Chapter 5

The Cognitive Basis of Material Engagement: Where Brain, Body and Culture Conflate

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A few years ago, the publication of *Cognition and Material Culture* (Renfrew & Scarre 1998) well exemplified that the science of mind and the science of material culture are two sides of the same coin. I consider the present volume to be an invitation to move a step further by placing our focus this time explicitly upon the realm where cognition and materiality intersect, mutually catalyzing and constituting each other. The process of material engagement as recently introduced by Renfrew (2001a,b; this volume) offers a new analytic means for that purpose, and my primary objective in this paper is to advance some proposals that will help the reception and better appropriation of this 'hypostatic approach' for the advancement of cognition-oriented archaeological research.

To this end, two main avenues are available. The first, as stated in the title of this volume, is to rethink materiality; the second and correlated one to rethink cognition. Following the second avenue, and building from a cognitive basis, my aim is to propound a hypothesis of the constitutive intertwining of cognition and material culture. This I do on one hand as a method toward a theory of material engagement, and on the other as a means of reclaiming cognition from the bonds of cognitivism. The important questions raised, both for archaeology and for the general domain of cognitive science call, of course, for a more extensive discussion than I can carry out here. My concern, however, is simply to clarify the ground and to stimulate a sort of direction, in the hope that the results so obtained will commend it to others.

I start with a brief note about the realm of material engagement which, strangely enough, can be conceived as the most familiar and at the same time unknown existential territory. To exemplify, this territory is familiar, as when the hand grasps a stone and makes it a tool, yet it remains *terra incognita*, since — despite a long genealogy of analytic efforts — just what this grasping implies for the human condition remains elusive, and refuses to be read in the narrative fashion that hermeunetics have promised.

Various factors may underlie this blind spot, but there is one that I want to emphasize from the very beginning. Despite the fact that contemporary archaeological theory appears in agreement about adopting a relational viewpoint, more often than not, it is either unwilling to follow the consequences of such a conviction or remains in a state of confusion about what this might imply in practice. The general call for non-dichotomous thinking in archaeology (e.g. Hodder 1999; Tilley 1994; Gosden 1994; Thomas 1996) seems captivated in the optical array of a Müller-Lyer illusion (Fig. 5.1). Knowing that the lines between the arrows are equal, we still perceive them as different; knowing that mind and matter are relational entities, we continue to approach them through the Cartesian lenses of symbolic representation. It seems that the purification project of modernity (Latour 1993) that habituated our minds to think and talk in terms of clean divisions and fixed categories blocks our path as we seek to shift the focus away from the isolated internal mind and the demarcated external material world towards their mutual constitution as an inseparable analytic unit. Thus, material culture remains one 'of the most resistant forms of cultural expression in terms of our attempts to comprehend it' (Miller 1987, 3), while cognition continues to look like a disembodied information-processing ghost captured in the laboratories of Artificial Intelligence.

I am afraid that, as long as cognition and material culture remain separated by this ontological gulf, our efforts to understand the nature of either is
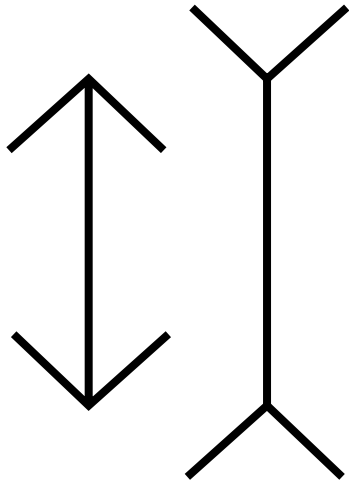
Figure 5.1. *The Müller-Lyer illusion.*

doomed to failure. Approaching the engagement of mind with the material world on such a basis will achieve nothing more than constantly reiterating a question-begging procedure which can be compared with an attempt to separate and analytically prioritize the process of ascending from descending in the famous drawing of Escher (1960; Bool *et al*. 1982). Finding an escape route from our Cartesian prison demands more than a small displacement in our academic 'language games'. Removing the arrows of modernity from the archaeological perceptual field is not an easy task; it will involve a great deal of cognitive dissonance (Malafouris 2003). Yet to tackle the complex intentionalities enacted through the materiality of the archaeological record, we need to move on and where necessary transgress the ontological tidiness of our modern taxonomies, just as conceptual art transgressed the aesthetic tidiness of the Renaissance.

With these remarks in mind let me now turn to defining the problem more closely.

Redefining the boundaries of mind: the problem with cognitivism

Ever since the famous Cartesian line between the 'thinking thing' and the 'extended thing' was drawn, the philosophy of mind has had to confront the crucial question of the so-called mind–body problem (Ryle 1949). In order to separate the mind from the body and by implication from the world, a mechanism was needed to account for how those independent components interact. The notion of symbolic representation was gradually introduced to bridge

this huge ontological gap, thus furnishing the principal mechanism by which we feed our cognitive apparatus with facts and information from the 'external world' as well as suggesting the way by which we materialize and externalize our mental contents.

Grounded on the premise of this representational thesis, cognitivism, or the so-called computational view of mind, emerged during the sixties as an attempt to re-define human conceptual architecture in the image of the digital computer (Gardner 1985; Dupuy 2000). That is to say, mind was viewed as a storehouse of passive internal representational structures and computational procedures, as a 'filing cabinet' capable of receiving and manipulating external sensory information (Clark 1997). Mind was then to the brain as a computer programme is to the hardware of the computer on which it runs. This to a large extent remains the dominant paradigm in contemporary cognitive science, as well as the implicit model behind most archaeological accounts of prehistoric cognition which conceptualize the human mind primarily through the idioms of representation and information-processing (for a concise discussion of this trend see Mithen 1998, 8–10). Consequently, Zubrow's statement that to understand cognition means to ask 'how do humans represent knowledge and what do they do with that representation' (1994, 109) echoes directly the major analytic imperative of cognitivism. This imperative can be summarized as follows: discover the representational and computational capacities of the mind and their structural and functional representation in the brain (Gardner 1985, 36).

The thing to note, however, is that behind the undeniable advances in the study of the human mind that this paradigm has brought about, one can easily trace some very important shortcomings. For example, in implementing computational theory in the laboratories of artificial intelligence (AI), it soon became manifest that although simulations based on computational logic proved extremely effective in complex analytic tasks, as for example running a program capable of winning a chess game, they were highly problematic in tasks as simple as instructing an automaton to find its way outside a room without running into the walls. In fact, when the first such autonomous devices (*machina speculatrix*) were constructed by Grey Walter (1953), they had nothing to do with complex algorithms and representational inputs. Their kinship was with W. Ross Ashby's *Homeostat* (1952) and Norbert Wiener's cybernetic feedbacks (1948) rather than with the complex representational structure of the by-that-time famous

Turing machine (1950). On the basis of a very simple electromechanical circuitry, the so-called 'turtles' were capable of producing emergent properties and behaviour patterns that could not be determined by any of their system components, effecting in practice a cybernetic transgression of the mind–body divide, and materially exemplifying a model of human cognition the implications of which are yet to be realized and properly digested in contemporary cognitive science (see Brooks 1991).

What the above implies for the computational model in question cannot be pursued here in detail (see Dupuy 2000; Boden 1990; Clark 2001). However, to make a long story short and easier to comprehend, it is safe to argue that the major problem with this paradigm was, and remains, that it provides a view of human cognition so purified and detached from the world that in the end it resembles a 'brain in a vat', a disembodied input–output device characterized by abstract, higher-level logical operations. This means that, using computational simulations as a method for gaining information about the human mind, you might learn a few things concerning the representational structures that support inferential logic and problem solving, but you will certainly also end up with a distorted picture as to how those structures relate to the environment, and probably with no picture at all as to how those structures are enacted in real-life situations and in different cultural settings. As Ingold (1998, 431) remarks:

> . . . it makes no more sense to speak of cognition as the functioning of such a [computational] device than it does to speak of locomotion as the product of an internal motor mechanism analogous to the engine of a car. Like locomotion, cognition is the accomplishment of the *whole animal*, it is not accomplished by a mechanism interior to the animal and for which it serves as a vehicle.

In other words, computationalism in most cases failed the test of ecological validity. Turing's algorithms and Chomskian grammars, however effective in mapping analytic procedures of disembodied intellects, scored very low when the cognitive task at issue involved embodied minds engaging with the material world in real-life settings.

I take the ancient mind whose operations we often pursue in the material remains of the past to be of the latter kind. It is a mind absorbed *in*, rather than detached *from*, the world, principally preoccupied with doing 'what computers can't do' (Dreyfus 1979). Consequently, grounding the challenging task of cognitive archaeology upon a model that conspicuously mistakes 'the properties of the socio-cultural system for the properties of the person' (Hutchins 1995, 366), and for which material culture has a place in the mind only as a disembodied digit of information written somehow on the neural tissue, is not simply to undermine the whole project from the very start, but to deprive it of the possibility of making any significant contribution to the understanding of the human mind.

Granting that the archaeology of mind is a task worth pursuing, and I believe it is, the question that immediately follows concerns the framework with which we should proceed. If the human mind is not the clearly demarcated information-processing device so neatly objectified in the familiar exemplar of the computer, then what is it? And, indeed, where is it? Where does the mind stop and the rest of the world begin? Despite four decades of cognitive revolution, we are still far from providing a consistent answer. Yet we are certainly in a position to restate the question in a more productive manner and to recognize that some of the key issues that initiated this movement may have been marginalized and obscured in the process.

Indeed, as I shall discuss later, a number of alternative frameworks emanate from such an awareness and constantly gain momentum in this field. I need to clarify, however, that in drawing attention to them does not mean that I uncritically succumb to their premises as a whole. This I argue for a very important reason: retaining a substantial dose of residual cognitivism, few of these models take material culture seriously (e.g. Lave 1988; Hutchins 1995; Clark 1997); and by seriously I mean being systematically concerned with figuring out the causal efficacy of materiality in the enactment and constitution of a cognitive system or operation. At the present stage of research, the majority of these models remain skeptical and undecided about entering the treacherous territory of the extended mind, preventing as such the 'missing masses' of materiality that balanced the fabric of social theory (Latour 1992) from exerting a similar effect in the fabric of cognitive science.

I believe this is a serious methodological drawback. And I do so for the same reasons that — despite my agreement with Merlin Donald that 'we cannot have a science of mind that disregards material culture as we cannot have an adequate science of material culture that leaves out cognition' (Donald 1998, 186) — I remain skeptical about the feasibility of 'external symbolic storage' (Donald 1991) as a *modus operandi* to this end. To illustrate this last point let me use the example of memory.

A note on 'exograms' and material memories

The strong ties between materiality and memory have recently been emphasized in various archaeological and anthropological studies (Van Dyke & Alcock 2003; Kwint *et al*. 1999; Connerton 1989; Mack 2003; see also Renfrew this volume and Jones this volume). The precise nature of those ties, however, as well as what they imply in cognitive terms, awaits a systematic investigation and the concomitant interdisciplinary coalition. Donald's suggestion about the implications of external symbolic systems for the structuring and organization of biological memory is undeniably central in this respect. His preoccupation with 'exographic storage', however, leaves his account with a restricted and often distorted view of what is at issue behind the gradual externalization of human memory.

To exemplify, without denying that objects like Alexander Marshack's incised lunar calendars (1991) or a Mycenaean Linear B clay tablet (Ventris & Chadwick 1973) fit nicely within such a theoretic template, I believe that, moving away from the general prototype of cuneiform and hieroglyphics (that is, writing systems and explicit information encoding systems), the concept of storage as an analytic template offers little help in letting us understand the complex relationship between materiality and memory. In fact, even in those cases, several important questions can be raised which the argument for external memory storage cannot fully accommodate. Let us take for example the case of the Mycenaean Linear B writing system. No doubt a Linear B tablet enables one to store complex information, displacing the mnemonic operational sequence of acquisition-storage-retrieval outside the biological boundaries of the human brain. Once the information is encoded on clay, it no longer needs to be constantly rehearsed. The script embodies a cognitive economy. The effort needed for constantly memorizing new information is replaced and amplified by that necessary for incorporating the structural code, i.e. learning to use the script. Moreover, information, arranged in visual space and real time, is now open to constant refinement and revision. Most importantly, to read is not the same thing as to remember, meaning that technically a different mode in memory retrieval is now available. Following Donald's thesis, and not without good reason, one would have expected that important changes in Mycenaean cognitive architecture must have followed the adoption and development of such a system.

In this case, however, the hypothesis fails to meet the archaeological test. The potential was not realized. The hand of the Mycenaean scribe never used the surface of soft clay for anything more than the recording of economic archives. There is no record of any significant event or episode of the Mycenaean past, not even a votive inscription as in the case of Linear A from Crete (Olivier 1986, 383–6). One might blame the internal systematics of the script for that, but the situation is far more complicated and cannot easily be disentangled from the social life of this cognitive artefact. Whatever the reasons, however, the Mycenaean external storage device *par excellence* played no important role (if any at all) in respect of commemoration and social memory. Does this leave Mycenaean memory with no external 'scaffolding' subject to Miller's (1956) 'magical number' of the 'seven plus or minus two' operational capacity for the short-term working memory, and with the inevitable distortions of the long-term biological store? As far as external storage is concerned, there are very few other artefacts or cognitive technologies that can be argued to have played such a role. Even the formulaic character of the Mycenaean iconic repertoire, which often points to a mnemonic function not dissimilar to 'the repetitive phrases and standard epithets in oral poetry' (Crowley 1989, 211; 1992), embodies a dynamic cognitive biography that the notion of storage cannot fully accommodate. Obviously if one is to pursue an archaeology of Mycenaean memory, a different perspective than that afforded by the notion of storage needs to be adopted.

The mnemonic knots of the Mycenaean past (and I am sure this is also the case for many other pasts: e.g. Jones this volume) do not come in pre-arranged clusters tied at intervals along a string, as in the case of the *khipu* of the ancient Inca. They do not contain memories in the form of codified discrete items of information. They rather engage memory according to the interactional properties which they afford to particular actors in particular settings. Does it make any sense to speak about information storage in the case of a funerary *stele* erected on top of a Mycenaean shaft grave or in the case of the elaborate swords deposited in it? Yet aren't those artefacts clearly associated with mnemonic operations, the former through its conspicuous presence and the latter through their conspicuous absence? By smashing a *kylix* at the blocking wall of a Mycenaean chamber tomb, is not the participant in the funerary ceremony implicitly constructing an artificial 'flash-bulb' effect (Neisser *et al.* 1996), enhancing the conditions of retrieval and recollection
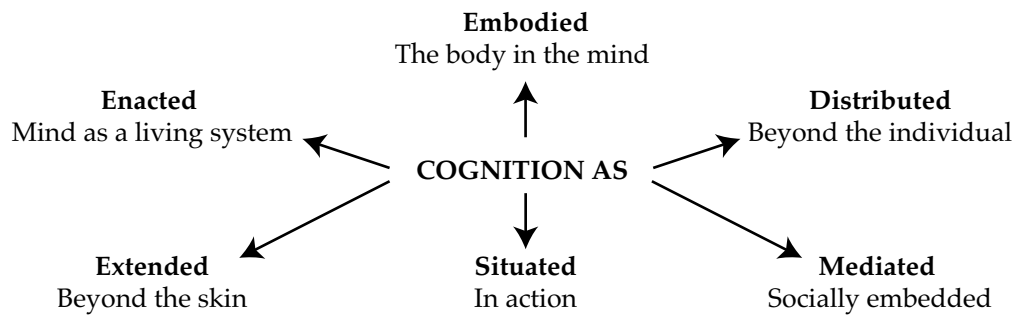
Embodied
The body in the mind

Enacted
Mind as a living system

Distributed
Beyond the individual

COGNITION AS

Extended
Beyond the skin

Situated
In action

Mediated
Socially embedded

Figure 5.2. *Mind beyond cognitivism.*

via the emotionally-loaded act of conspicuous destruction? Obviously, the role of such intentional or non-intentional mnemo-technical artefacts and practices is far more dynamic and dialogical than the one implied by the notion of a passive external 'long-term' store. The complex associative enchainment between the 'internal' and 'external' elements of remembering that they embody might be better expressed with the metaphor of a handkerchief knot than that of a computer hard disk. They remind you, sometimes even force you to remember, without including the content of what precisely is to be remembered. There is no linear stimulus–response situation here but a process of active discovery spanning the monumental and the minute, the conspicuous and the commonplace, iconicity and iconoclasm.

My suggestion in other words is that understanding material culture in its capacity of mnemo-technical mediation cannot be reduced solely to an analogue process of encoding-storage-retrieval which, we should bear in mind, represents the basic structure of the computational account of human memory — far from the natural state of things. Even in the case of the Linear B script where storage seems undeniably the case, it is far from clear whether we should construe this technology as an aspect of the Mycenaean art of memory, or of the art of forgetting. It may sound paradoxical, but are we not writing down something so that we will not have to remember it? I am not denying that forgetting and remembering are co-dependent processes (Forty & Küchler 1999). I simply want to underline the need on the one hand for a more subtle classification of mnemonic operations enacted in the context of material engagement, and on the other for a shift in the basic analytic unit for the study of human memory beyond the boundaries of the individual. Materially-enacted memory is hardly a unitary phenomenon and as such, the adoption of ready-made psycho-logical models and classifications derived from a paradigm that *a priori* treats material culture as external and epiphenomenal to the mnemonic system proper, will not help us go very far.

If we are to succeed where cognitivism has failed we need to develop our own means to grasp the engagement of the mind in culture, moving from concerns with 'potentials to concerns with the actual engagement' (Bloch 1998, 216–17). Focusing on substantive signs of *remembering-through* (Casey 1987), the objective should be to develop a more detailed classification of the types of mnemonic operations involved, keeping in mind that object traditions allow a 'direct re-engagement with past experience in ways that are prevented in language' (Rowlands 1993, 144) and as such need not rely on explicitly-inscribed information (see Renfrew's discussion, this volume, of implicit memory).

The hypothesis of the constitutive intertwining of cognition with material culture

With this brief note on memory, let me now return to the alternative schemes I mentioned above and present them by way of some key terms, suggestive of how human cognition should be construed. These are the following (Fig. 5.2): *embodied* (Lakoff & Johnson 1980; 1999; Lakoff 1987; Johnson 1987); *situated* (Suchman 1987; Sternberg & Wagner 1994; McClamrock 1995; Clancey 1995; Lave & Wenger 1991); *extended* (Clark 1997; 2003; Clark & Chalmers 1998); *enacted* (Maturana & Varela 1980; Varela *et al.* 1991); *distributed* (Hutchins 1995); and *mediated* (Lave 1988; Wertsch 1991; 1998; Cole 1985; Vygotsky 1978; 1986). Setting aside for now the complexities of the technical arguments underpinning these notions, suffice it to point out that if accepted as the new predicates of human cognition these terms are able to collapse the conventional mind/brain tautology and

mind/body dichotomy. They further render problematic any research procedure that artificially divorces thought from embodied action-taking.

Given this background, I can now proceed to spell out my hypothesis: if human cognition, as Clark (1997, 98) proposes, 'is fundamentally a means of *engaging* with the world', *then material culture is consubstantial with mind.* The relationship between the world and human cognition is not one of abstract representation or some other form of action at a distance but one of ontological inseparability. That is, what we have traditionally construed as an active or passive but always clearly separated external stimulus for setting an internal cognitive mechanism into motion, may be after all a continuous part of the machinery itself; at least, *ex hypothesi*. To exemplify, it is not simply that without pencil and paper you cannot do a large multiplication, or that adding using Arabic numerals is much easier than using Latin ones, but that those extended mediations of numerical signs, pens, paper, hands and bodily senses, are not simply tools actualized by an internal processor but the systemic components the interaction of which brings forth the cognitive process in question (see also Knappett's discussion of jigsaw puzzles, this volume). In such cases 'it may make little sense to speak of one system's *representing* the other' (Clark 1997, 98). Although we may well be able to construct a mental representation of anything in the world, the efficacy of material culture in the cognitive system lies primarily in the fact that it makes it possible for the mind to operate without having to do so: i.e. *to think through things, in action, without the need of mental representation*. In other words, my hypothesis is that material engagement is the synergistic process by which, out of brains, bodies and things, mind emerges.

Some examples

> [C]onsider a blind man with a stick. Where does the blind man's self begin? At the tip of the stick? At the handle of the stick? Or at some point half-way up the stick? (Bateson 1973, 318)

Where do we draw, and on what basis can we draw, a delimiting line across the extended cognitive system which determines the blind's man locomotion? Bateson's answer is 'that these questions are nonsense', and indeed they are, if one adopts his cybernetic perspective and sees the stick as a 'pathway along which differences are transmitted under transformation' (Bateson 1973, 318). However, even if we accept such a transactional logic where differentiation between 'inside' and 'outside' makes no real sense, the question of the ontological status of the stick in respect of the blind man's perceptual system remains vague. Should we go so far as to conceive of the stick as a structural part of the blind man's living body? Our common sense would seem to favour the idea of a cognitive agent who simply exploits a tool in order to overcome a perceptual deficiency by substituting vision with touch. But does the biological boundary of the skin apply in this case? Are we not, by removing the blind's man stick, preventing him from seeing? If we replace the stick with a Mycenaean sword, would this be the sort of extended artefact envisaged by Marshall McLuhan (1964), capable of transforming the way the Mycenaeans perceived and acted in the world, or is it simply an instrument, an aid to the body, with no real or in any sense important cognitive bearing? If the latter, the inner–outer schism between the mental and the physical remains unaffected; if the former, as my hypothesis implies, then the boundary has been transgressed. The sword becomes a constitutive part of a new densely-coupled cognitive system objectifying a new frame of reference and giving to this frame of reference a privileged access to Mycenaean reality and to the ontology of the Mycenaean person.

To cite an example from the domain of archaeological practice, a context record form does not simply augment archaeological cognition by making it possible to see at a glance 'whether all data that should have been recorded are there' (Drewett 1999, 126). It participates rather in the kinds of operations that produce those data, and has a great deal to do with the type of problem-solving and categorization involved. It operates, in other words, as a kind of materialized 'terministic screen' (Burke 1966) directing attention to one field rather than to another and affecting the nature of archaeological observation. In similar manner, concepts and categorizations, like 'dark reddish-brown' or 'light yellowish-brown', do not reflect the workings of an inner brain but the material engagement between a Munsell soil colour chart, a trowel with a piece of wet soil on it and an archaeologist aiming towards 'getting a maximum grip' on the activity known as colour identification (Goodwin 1994). Indeed, 'an archaeologist and a farmer see quite different phenomena in the same patch of dirt' (Goodwin 1994) but if you are to account for this difference in 'professional vision' the dense complementarity between the spatially and temporally extended components of interaction needs to be taken into consideration. If archaeological in-

terpretation starts at the trowel's edge (Hodder 1999) it is because, in the context of archaeological excavation, the trowel, more than a tool for digging, becomes a boundary artefact that inhabits simultaneously the realms of 'pragmatic and epistemic action' (Kirsh & Maglio 1994; Knappett this volume), participating in the processes by which archaeological 'brains make up their minds' (Freeman 1999).

Matters are not so simple, however. Undoubtedly, working through the implications of such a thesis one may better appreciate Gell's suggestion of an 'isomorphy of structure' between mind and the 'external' world (1998, 222–32), or Renfrew's (2001b, 98) discussion of measuring systems as constitutive symbols where the cognitive element and the material element co-exist, 'and where the one does not make sense without the other'. But we are a long way from arriving at testable formulations of the issues involved that will be consistent with the phenomenological requirements of the above assertions.

At the potter's wheel

A good context to begin exploring some methodological implications can be found at the potter's wheel. A number of interesting questions can be raised about knowledge, memory, perception, intentionality, problem-solving and the ways those processes are embedded and distributed in a given operational chain. In attempting to construct a cognitive ethnography pursuing these issues, several general points need to be borne in mind.

The thing to note first is that in terms of cognitive topology — that is, the question of where those cognitive processes reside — no *a priori* hierarchy can be argued between the potter's brain/body/wheel/clay/product/context of activity. For example, the cognitive map of knowledge and memory may well be extended and distributed in the neurons of the potter's brain, the muscles of the potter's body, the 'affordances' (Gibson 1979; Knappett this volume) of the potter's wheel, the material properties of the clay, the morphological and typological prototypes of existing vessels as well as the general social context in which the activity occurs. The above components can be broken down further, but none of them can be argued as determining the contours of activity in isolation. The affordances of the wheel-throwing technique need to be discovered each time, in real time and space within the totality of the interactive parameters. The cognitive dialectic so initiated is in a constant state of becoming through the

process of 'accommodation and resistance' (Pickering 1995). This is a dance of agency not dissimilar to the one performed by Walter's 'turtles' which we discussed earlier. In any given stage of the operational sequence the wheel may subsume the plans of the potter and define the contours of activity, or at another point serve as a passive instrument for his or her manufacturing purposes.

To appreciate the above claims one needs of course to do more than simply adopt an 'intentional stance' (Dennet 1987) on the task at issue. Ethnographic and experiential familiarity with the task domain is a prerequisite. Verbal description, however detailed, can hardly capture the phenomenological perturbations of real activity. As any attempt to deconstruct the complexity of the task involved (e.g. for instructional purposes) will reveal immediately, it is impossible to provide precise directions solely through the medium of language, especially to the uninitiated. Apprenticeship is the necessary medium through which dispositions and constrains are unfolded and internalized in a trial and error procedure (Rogoff 1990). It is at the potter's fingers that the form and shape of the vessel is perceived as it gradually emerges in the interactive tension between the centrifugal force and the texture of the wet clay. Materiality enters the cognitive equation at a much more basic level, shaping the phenomenology of what Searle has defined as the 'Background' i.e. the 'set of non-representational mental capacities that enable all representing to take place' (1983, 143). In other words, and returning to my hypothesis, we should replace our view of cognition as residing inside the potter's head, with that of cognition enacted *at the potter's wheel*.

An analytically-minded archaeologist may object however that in the above cases the focus is not on cognition proper, but rather on practical skill, a know-how that should clearly be differentiated from the discursive level of rational thinking. This deeply rooted problematic assumption characterizes a large part of contemporary cognitive archaeology which conceptualizes its subject matter in the supposedly privileged symbolic domains of religion and ideology, reiterating Hawkes's ladder (1954), perhaps in the hope of developing appropriate means to enable a methodological ascent. But this is precisely the assumption that should be questioned by collapsing the dividing lines between perception, cognition and action, and rejecting the methodological separation between reason and embodiment. Or if I may elaborate on Gilbert Ryle's (1949) formulation of the fallacy involved, the archaeologist who is searching for

the ancient mind *behind* the prehistoric tool is committing the same 'category mistake' as the foreign visitor at Cambridge who having seen the colleges, libraries and departments asks to be shown the University. There is no mind apart from the world (though there might be a brain), just as there is no University apart from the colleges and departments. The analogy may be crude but it makes the basic point: mind is immanent on the one hand in the sequence of technical gestures required for the production of the tool and the various media that are brought to bear on that sequence, and on the other in the skilful actuality that transforms the tool into an agent imbued with cognitive and social life (Malafouris 2001). We need not adopt here an attitude of crude behaviourism, but it is necessary to appropriate the insights from this way of thinking that cognitivism has chosen to ignore. The point is not to deny altogether the existence of mental models, schemata and internal planning procedures as active in the course of any creative process, but rather to recognize them as the temporally emergent and dynamic products of situated activity.

So are we wrong to infer an information-processing mind active behind the corbelling of a Mycenaean *tholos* tomb or the construction of the Cyclopean wall that surrounds the citadel at Mycenae? Of course we are not. What it would be wrong to assume however, is that such complex and certainly distributed problem-solving operations can be reduced to an isolated individual mental template that precedes and defines the operational sequence. In building a Cyclopean wall, the choice of the appropriate block of stone was determined by the gap left by the previous one in the sequence of action rather than, or at least as much as by, any preconceived mental plan to which those choices are but subsequent behavioural executions. As Lucy Suchman (1987) has aptly indicated, plans and models are always too vague to accommodate in advance the manifold contingencies of real-world activity.

There is always what Davidson & Noble call the 'finished artefact fallacy' (1998) involved whenever archaeology prefers the *Think Me, Make Me* order of things to that of *Make Me, Think Me* — according to Renfrew (2003, 176) the crux of the engagement process as neatly expressed by the artist Bruce Nauman. And although in the case of the Mycenaean wall, such a preference may not have any significant bearing on the great scheme of things, placed in evolutionary time it might be the one that decides some of the most profound questions in the emergence of human cognition.

As a conclusion

In this paper I have attempted to sketch a preliminary framework for understanding the cognitive basis of the engagement of the mind with the material world, advancing the hypothesis that contrary to some of our most deeply-entrenched assumptions, the boundaries of human cognition 'extend further out into the world than we might have initially supposed' (Clark 1997, 180). Far from a simple terminological shift, the hypothesis of extended mind carries with it major implications in terms of how we go on to study human cognition past or present. Most importantly, it qualifies material culture as an analytic object for cognitive science, warranting the use of methods and experimental procedures once applied to internal mental phenomena for use upon those that are external and beyond the skin. We need no longer divorce thought from embodied activity, as we need no longer adopt the stance of methodological individualism and thus reduce the complexity of an extended and distributed cognitive system to the isolated brain of a delimited human agent. Material engagement may offer the optimum point to perceive what for many years remained blurred or invisible, i.e. the image of *a mind not limited by the skin* (Bateson 1973).

Acknowledgements

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