

## Pattern and Process in Cultural Evolution

Stephen Shennan (ed.)

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In his introduction to *Pattern and Process*, Shennan states that the aim of this collection of papers “is to demonstrate the potential for building a genuinely integrative evolutionary anthropology, in which evolutionary theory unites studies of past and present.” The bulk of the chapters derive from a conference held at University College London’s (UCL) *Centre for the Evolutionary Analysis of Cultural Behaviour* in September 2005. Having been aware that this volume was in preparation over a period of some four years, it was with some trepidation that I opened the book. The last few years have seen a sharp increase in the pace and breadth of studies that utilize evolutionary theory to analyze cultural data, and there was some natural concern that the book might seem dated or even off pace as a result. As it stands, I need not have been concerned; a factor aided by the breadth of approaches and case studies displayed.

The book itself is comprised of 21 chapters divided into three sections: (1) Understanding cultural transmission, (2) Testing evolutionary hypotheses; and, (3) Social evolution. Shennan’s opening introductory chapter expertly steers the reader to what is to follow, providing insight into some of the broader historical context of the volume. In particular, he describes the mixed history of Darwinian approaches to human behavior, laying out how today’s evolutionary studies of cultural phenomena have diversified into several distinctive, but not necessarily mutually exclusive, approaches. He also stresses that notions of “selection” in cultural evolution have moved beyond the simple imposition of natural selection, and now take into account a much broader array of cultural selective processes (e.g., prestige bias, conformity) not all of which will necessarily affect biological fitness parameters within the same population.

In recent years, anthropologists and archaeologists working in a range of chronological periods and geographic regions have come to recognize that a full evolutionary explanation of human populations and societies has to take into account two inheritance mechanisms—one biological (mediated via genetic transmission) and the other cultural (mediated via social transmission). Some have referred to this as “dual inheritance theory” (Richerson and Boyd 2005). This theoretical position is the one taken by contributors to Section 1 (and indeed several chapters in the second section). The first two chapters in this section are arguably more theoretical in focus than the majority of chapters. Mesoudi and O’Brien (Chapter 2) make the crucial point that cultural evolution—when understood from a dual inheritance stance—can be seen to consist of both

micro- and macro-evolutionary processes, just as in the case of biological evolution. They further note that archaeology has a major role to play in understanding macro-evolutionary processes, but should not ignore the micro-scale, particularly when formulating hypotheses. In this sense, they argue that operationally and ontologically, evolutionary analyses of archaeological data are the cultural parallel of what paleobiology is to biology in general. Auger (Chapter 3) meanwhile argues that artifacts themselves are a means of information transmission, and reflects on the impact that recent developments in communication technology are having upon culture change in contemporary societies from this perspective.

Turning toward more micro-evolutionary aspects of dual inheritance, Hosfield (Chapter 4) examines the transmission of craft skills using cross-cultural ethnographic data. He is particularly interested in potential relationships between material culture patterns (i.e., instances of craft conservatism versus those with greater evidence of innovation) and particular modes of social transmission (i.e., parent-to-offspring versus learning from non-parents). As predicted by Cavalli-Sforza and Feldman (1981), Hosfield finds the highest levels of conservatism are most closely associated with parent-to-offspring learning of craft skills. However, non-parent transmission appears to result in variable levels of innovation and conservatism depending on particular attitudes towards innovation, the particular non-kin transmission route(s), or combination thereof.

The following four chapters all utilize phylogenetic methods to study cultural evolution. The data to which such methods are applied is diverse: clothing from the Khanty of northern Siberia (Jordan, Chapter 5); cutlery attributes (Riede, Chapter 6); Iranian tribal carpet designs (Tehrani and Collard, Chapter 7); and Fijian pottery rim classes (Cochrane, Chapter 8). The chapter by Jordan and that of Tehrani and Collard, both employ phylogenetic techniques to assess the degree of inter-group transmission (i.e., cultural “blending”) in their respective data sets. As Tehrani and Collard note, this process has been shown by a majority of case studies to be far less virulent in cultural evolution than is commonly assumed, and thus must be examined on a case-by-case basis rather than assumed *a priori*.

In a particularly fascinating chapter, Riede (Chapter 6) combines phylogenetic techniques and methods for studying host-parasite co-evolution to a dataset of 16th–20th century European knives and forks. His results confirm that a co-evolution of attributes in these items of table cutlery

appears to have occurred over time; quite literally in evolutionary terms, the right hand seems to have been monitoring what the left was doing. This is one of many chapters from the volume that immediately begins to set the mind at race wondering what other such relationships might be demonstrated in material culture data.

In the final contribution of this section, Charlton (Chapter 9) examines iron production traditions in Iron Age Wales. Interestingly, he does this not by looking at the attributes of crafted artifacts, as might be typical for studies of this type, but at the chemical signature of iron slag. As Charlton explains, the chemical profile of this waste product will be influenced by factors such as furnace construction techniques, fuel use, and furnace operation techniques. As such, variations in chemical signatures over time and space may provide a proxy for the evolution of socially transmitted traditions associated with a range of iron smelting practices. If the evolutionary analysis of artifact attributes can be seen as analogous to paleontology (Mesoudi and O'Brien, Chapter 2), then Charlton's approach seems somewhat more like the archaeological equivalent of analyzing blood groups to reveal historical processes.

The second section of the volume (Testing evolutionary hypotheses) presents a particularly diverse set of case studies. Lake and Venti (Chapter 10) and Steele (Chapter 11) both deal with relatively recent case studies of cultural phenomena. The question of whether changes in bicycle design ca.1800–2000 follow a classic pattern of adaptive radiation forms the focus of Lake and Venti's chapter, while Steele examines the adoption of agricultural innovations (hybrid corn and the motorized tractor) in the United States during the 20th century. In reading these chapters it is interesting to contrast how Lake and Venti's analysis emphasizes chronological patterning and draws heavily on theory and method from paleontology, while Steele, who certainly utilizes chronological trends as part of his analysis, places greater emphasis on spatial data patterning and draws more on marketing science literature and economic theory.

Chapter 12 by Smith et al. represents the volume's only explicit consideration of archaeological patterns during the Pleistocene. Specifically, the authors of this chapter use simulation models of hominin dispersal patterns, originally developed by Mithen and Reed (2002), to address patterns in the distribution of Lower Paleolithic technologies. Extending the model described in Hughs and Smith (2008) to simulate Pleistocene morphological variability, the default model described in this chapter simulates the dispersal of a series of cultural attributes (trait frequencies) while incorporating parameters representing rates of cultural drift. Extinction probabilities are set to vary according to vegetation and climatic parameters in different regions. This default model is calibrated so that hominins dispersing from Africa at 2.0 Mya reach Dmanisi (Georgia) by 1.8 Mya. The results of multiple runs of this default model show that trait frequencies are lowest in Europe and China. Interestingly, Smith et al. find that lowering the extinction probability of populations occupying coastal regions results in

populations in India exhibiting cultural trait frequencies more comparable to those of Africa. Smith and colleagues conclude that the results of these simulations are consistent with archaeological data supporting a late spread of Lower Paleolithic Acheulian toolkits into Europe and India, and a paucity of such technologies in East Asia. The authors also suggest that the emergence of a more coastally adapted hominin (something they tentatively link with the emergence of *Homo heidelbergensis*) may have exacerbated such patterns. While some of the details of the model's basic parameters and the specifics of the interpretations of the patterns produced could profitably be subject to further scrutiny, these analyses certainly demonstrate the heuristic value that running simulations of this type have for identifying parameters likely to be pertinent when attempting to infer the processes underlying broad archaeological patterns at this deeper timeframe.

The final chapters of this section both examine changes in the lithic technologies of Holocene hunter-gatherers. Edinborough (Chapter 13) does this at the level of attributes within a single class of artifacts (projectile points from the Mesolithic of southern Scandinavia), while Fitzler and Trusler (Chapter 14) attempt to determine the causes of a shift from blade to biface technologies in Kodiak Island, Alaska, ca.7,500–6,000 BP. Both papers are worth reading back-to-back for the different perspectives they take. Edinborough uses a multivariate analysis to demonstrate a lack of relationship between projectile point attributes and changes in prey fauna during his timeframe of interest. However, he shows that there does appear to be a relationship between point form and summed probability distributions of radiocarbon dates which, he suggests, provide a proxy for fluctuating population sizes. As a result, Edinborough argues that cultural transmission processes, sensitive to population sizes, are influencing point form attributes at this time. Fitzhugh and Trusler, meanwhile, draw on Fitzhugh's (2001) earlier "risk innovation model" to suggest that changes in technology are most probable when conditions favor risk-prone experimentation. Such a situation, the authors argue, is likely to occur in situations where the risk of using a known technological solution is relatively high. Fitzhugh and Trusler contend that such a situation arose at Kodiak due to a shift in environmental parameters, thus triggering the recorded technological shift from blade to biface technologies. These papers are instructive in illustrating how quite different processes—one stochastic in nature and the other more selective—can potentially drive changes observed in lithic data.

The final section of the book is dedicated to social evolution. As Shennan notes in his introductory chapter, this aspect of using evolutionary principles to study change and pattern in human societies has historically proved to be particularly controversial. Again, this section is topically and chronologically diverse, with chapters on Indo-European marriage practices (Fortunato and Mace, Chapter 16), parent-offspring conflict and its impact on marriage choices in the Ju/'hoansi of Botswana (Weissner, Chapter 17), prestige goods and the emergence of social hierarchy

(Plourde, Chapter 18), as well as three archaeological cases studies looking at inter-group conflict in the southwestern USA 600–1300 CE, the emergence of social hierarchies in the Californian Channel Islands 3000–250 BP, and the Levantine Pre-Pottery Neolithic (respectively, Kohler et al., Chapter 19; Kennett et al., Chapter 20; Kuijt, Chapter 21). Of the chapters in this section, however, that by Dunbar (Chapter 15) is obviously likely to be of most interest to paleoanthropologists. His argument is a further extension of his “language as social grooming hypothesis” that will be familiar to many (i.e., language evolved to replace the bonding mechanism of physical grooming as group sizes became too large for grooming due to the time costs involved). Here, Dunbar considers the role that laughter, music, and religion may have additionally played, outlining a scenario that proposes these evolved in hominin populations in that sequential order, with language evolving between music and religion. Dunbar strives to draw on diverse evidence to support his building of this scenario, but as he himself acknowledges at the close of the chapter, a substantial quantity of independent testing will be required to substantiate it. Collectively, what the chapters of this section reaffirm is that despite its apparent controversy, the study of human sociality and sociopolitical patterns via evolutionary principles appears to be alive and well in anthropology.

It has sometimes been argued that evolutionary theory is a poor instrument for addressing cultural questions due to the inherently “more complex” nature of cultural phenomena compared with that of biology; those who are better informed have retorted that nothing in biology is simple or straightforward. Indeed, the chapters within this volume highlight the diversity of approaches, methods, and concepts that can legitimately be brought to bear on cultural questions from an evolutionary standpoint and, as a result, are demonstrative that the rigorous application

of evolutionary theory to cultural data is far from naïve, straight-forward, reductive, or “simple.” As such, the chapters in this volume deserve a close and detailed reading; it will come as no surprise that many aspects of the conceptual and methodological approaches adopted by the contributors have been glossed over within the confines of this review. While only one chapter (Hughes et al.) explicitly addresses cultural data during the Pleistocene, and only two others (Edinborough, and Fitzhugh and Trusler) use data of a category perhaps most familiar to readers of this journal (i.e., lithic technology), it is perhaps this wealth of conceptual and methodological food-for-thought that will be valued by most readers. Indeed, being more familiar with the detailed aspects of evolutionary theory, and its application in empirical case studies, readers of this journal will be better placed than most to be appreciative of, and stimulated by, what is offered.

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