standards, but does not see individual peculiarities as cultural; to Krieger, within-group variation is but 'noise' (1944: 272; see also Gifford 1960: 343 for an especially clear example). This normativist assumption is Dunnell's *ex posteriori* essentialist element of culture-historical classification method. Cultural variants are badly neglected, and the normativist assumption is both theoretically and methodologically unwarranted.

Culture history and its systematics are formally compatible with evolutionary theory. Distributions of groups defined by observer-generated classes are used to test hypotheses about reality, namely, that the classes are behaviourally emic and are related to one another. If biological classes are propositions about nature, culture-historical classes are propositions about culture. The explanatory power of culture history may seem limited, although the analogy to biological evolution is strong. This probably stems from the fact that the relatedness of cultures is intuitively convincing, while Darwin's postulate of the relatedness of species was a major breakthrough. Furthermore, the normativist model is unwarranted and does not account for individual variation and the complexities of cultural transmission which were reduced to a single nebulous process called "diffusion", thereby eclipsing the study of cultural descent (Durham 1990: 191). Most of these problems are caused by a failure to understand the sources of artefact variability.

Some implications for archaeological artefact analysis

Artefacts can be viewed as the products of culturally transmitted information (cultural instructions or memes), in conjunction with the physical capacities or motor habits of the makers as well as stochastic factors, working upon material found in the environment. Phylogenies exist in the transmission of the cultural information that gives rise to the making of an artefact. Selection operates on the information – through people's preferences or choice – and/or on the artefact whose performance is put to the test by the environment and then judged by people, which results in evolutionary feedback to the cultural inheritance system. Thus, in a strictly Darwinian perspective which focuses on the evolution of cultural instructions or memes, people are the selective agents, and the human mind is the arena of cultural evolution (cf. Ruyle 1973). It follows that at least in a formal sense we know the selective agent of cultural evolution by default. Understanding why past human actors selected particular cultural instructions is clearly relevant to an approach which attributes the fundamental role of selection to individual choice; however, this is beyond the scope of a descriptive-evolutionary archaeological systematics. When evolutionary biologists demonstrate the descent of one species from another – the main purpose of biological species-level taxonomy – they are clearly making a meaningful proposition, even if they do not explain why this happened. Hence, of the two evolutionary processes, transmission and selection, our classifications should primarily focus on measuring transmission – that is, establishing cultural phylogenies or descent.

This position differs from cultural selectionist approaches to archaeological systematics (see Braun 1987; Neff 1992; 1993) which lay emphasis on the measurement of selection rather than of transmission. Cultural selectionists regard only functional variation as selected (Dunnell 1978a; 1978b; Neff 1993: 27), because in their view it is the artefact as part of its makers' and users' phenotypes which is selected by the environment. The task is therefore to distinguish functional from non-functional variation and to understand the selective advantages of an artefact's functionally significant properties within the context of other features of the makers' phenotypes. There is some disagreement among cultural selectionists as to the definition of 'functional variation'. Dunnell (1978a; 1978b) suggests a dichotomy of functional and selected versus non-functional, stylistic (i.e., resulting only from proximity or distance in time and space) and selectively neutral variation; in contrast, reacting to recent models of the functions of style in non-verbal communication (see, for instance, Conkey & Hastorf 1990; Hegmon 1992), Neff (1993: 27–8) proposes a continuum of style and function and more or less selectively relevant traits, and he seems to attribute some selective significance to 'stylistic' behaviour. However, on the whole the cultural selectionist position is an unnecessarily restricted, 'materialist' version of Darwinian cultural evolutionism.

If our classifications are to measure cultural transmission and descent, they must be designed to establish the spatio-temporal continuity of cultural instruction sets. And this is what culture history was all about. But, as already mentioned, the major shortcomings of culture history, from a Darwinian standpoint, were its typological thinking, i.e., the attempt to subsume, rather than describe, the range of artefact variation – which is the material of evolution – and its normativist neglect of cultural variants. The type-variety system provides a particularly clear example of this flaw (Gifford 1960; Sabloff & Smith 1969; Smith & Gifford 1965; Smith *et al.* 1960): rather than being a description of some real cultural phylogeny observed in the archaeological record, its taxonomic hierarchy is made up of preconceived units defined by standardized sets of attributes which are held to be universally of use in identifying social units at different (and likewise preconceived) levels of inclusiveness, and the transmission of cultural information between them. Using such standardized attribute sets, type-variety classifications hide, rather than describe, much of the existing variation. Culture historians did not probe the particulars of cultural inheritance, assuming that everything cultural was a community-wide standard or norm. In spite of Rouse's and Krieger's theoretical constructs, the problem was most often reduced to the question of whether a trait was of local or 'foreign' origin. Culture is a population-level phenomenon, but a culture is a distribution of individual cultural variants. Variability is always present and, rather than the origin of a trait, it is the competition between traits that is important in explaining history. Culture history must therefore be radically purged of the normativist assumption if it is to be made a tool in the study of cultural descent.⁴

I discern three basic tasks for a Darwinian archaeological systematics: (1) to identify the cultural instructions which gave rise to the making of the artefacts under study; (2) to describe the range of variation or diversity of such instructions at any point in time and space, as well as the changes of this diversity through time – that is, cultural evolution; and (3) to trace the flow of cultural instructions both through time at any one site (transgenerational transmission) and across space (oblique transmission), beginning at the intra-site level and distinguishing homologous from analogous variation.

Identifying cultural instructions from prehistoric artefacts and tracing their spread can be problematic; in fact, Neff (1993: 25) argues that cultural instructions are simply not observable in the archaeological record. An artefact is likely to be the product of multiple cultural instructions, all of which can stem from different sources. Culture can be transmitted piecemeal, the units of transmission being entirely unknown (Boyd & Richerson 1985: 37; Lumsden & Wilson [1981] postulate bits of cultural information which they call *culturgens*); and every element in the cultural instruction set of an individual can be inherited from different cultural parents and/or be acquired or modified by individual learning. In contrast to organic evolution, cultural evolution thus need not lead to tree-like branching of isolated populations. Archaeological systematics is therefore a far more complex task than is

biological systematics (cf. Cowgill 1989: 132) where entire sets of traits, except for some degree of phenotypic plasticity, can reasonably be assumed to be controlled by the genome.

One promising approach to these problems can be found in ethnoarchaeology. Friedrich's (1970) and Lathrap's (1983) studies of learning patterns and the spread of decorative ideas among modern potters are short-term observations of ongoing cultural evolution and can produce much needed evidence on the units of transmission in the context of artefact making. Insights from such studies can subsequently be applied to archaeological cases. In an archaeological context, we may not be able to prove cultural significance (Dunnell 1971: 133-8; cf. Read 1982). However, if multiple dimensions of variation of prehistoric artefacts are described, including step-by-step reconstructions of the production process and objective design classifications down to the level of minimal design units (cf., for instance, Plog 1980), artefacts can be compared along all of these dimensions, searching for those similarities which are of relevance to the study of cultural transmission. To some extent this will remain a trial-and-error procedure, as it was in culture history.

Binford (1968: 9-11) long ago criticized culture history because it was unable to distinguish analogous variation (transmission) from homologous variation (convergence). However, this problem may be solved by studying the developmental sequences of the individual cultural instructions we have identified, paying close attention to stratigraphic evidence, and by comparative analysis of several traditions: if some functionally significant feature develops in several different artefact traditions, while otherwise these traditions do not display a trend towards increased similarity, convergence is strongly suggested (cf. Braun 1987). Clearly, this implies an ability to distinguish functional from non-functional artefact variation, particularly through controlled replication experiments.

To trace the spread of a cultural instruction, we need to investigate where it develops locally and where it appears without an *in situ* developmental sequence. Precise independent datings of its appearance at each site are required; making use of similarities for cross-dating – as is common practice in archaeology – would be a totally circular procedure for the purpose of tracing transmission. Obviously, archaeometric source tracing techniques will be of use in this context.

In contrast to culture history's normativist assumptions discussed above, cultural transmission should be studied at the intra-site level too. The contribution of Binford and others towards an understanding of the sources of artefact variability are of the utmost importance in this context. Methods more sophisticated than those available to culture history, developed with reconstructionist goals in mind, must be applied to determine whose 'norms' or 'cultural ideas' are expressed in artefacts and who inherited which trait from whom. Krieger's (1944: 283) 'proof of evolution in cultural products by means of exhaustive historical study' quite aptly enunciates this objective of a micro-level culture history.

So far, ceramic sociology has come closest to such an approach (leaving aside problems with the specific methods used, which have been much discussed in the literature). Hill's (1970) underlying assumption that pottery designs are passed down from generation to generation within kinship groups and are modified by the transmission process, is cultural evolution in the strictest sense, and it is micro culture history. Whallon (1968: 229) explicitly compares diffusion, the process of style being influenced by the interaction between artisans and the distribution of stylistic elements, to gene flow and the distribution of genetic traits. Plog (1978; 1980) has shown that a synchronic, systemic reconstruction is indispensable to a reconstruction of the flow of cultural information. In biology, ecology and evolution are also interdependent. Ideally, individuals should be identified (cf. Hill & Gunn 1977; Hill 1978). Since individuals have been regarded by and large as methodologically inaccessible (Shennan 1991: 199), this will require the study of novel lines of evidence, e.g., Tretyakov's (cited by Childe 1943: 6) sex identifications from fingerprints left on ceramic vessels by their makers or motor habits used by Hill (1978); most importantly, external evidence from contextual information and independent dating procedures must be fully exploited.

Many of the arguments advanced in this section will already be familiar from rather dated methodological debates. This should come as no surprise given the major point of this article: a sophisticated version of culture history is a Darwinian archaeological systematics.

Conclusion

I have shown that the 'core' of culture history and its systematics is reasonably compatible with Darwinian theory of cultural evolution, culture being conceived of as an inheritance system, variability as discrete, and culture change as the alteration of relative frequencies of cultural traits or 'selection'. This does not mean that I believe culture history to be an explicitly and perfectly Darwinian evolutionary approach. Rather, this article is an attempt to retrieve the honour of culture history by demonstrating that it is culture history and its ostracized 'space-time systematics' that are required if we are interested in the evolution of culture. It must be the goal of our classifications to determine cultural instructions and to establish their 'genealogies' and that is what culture history is all about. Mayr's (1981) remark, mentioned above, that the classification of living organisms is different from that of inanimate objects does not apply to objects produced by cultural behaviour, if cultural behaviour is viewed as the result of cultural stimuli subject to evolutionary processes that closely parallel those of organic evolution. The relation between archaeological systematics and cultural evolution does not necessarily greatly differ from that between systematics and evolution in biology. Hill and Evans (1972: 238) thus miss the point when they criticize culture history for presupposing single best typologies: there are single best typologies for the purposes of culture history and 'natural' taxa in an evolutionary sense, just as there are single best biological taxonomies, if these are

conceived as hypotheses about the evolutionary history of the units formed. A critique of culture history as mere time-space pigeonholing would also miss the point, although in practice of course it often degenerated into exactly that. The distribution of artefacts in time and space was used as a test implication to support or falsify the hypothesis of the cultural significance of the units formed (even though strictly speaking this cannot be proven, see Dunnell 1971: 133-38; cf. Read 1982). Evolution is a much less spectacular, descriptive-looking, explanatory framework than is often assumed: evolution is a unique historical process; it is governed by all kinds of causal laws, but its description is a singular historical statement (Popper 1963: 108). There is no contradiction between evolution and history whatsoever. In fact, the study of evolution is the study of history (*contra* Martin 1971: 5).

Binford's new systematics, on the other hand, although designed to deal with culture change, focuses on synchronic systemic reconstruction of comprehensive sociocultural systems and not genuinely on culture. The relationship between idealized culture history and Binford's new systematics in some ways closely resembles that between evolutionary biology and ecology.

If our classificatory units model cultural transmission processes, their theoretical justification would not be as different from that of biological units as Dunnell (1989: 145) believes. The appropriate scale of units is an empirical question to be addressed by ethnoarchaeological, archaeological and non-archaeological research on the units of cultural transmission. Such units would provide the appropriate basis for evolutionary studies: 'differences in the relative abundance of variant forms ... in space and over time become the *empirical basis on which the action of evolutionarily significant selective forces can be studied*. For the Darwinist, change in diversity is evolution' (Rindos 1989a: 22, emphasis in original). As Shennan (1991: 207) has argued, if cultural transmission is a process with its own properties, then culture history is a distinct phenomenon requiring examination in its own right. The study of cultural evolution does not end with a reconstruction of the 'genealogies' of cultures. But without such a reconstruction, it will never begin.

NOTES

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¹ Only Flinn and Alexander (1982: 390-1) disagree because, according to them, culture has never been shown to be more than a subset of a human being's environment.

² Compare, for instance, Sokal & Sneath (1963) and Sokal (1966) with Sneath & Sokal (1973) and Sokal (1974). Clarke (1968) enthusiastically adopted the theoretical programme of early numerical phenetics for archaeology.

³ As defined by Dunnell (1971: 44-5), a class is a unit of meaning or conceptual category consisting entirely of the set of criteria which determine its boundaries. In the process of identification, classes are used to assign phenomena to groups.

⁴ Post-processualists (Hodder 1986: 149) reach a similar conclusion from a drastically different point of departure. See also Shennan (1989) for a comparison of evolutionary views of culture and current social theory.

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La systématique archéologique et l'évolution culturelle, ou comment réhabiliter l'histoire culturelle

Résumé

Le but de cet article est de montrer comment la systématique archéologique peut être fondée sur la théorie de l'évolution, et de déterminer les théories de l'évolution culturelle qui seraient le mieux à même de fournir un cadre théorique pour la classification archéologique. On indique brièvement les modèles darwiniens adéquats, avant de discuter la taxinomie biologique et sa relation à la théorie de l'évolution. On examine ensuite la 'nouvelle systématique' processuelle de Binford et la systématique culture-espace historique-temps sous un angle culturo-evolutif darwinien. Il est montré que l'archéologie processuelle, malgré sa rhétorique ouvertement évolutionniste, est fondamentalement non-évolutive. Pourtant, il est possible d'utiliser des éléments de la systématique culture-espace historique-temps pour, en suivant l'exemple de la biologie où la classification des espèces s'inspire de la théorie biologique évolutive, construire un cadre théorique fidèle à la théorie culturo-evolutive darwinienne.

Kollwitzstr. 78, 10435 Berlin, Germany