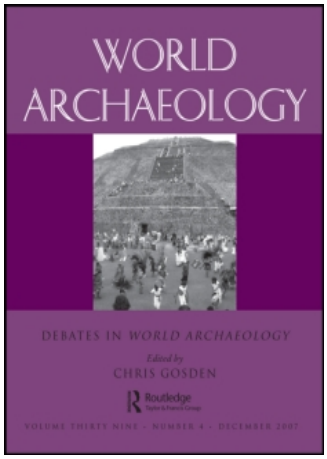

World Archaeology
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713699333

Evolutionary archaeology is unlikely to go extinct: response to Gabora

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Online Publication Date: 01 December 2006
To cite this Article: Lyman, R. Lee and O'Brien, Michael J. (2006) 'Evolutionary archaeology is unlikely to go extinct: response to Gabora', World Archaeology, 38:4, 697 - 703
To link to this article: DOI: 10.1080/00438240600963460
URL: http://dx.doi.org/10.1080/00438240600963460

Evolutionary archaeology is unlikely to go extinct: response to Gabora

R. Lee Lyman and Michael J. O'Brien

As was pointed out in the article that apparently served as the catalyst for Gabora's comments (O'Brien 2005), an already sizable and growing literature suggests that a significant number of archaeologists working in North America, South America and Great Britain are interested in incorporating elements of Darwinism into their analytical work. This interest is not a new phenomenon but one that has been around in various guises for over a century (Lyman and O'Brien 1997; O'Brien and Lyman 2000b). To continue its growth, Darwinian archaeology needs to move beyond a narrow reading of Darwinism and become a more inclusive approach. There are encouraging signs in this direction, as behavioral archaeologists, human-behavioral ecologists and processual archaeologists are adding their perspectives to the mix, especially with respect to such things as cultural transmission, artifact function and style. Five recent or forthcoming collections of essays (Barton and Clark 1997; Lipo et al. 2006; Maschner 1996; O'Brien 2007; O'Brien and Lyman 2003a) bring this ecumenism into sharp focus and point out the synergy that can result from collaborative efforts that crosscut traditional labels and compartments.

Gabora's comments notwithstanding, no one has ever suggested that Darwinism can solve all of archaeology's problems. Rather, what we and others have pointed out is that it might solve some of archaeology's historical – read evolutionary – problems. For these solutions to be meaningful, they have to be grounded in appropriate theory and method and not in someone's uninformed, idiosyncratic view of the natural world. Gabora can join the debates over Darwinian archaeology, but she, like everyone else, needs to understand exactly what is being debated and the context in which it is being debated. Archaeologists can no longer rely on popularized accounts of nature as the source of our understanding of biological evolution. Things are much more complicated than that.

If we strip away everything else and attempt to get at the heart of Gabora's criticism (this issue), we find it to be, not surprisingly, Darwinian archaeology's views on the human phenotype. She does not see how artifacts can be phenotypic – a viewpoint that we find indefensible from a biological stance but one that nonetheless has deep roots in the social sciences. Brew (1946) pretty well summed up the majority opinion among culture historians of the mid-twentieth century when he pointed out that inanimate objects do not breed and that therefore the term 'evolution' should be restricted to the

Routledge
Taylor & Francis Group

World Archaeology Vol. 38(4): 697–703 *Debates in World Archaeology*

ISSN 0043-8243 print/1470-1375 online
DOI: 10.1080/00438240600963460

transmission of genes. The result was a continued reliance on the notion that culture is best viewed as a constantly flowing stream of ideas in which various cultural rivulets come together, break apart and converge in an endless, open cycle, thus demanding that mechanisms of culture change be limited to diffusion, migration and invention (O'Brien et al. 2005). Although some archaeologists still hold to this outmoded notion, it thankfully is being replaced by the view that cultural transmission is much more than simple diffusion and the like. Rather, it is the glue that creates and molds culture, however defined.

Archaeologists have made significant advances in understanding transmission processes (e.g. Bettinger and Eerkens 1999; Eerkens et al. 2006; Lipo et al. 1997; Neiman 1995), much of it a logical extension of theoretical work done outside archaeology (e.g. Aunger 2002; Boyd and Richerson 1985; Cavalli-Sforza and Feldman 1981; Henrich 2001; Pocklington and Best 1997). This work sometimes is referred to as dual-inheritance theory, and, although there are significant differences in terms of how various authors view the transmission process (Winterhalder and Smith 2000), there are enough similarities that for present purposes we can view them as complementary. In dual-inheritance theory, genes and culture provide separate, though linked, systems of inheritance, variation and change. The spread of cultural information is affected by several processes, such as the strengths of the transmitters and receivers, decision making and natural selection. Gabora would view such things as the strength of transmitters and receivers as being non-phenotypic, whereas evolutionary archaeologists, human behavioral ecologists, behavioral archaeologists and others view them as important phenotypic features.

That behaviors are phenotypic has long been accepted by evolutionary biologists (e.g. Roe and Simpson 1958), as has the notion that beaver dams, bird nests and spider webs are phenotypic extensions of an organism's body. As Dawkins (1990) noted, a spider's web is a 'functional extension of the effective catchment area of [the spider's] predator organs'. Natural selection works myopically on phenotypes, focusing on particular characters or character states (Mayr 1963). The 'replicative success' (Leonard and Jones 1987) of organisms and artifacts is probabilistic (not deterministic) and results from various sorting processes, including natural selection, drift, various kinds of transmission processes (Bettinger and Eerkens 1999) and the like. In Darwinian archaeology, artifact types are treated analytically as empirical (phenotypic) manifestations of cultural traits (Lipo and Madsen 2001). The evolving population is one of artifacts; whether or not the human population using those artifacts evolves in concert with them is historically contingent (Leonard 2001; Neff 1992). Thus there is no 'persistent error' as to what Darwinian archaeology views as a population, as Gabora alleges.

While on the subject of genes, we note that Gabora has the impression that Darwinian archaeology sees a direct linkage between artifacts and genes. Since we are students of Boas (removed by several generations), that cannot be true. We have never said or implied that, to paraphrase Gabora, 'biology (genes) explains the design of an artifact'. If anyone *does* find a gene, say, for how to design projectile points, we would like to be among the first to know about it. Parenthetically, we point out that Gabora is not alone in this misplaced criticism (e.g. Bamforth 2002), proving once again that some

archaeologists still cannot move past Brew's (1946) old saw that artifacts do not breed. For them, evolution is nothing more than a change in gene frequency, whereas we take a much broader, naturalistic view of evolution, defining it as 'any net directional change or any cumulative change in the characteristics of organisms or populations over many generations – in other words, descent with modification. It explicitly includes the origin as well as the spread of alleles, variants, trait values, or character states' (Endler 1986: 5). This is, of course, the manner in which modern evolutionary biologists and paleobiologists view evolution.

In Gabora's view, another 'glaring problem' with Darwinian archaeology is that it identifies no unit of replication. This is hardly Darwinian archeology's problem alone; identifying the unit(s) of cultural replication is an extremely contentious issue throughout the social sciences (e.g. Atran 2001; Aunger 2002; Blackmore 2000; Gabora 2004; Pocklington and Best 1997; Wimsatt 1999). We are content with the concept of 'cultural trait', given its historical precedence and flexibility of scale and inclusiveness (Lyman and O'Brien 1998, 2003; see also Borgerhoff Mulder et al. 2006). Cultural traits are units of transmission that permit diffusion and tradition and that play a role in innovation (by means of recombination, copying errors and the like). They are transmitted with greater or lesser fidelity (as are genes and chromosomes) and have empirical (phenotypic) manifestations in behaviors and behavioral by-products typically referred to as 'artifacts' (similar to genes and chromosomes). As we see them, cultural traits have many of the characteristics of Hull's (1981) 'replicators' – they can exist at various scales of inclusiveness and can exhibit considerable flexibility (O'Brien and Lyman 2000b).

Cultural traits are concepts, and thus we agree with Gabora on the nature of the 'unit of replication in culture'. We disagree, however, with her suggestion that the unit of cultural replication is a 'worldview', an 'integrated web of memories, concepts, ideas and attitudes'. This is a large unit, equivalent to the genotype of an individual. Cultural traits may be equivalent in scale to a gene, but, again, they can vary in scale so as to account for phenomena such as pleiotropy and polygeny. Cultural traits as units of transmission allow an individual's culture – an idiolect – to be unique (as with an individual's genotype), while simultaneously connecting individuals who share characteristics.

Gabora worries that, relative to biological evolution, cultural evolution is fast and cumulative, and we agree. She also states that cultural evolution is guided by means of the production of directed variation. Maybe this is partially true in a proximate sense, but even some amount of directed variation hardly sends Darwinian evolution off its tracks. Gabora states otherwise, in the process claiming that no one before her has pointed out that, because of these and other differences between biology and culture, the evolutionary processes that work on organisms are inapplicable to artifacts and the behaviors behind their creation and use. She is incorrect; the literature containing just these arguments is fairly extensive (e.g. Bamforth 2002; Kehoe 2000; Larson 2000), as is the literature containing rebuttals (e.g. Lyman and O'Brien 1998, 2001; O'Brien and Lyman 2000a, 2000b, 2002; O'Brien et al. 2003).

Gabora does not like our use of the word 'law', which to her refers to a 'rule of conduct'. Here, Gabora ignores the literature on the philosophy of science in general (e.g. Hempel 1966) and on the philosophy of archaeology specifically (e.g. Fritz and Plog 1970; Salmon

1982), in which the word 'law' is used to signify an 'if A, then B' statement. We have, on occasion, used the word 'law' because that is the term many archaeologists use. However, we prefer 'theory' for ontological reasons (O'Brien et al. 2005) – evolution is historically contingent whereas chemical reactions are not. The point we are making is that humans are organisms that happen to have culture but which nevertheless are subject to the same Darwinian processes as organisms that do not have culture (Mesoudi et al. 2004). Thus, Darwinian archaeology does not accept the argument that humankind's cultural history cannot be explained with Darwinian *theory*.

Finally, we note that we have consistently argued that Darwinian archaeology demands not simply the adoption of Darwinian theory but rather that the theory – and all its myriad theorems, postulates, corollaries, mechanisms, processes and units – be *adapted* to the archaeological record (Lyman and O'Brien 2000; O'Brien and Lyman 1999, 2000b, 2002, 2003b). This will be a long, tedious process because, like all theory building, it demands trial and error (e.g. Mesoudi et al. 2004). Meanwhile, a result-hungry population of archaeologists demands substantive products. The generation of substantive products, however, proceeds hand in hand with theory building (e.g. Eerkens and Lipo 2005), and neither sort of result is ever beyond perfection. Attending the effort to adapt (biological) evolutionary theory to cultural phenomena – whether they be artifacts, behaviors, or languages – will be disagreements about which parts of the theory to retain unchanged, which parts to change and how, and which parts to discard. This is typical of science. The proof of the value of Darwinian archaeology will be in how well it works at explaining and granting unique insights with respect to the archaeological record. We suggest Gabora read further in the relevant literature before rendering final judgment about the future of Darwinian archaeology.

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