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Cognition and Material Culture: the Archaeology of Symbolic Storage

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Chapter 15

Material Culture and Cognition: Concluding Thoughts

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Material culture probably played a seminal role in the initial formation of the human mind. Large-scale efforts at structuring the material environment, such as dwelling arrangements, graves, earthworks and monuments, as well as smaller artefacts, some symbolic, others primarily utilitarian, all played a part. They acquired meaning through their immersion in a rich matrix of custom, ritual, storytelling, and myth. This matrix, in turn, was framed, preserved and sometimes extended by material culture.

Material culture externalizes memory and greatly amplifies the permanence, and power, of distributed cognition. In advanced societies, external symbolic storage entails highly complex storage media that require extensive training of the young. Such training can actually change the operational architecture of cognition in the individual by influencing the developing brain. The continuing interplay between material culture and cognition creates new cognitive opportunities, changing how members of a society represent reality, both individually and collectively.

Material culture and the human mind have co-evolved, and this co-evolutionary process extends far back in time, perhaps two million years or more. Modern humans depend so heavily on material culture that the word 'symbiosis' does not seem out of place, yet cognitivists often seem unaware of the importance of this symbiosis, as fish are unaware of the sea. As Renfrew pointed out in his introductory paper in this volume, we are especially blind to those aspects of material culture that are not explicitly symbolic, such as the physical settings that surround us. Yet surely the most inclusive framework of material culture is its physical setting. It is the skeleton, as it were, on which the body of material culture is hung. Settlements, roads, site plans, structures, landscapes, earthworks, and other large-scale arrangements of the environment form the working framework, as well as the stabilizing anchor, for most of human social cognition.

Strathern's paper showed very clearly how the physical setting of a village reflects and transmits cultural knowledge in New Guinea. The plans of such villages are really shared analogue constructs

that serve as shared cognitive maps. These constructs are 'stored' in the permanent organization of the village itself. For the most part, the symbolism implicit in a village plan shapes day-to-day social interactions, and serves as one of the foundation stones of local culture. Perhaps most importantly, it is also the basis for the acquisition of these same cognitive maps by subsequent generations. The village plan is thus transformed into a transmitter of cultural knowledge, serving as what some neo-Darwinians call a 'replicative' device, as well as a stabilizing force on the culture.

Another example of crafted physical settings was shown in Dowson's work on cave art. Although we can never acquire the same detailed documentation in such cases as Strathern was able to do from a living culture, it is nevertheless clear that similar forces were at work. These cultures shaped and embellished their living spaces with material structures and symbols. Those spaces in turn acted upon their creators, and shaped the individuals living in the culture in much the same way that the villages of New Guinea shaped their inhabitants. The richness

of cave art conveys the same strong image of the reciprocity of cognition and the physical setting of culture. Just as it does in living cultures, these two factors, the physical setting itself, and the cognitive map collectively held by the society, were constantly accommodating themselves to one another.

Larger physical settings are typically filled with a constant movement of smaller material items between families and individuals, equivalent in function, if not in detail, to the flow Strathern observed in New Guinea. She showed how the flow of smaller material artefacts follows an intricate pattern that mirrors relationships within the culture. How early did this pattern emerge? It is difficult to say with any certainty, but the finely-detailed artefacts of the Upper Palaeolithic that were described in detail by d'Errico might possibly fall into this category. His paper suggested that small crafted objects appeared early in sapient prehistory. Some of these objects seem to have been non-utilitarian, and may have had a primarily symbolic function. It will be important to try to determine whether these objects reflect a typically human hierarchical arrangement of material culture; that is, a flow-pattern of material objects within a larger crafted setting. Alternatively, their use might have been restricted to individuals, but that seems unlikely.

Strathern wrote that social relations make 'artefacts' out of persons, and drew a comparison between the symbolic functions of persons, viewed in this way, and external symbolic artefacts. This is an important point. All of human culture, including its mimetic and oral aspects, exists outside of the individual, or more properly incorporates and entangles the individual. Within that distributed cultural matrix, almost anything or anyone can be made to serve a symbolic function. Buildings can form a symbolic boundary, and so can personal acts, natural objects, or abstract maps. In that case, what is so special about external symbolic artefacts? Taken in that way, they may not appear to be special. They can serve functions that are similar to those served by personal acts, or objects such as buildings, and in fact they are often substitutes for such acts and objects.

But in another sense, external symbols are very special, and that is why I have placed such emphasis on the physical media from which symbolic artefacts are made. As I tried to make clear in Table 2.2, the various physical media of external symbols were crucial variables in the cumulative increase of their power over time, because the introduction of new media gradually freed the symbolization process from the limitations of biological memory, eventually

leading to the possibility of radically novel symbolic formats such as ideographs, logographs, writing systems, monographs, geometric drawings, schematic diagrams, and mathematical notations. Persons can never store knowledge the way a novel or encyclopaedia can, in either a qualitative or a quantitative sense, and the main reason for this is the limited medium of biological memory storage. Crafted cues whose primary functions are non-symbolic, such as costumes, villages and houses, can certainly function symbolically, and undoubtedly served as important way stations during the third transition, but, by their very nature, they are not comparable in sheer representational power to later inventions, such as books and scientific diagrams. Nevertheless, they were the starting point of a revolution, and the only way to reconstruct that revolution is to trace their prehistory.

The habit of crafting the environment itself, as well as the smaller, more explicitly symbolic forms of material culture, to meet the social, practical and communicative needs of the group, is possibly the most salient marker of our distinctively human style of cognition. This remains true in modern human society, where our material culture sometimes threatens to overwhelm us with its richness. Individuals are surrounded by a sea of symbols and artefacts. The conventions regulating their uses are complex and subtle, and individuals often employ material culture in idiosyncratic ways. Halle's paper explored how certain cultural objects are actually used by people in modern society, and he demonstrated something that is often overlooked in studies of symbols, that the rules of use are far from rigid and formal, and at times appear irrational in the extreme. Archaeologists and psychologists might both gain an important clue from his study of the mundane uses to which humans put their material culture. There is clearly a wide continuum of formality, ranging from the state-enforced ritual uses of formal religious art and architecture, to many personal use-patterns that are rather more casual. The latter have probably not changed very much over time, despite the much greater size and complexity of material culture in technologically sophisticated societies. Even in modern society, some of the apparently 'symbolic' uses of material culture are governed by irrational, largely mimetic principles.

Conformity and mimesis

There may be a tendency among highly literate academics to place inordinate stress on the role of formal

languages and symbols in human culture. This reflects an aspect of modern social reality, but not necessarily the more basic principles that rule human cultures. I do not deny the dominant role that language-based symbols have played, but the roots of human culture run far deeper than our language-based cultural institutions. In my view, human culture is primarily mimetic in its origins. It is more deeply rooted in non-verbal cognition and communication than it is in language. This principle extends, I believe, to many of the uses of material culture, including some of its earliest forms.

Among other things, our powerful mimetic skills make us conforming creatures. The pressure to act and think like others, and to become identified with groups, is overwhelming. It is thus perhaps not surprising that we commonly use aspects of material culture to enforce conformity and group identity. Kinship emblems, village plans, dress and body decoration conspire to impose a social order. This is a cultural universal. Even modern scientists, who (without exception in my experience) believe themselves to be 'individualists' are in fact strongly conditioned to behave one way in the seminar hall, another in the street, and another in various private settings. Facial expression, body language, and actions are closely controlled by these settings. So, to an alarming extent, are thought and gesture. The slightest deviation from an unwritten, and highly complex, code of dress, voice, action and gesticulation will be picked up anywhere, whether on the street or in academe itself. Even Cambridge, famous for its eccentrics, will accept only those who conform to its unwritten codes. The codes that regulate thought and association are also narrowly cued by specific settings — pubs, High Tables, libraries, laboratories, classrooms, hotels, houses. These settings call up what computationalists call 'scripts', or sequences of behaviour appropriate to them. Thus there are scripts for 'participating in a seminar', 'working in the library', and 'eating at High Table'. These define what is possible in each setting. To be truly a part of Cambridge, we must acquire the appropriate scripts, just as children must acquire languages.

The most universal of these scripts are acquired early in life, mediated by the mimetic processes so beautifully described by Harris. Certainly, such processes as full-body re-enactment, shared pretending, and imaginative displacement allow modern children to acquire an initial understanding of their culture, including some of its material aspects. This understanding is later greatly enlarged through the mediation of language, but the mimetic dimension

remains fundamental, and to some degree, independent. Although, as Harris has observed, mimesis and language may normally develop in synchrony with each other, mimetic skills have been observed in nonsigning deaf people, where there is no possibility of language mediation. Moreover, mimesis and language operate by different principles, the former by iconicity and analogy, the latter by explicit description and explicit denotation of relations.

Even today, the uses of material culture more often than not reflect these 'irrational' mimetic forms. The universal presence of fashion, music, custom, and ritual in popular culture, so apparently subversive of more formalistic and rational cultural institutions, testifies to this. Although apparently easy to acquire when young, such conventions are often difficult for adults — more difficult than languages, a lesson that many Western executives and diplomats have learned the hard way.

In summary, material culture acquires its meaning through immersion in a rich cognitive-cultural system, and the fundamental cognitive 'glue' that holds this system together is mimesis.

External memory

External memory, as a general rule, is a direct extension of the larger cognitive-cultural system that generated it. But material culture, broadly defined, has marked hominid society for a very long time, whereas I have placed the 'third transition' in human evolution squarely within the era of sapient humans. Is there perhaps a contradiction here? If not, when did hominid material culture suddenly and miraculously start to qualify as 'external memory'? Does this term apply only when the symbolism of material culture is explicit? Or does it apply to the crafted environment, including the physical setting, which, as we have seen, can be implicitly symbolic? What, for instance, about the subtle, quasi-symbolic influences of the site plan? Do such things qualify as *bona fide* 'external memory'?

I now realize that I have not addressed this question as thoroughly as I should have, and I am grateful to archaeologists for pointing that out to me. I think I have already hinted at a possible answer: there is nothing magical about external symbols, and no clear-cut break between non-symbolic, non-intentional aspects of material culture, such as the earliest stone tools, and obviously symbolic aspects, such as systems of notation whose utility as memory devices is explicit. Apes can learn to use external symbols, and they do not thereby change

their basic cognitive abilities, even though symbols may release a number of latent skills. Their uses of symbols reflect the kinds of 'mental models' that apes are able to produce. When they master a set of symbols, they do not suddenly start to think like humans. The point is that external symbols can only be used to enhance and extend basic capacities that are already in place.

The same principle applies to humans. In the course of evolution, hominids acquired two kinds of mental capacity that apes cannot match: mimesis and language. Predictably, the external symbols invented by humans exploit those two uniquely powerful human capacities. Other aspects of material culture also exploit these special capacities, but they cannot change human nature, or the basic capacities of humans. The significant change came with the transition from casual or implicit material influences, such as may be found in those aspects of material culture that are not explicitly symbolic, to full-fledged external symbols. External symbols have become a very powerful transforming force in human life, and have altered the cognitive landscape, precisely as they became more potent storage devices, capable of storing much more explicit and highly detailed knowledge.

When did this transformation begin? As d'Errico pointed out, when it comes to decoding the earlier stages of human prehistory, we are left with only a few artefacts that might qualify as 'true' symbols. Moreover, whatever artefacts might survive his rigorous initial screening lack the codes and conventions that must have informed their use. Unfortunately, the external symbols themselves never contain enough information to allow us to rediscover the detailed thought-habits of an ancient culture *a posteriori*. Symbolic artefacts, even of the more elaborate kind, rarely encode the conventions governing their use, with the possible exception of some mathematical systems.

This makes it very difficult to reconstruct the earliest period of symbolic prehistory, which includes most of the Upper Palaeolithic. D'Errico gives us a hint of one possible means of resolving this issue. By analyzing carefully the construction of these very early artefacts, one might be able to infer their use-patterns, and possibly the type of construction plan in the mind of the person who made them. This might permit a generic re-classification of these artefacts, and might well yield a new conceptual framework within which not only very ancient, but even more recent artefacts can be placed in a conceptual hierarchy.

Some delegates, for instance, Lowe and Thomas, came to this conference with the intent of focusing exclusively on the 'storage' functions of external

symbols. But, in my view, adhering too closely to such a literal interpretation restricts discussion unnecessarily and tends to distort my theory. (Thomas in particular misread me as a computationalist, which I most emphatically am not.) I have never placed a literal interpretation on the title of this conference, but some have taken my terminology literally, as if the term 'external symbolic storage' were meant to exhaust all the functions of external symbols. In fact, this goes completely against the grain of my thinking. The 'storage' function of symbols cannot be isolated from their other functions, nor from the minds that use them. Above all, they are a testimony to the public creative processes that invented them in the first place.

When I coined the term 'external symbolic storage', I was simply singling out the most salient and indisputable property of material culture: it exists only in relation to interpretative codes stored inside the heads of the people who invented it, that is, inside their 'biological' memory systems. Written symbols, and even other less explicitly symbolic aspects of material culture, are external to biological memory, and serve as storage devices for the information needed to replicate entire cultures. This simple fact changes the nature of shared cognition. But it also makes the archaeologist's job very difficult, because the specific content of symbols can never exhaust their functions when in use. When in use, symbols engage biological memory, which is a creative, constructive, dynamic, force. Symbols and cognitive artefacts are thus drawn into a maelstrom of shared cognitive activity in any culture. Artefacts are static things, and undoubtedly serve as static storage devices, but their functions in the larger cultural matrix go well beyond mere storage, because they are in dynamic interaction with the entire cognitive-cultural system in any living culture.

Regarding Lowe's notion that symbolizing capacity depends upon a uniquely human form of conceptualization and classification, I cannot agree. In the last few years our view of the minds of what he calls the 'lower animals' has been somewhat revolutionized. This is especially true of chimpanzees and bonobos, but it also applies to other species that are genetically quite far from the primate line, such as dolphins and parrots. Many species have the ability to use symbols, and use them intelligently. Pepperberg's parrot comes to mind. When confronted with a choice of various coloured objects, and asked: 'Which is the yellow one?'; he answers correctly, 'banana'. It seems that even a parrot can conceptually isolate the colour from the form of an object, and realize (only implicitly, of course) that objects can simultaneously

come under various conceptual hierarchies (Pepperberg & Brezinsky 1991; Pepperberg 1992).

The same is true of primates. Premack (1976) showed that chimpanzees can master visual symbols that represent abstract concepts such as 'same as' and 'different from', and are able to answer a variety of questions, some fairly abstract, using this skill. As I pointed out at some length in my (1991) discussion of symbolic invention, we should not read too much into this; but we should not underestimate this achievement either. Savage-Rumbaugh and her colleagues (1993) have demonstrated convincingly that Kanzi, their star bonobo pupil, can do far more than conceptualize objects and their relations. He can segment the speech stream into words, parse simple reversible English sentences, and use hundreds of visual symbols to communicate, not only with humans, but also with other bonobos (although the latter occurs only under highly structured conditions). Kanzi is also able to manufacture (and correctly use) simple stone tools and play simple computer games. His symbolic talents far exceed anything we might have predicted a decade ago. Humans are undoubtedly unique in their spontaneous invention of language and symbols; but, as I have argued elsewhere (Donald 1997; 1998a,b) our special advantage is more on the production side than on the conceptual side of the ledger. Animals know much more than they can express. We can come closer to expressing what we know, because of a revolution in our ability to apply our knowledge in the control of action, whether in speech, gesture, or re-enactive pantomime.

The cultural context

All this is thrown into sharp relief when archaeologists and anthropologists confront us with cultures that fall outside our direct experience. I was very struck by Rawson's paper, which showed how symbols, sacred objects, and ritual were employed in the immensely complex matrix of custom that encompassed the whole fabric of Chinese classical civilization. To understand the function of a ceremonial knife in that society, it is clearly not enough to describe the object itself, although it is perhaps the only way to start. A knife may indeed serve a storage function, perhaps to cue a ritual behaviour, convey either acceptance or some other form of social recognition, or to facilitate a certain kind of reflection, but its cognitive utility is rarely, if ever, restricted to its storage function.

Above all, the symbolic value of any artefact is

not always evident in its appearance. The same object may have several functions, and several layers of symbolism in different times, places, and social classes, in the same society. It is only a node in a dynamic social-cognitive system. The system itself defines the role of such objects. It creates, changes, and enforces their precise functions. True, the objects themselves serve a storage function. But to know what symbols and artefacts store, and what kinds of specific cognition they might support, we must know a lot about the culture, and the mind, that uses them. In this I am in full agreement with Renfrew.

In the absence of that kind of detailed knowledge, the only available strategies for reconstructing hominid prehistory are interpolation, based on primate-human comparisons, and extrapolation, based on what is known about the uses of material culture in existing societies. Used cautiously and in a principled manner, these strategies can yield rich insights. I think that Mithen's attempt to recreate human prehistory in cognitive terms is laudable, even though I disagree with many elements of the specific theory that he has proposed, particularly his reading of the domain-specificity literature. But he has at least acknowledged the complexity of the problem, and given more time, we should be able to build better reconstructions.

Many previous accounts of human prehistory have tended, in the interest of doctrinaire reductionism, to oversimplify the magnitude of the cognitive steps that early hominids had to take to arrive at our current cognitive and cultural state in two million years. There are still many theorists who resist the idea that hominids really travelled so far so fast, and who insist on oversimplifying the problem, usually, in my opinion, by greatly underestimating the capabilities of early humans. A few more efforts like those of Mithen, and perhaps these oversimplifications will be seen for what they are.

Renfrew has suggested, in this vein, that perhaps we should interpose an additional transition in my scenario, one that effectively distinguishes between certain Neolithic material cultures that have many of the forms of modern symbolic culture, with the notable exception of writing, and those cultures that also have writing. This distinction could prove quite useful. Although writing was undoubtedly the most powerful symbolic invention, and the one that started us on the road to modernity, there is a great deal more to external symbolic representation than writing, and writing eventually changed the rules by which symbols were used. Many cultures that completed the transition to food production, and had large permanent settlements, monuments, highly

crafted possessions, emblems, and many markers of identity and possession, could be said to form a symbol-using category of their own.

Others mentioned that it might prove useful to introduce other additional transitions, micro-transitions as it were, to recognize some of the finer distinctions between different types of symbolic cultures. Rawson proposed that theoretic culture should perhaps be dissected into subphases and subcategories, and elsewhere, Egan (1997) has made a similar suggestion regarding mythic culture. Of course, Renfrew, Rawson and Egan have their own agendas, and as soon as we abandon my neurocognitive position, there may well be good reason to make these finer distinctions.

However, in defence of my three-transition scenario, I should say that it was a fairly revolutionary act to introduce even a single nonbiological evolutionary transition into what was, after all, a primarily biological scenario. I chose to introduce a third transition not so much to develop a refined tool for cognitive archaeology and anthropology (although that is an admirable objective in itself) but to point out to neuroscientists and psychologists that culture is a major player in shaping the mind, not in a trivial way, but in the psychologically fundamental sense that it actually alters our cognitive architecture. It gives the human mind much of its adult shape and power. My criterion for categorizing the modern symbolic era as a full-fledged 'transition', equal in importance to the two cognitive adaptations that shaped the early hominid mind was that it also triggered an architectural change in the human cognitive apparatus.

This change shows up in two ways. First, internally: symbolic literacy, once it reaches a certain level of complexity, alters our internal modular brain organization. This alteration is imposed by cultural reprogramming of axonal and synaptic growth during some of the key periods of neural epigenesis. Second, externally; symbolic cultures alter the externally distributed, or shared, architecture of cognition, introducing some very powerful properties into the external memory system. This change took considerable time — at least several thousand years — before it had an impact on how we think, but the end-result has been a period of unprecedented cultural innovation, with some completely new forms of representation. While it is true that most of this change occurred after the initial invention of writing, the process actually started long before writing, and long before the arrival of the High Neolithic societies that Renfrew singles out for different treatment. The external symbolic juggernaut has not yet settled into

equilibrium, and continues to spin off new cognitive and cultural forms. For this reason, I still find it useful to classify the historical unfolding of external symbols as a single event, at least for the purpose of describing changes in psychological structure. I willingly conceded, that, for the advancement of cognitive archaeology, a different, and finer-grained, classification of material cultures might be justified.

We should not, however, aspire to more precision than the data justify. Material culture is multi-dimensional in its function, and unlikely to blend easily into a neat, communication-engineering model of cognition, in which every functional subsystem is clearly delineated, and every symbol given an unambiguous definition. Accordingly, I have tried to avoid such models. Unlike the narrowly-defined symbols and algorithms that drive digital computers, human physical culture exists in a community of 'fuzzy' minds that tolerate, indeed thrive on the ambiguity, subtlety, and perversity of human life. Many of the external symbols invented by human culture reflect this fuzzy or analogue thinking strategy. The fascinating ancient maps reviewed by Zubrow are typical of such symbols, since they follow a principle of perceptual and action-metaphor, reflecting 'pictorial' and 'ideographic' modes of visual representation that are essentially analogue in style, and highly diverse in their vernacular. These kinds of sophisticated symbols seem to have come much later, long after humans evolved language, but they still operate primarily according to a mimetic organizational principle, which is the most fundamental level of human representation.

Lake's paper raised Dawkins' concept of 'memes', and the question of Darwinian cultural transmission theory. This is an interesting theoretical approach, certainly worth exploring, albeit with great caution. Dawkins' idea is a dangerously attractive meme in its own right, in my view. It is an oversimplifying notion thought up by a geneticist as a way of 'explaining' cultural evolution without engaging in any psychology. This is why sociobiologists love memes — they can continue to avoid the complexities of psychology and physiology, as they always have. Dawkins' idea is simple enough: find the elementary cognitive units in any culture that self-replicate, and hang the details; all you need is the theory of natural selection. Ideas and customs, like genes, are in constant competition for survival. Some memes self-destruct quickly, while others prosper for thousands of years. All that remains to be explained is their adaptive value; that is, the reasons why certain memes survive, while others die out.

This is achieved by a *post hoc* process of reasoning.

Unfortunately, this approach leaves out all the details, and, as the saying goes, the science is in the details. Memes, whatever their form, are intentional representations. To understand them, we must discover what they are, in terms of basic cognitive processes. The primary motive behind my own theoretical work has been to answer that question. Until we know the answer, we cannot know what memes are, how they emerged, how they are transmitted across generations, or how they tap into pre-existing cognitive domains. Some neo-Darwinians don't even ask these questions, but hopefully archaeological explorers such as Lake will.

It is a chastening thought for a psychologist to realize that material culture provides the context for virtually all modern higher cognition. In our society, material culture appears as an overbearing force, so much so that one might be tempted to regard the individual mind as diminished by it. But we cannot have a science of mind that disregards material culture. Similarly, we cannot have an adequate science of culture, whether ancient or modern, that leaves out cognition. Despite the explosion of material culture in our times, the individual mind remains its source, interpreter, and final arbiter.

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