Art in the Making: The evolutionary origins of visual art as a communication signal

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5. ART IN MIND: STEVEN MITHEN'S MODEL OF COGNITIVE EVOLUTION

We have both reason and need to search for a link only if there is something to be linked, only if, for example, it has been decided that there is a space to be found that separates chimpanzees from human beings. The Mental Ladder was the chain, of course, just as the fossil record has come to be the supposed chain that links all living beings, past and present, extinct or breathing on today's ladder. Each new fossil find of a supposed hominid fossil brings new guesses as to the nature of the link in structure and behavior between ourselves and those very remote genetic ancestors.

DOUGLAS K. CANDLAND, 1993

Over two decades ago, British archaeologist Steven Mithen, armed with a broad knowledge of prehistory and psychology, set himself the difficult and ambitious task of proposing an evolutionary model not only for the origins of art, but for the modern human mind, in his seminal book *The prehistory of the mind: A search for the origins of art, religion and science* (1996a). His proposal – well informed by archaeology, palaeoanthropology, evolutionary psychology, cognitive science, artificial intelligence, and philosophy of mind – emphasizes the symbolic nature of human cognition and conceives of visual art as a cognitive faculty intended to encode and communicate ideas between individuals, and has had a great impact in the fields of cognitive archaeology, and in studies on the origins of art.

The aim of this chapter is to carry out an assessment of the key arguments in Mithen's proposal as presented on *The Prehistory*. Although I will also use relevant work in which he has developed the arguments expressed in *The Prehistory*, the latter contains the core of Mithen's origin-of art model. Moreover, even when the author has somewhat modified his position since that publication, this is still his most influential work and continues to be widely cited. For this reason, it constitutes the main focus of this assessment.

The chapter development includes an overview of the ideas that underlie Mithen's model in the realms of archaeology and cognitive science, a description of his main arguments regarding the evolution of the modern mind and the origins of visual art, and a discussion and evaluation of some of the key features of his model in view of recent data from cognitive and evolutionary science. Finally, I examine some predictions from his proposal in light of recent archaeological data.

5.1 The evolution of human cognition: The background

Mithen's model for the evolution of cognition and the origins of art, firstly, belongs to a long scholarly tradition in archaeology concerned with explaining the changes in the archaeological record of the Late Pleistocene, and in particular of the European Upper Palaeolithic. He attempts to account for the differences in the material culture of extinct and living humans in terms of the evolution of cognitive abilities in the *Homo* lineage. In second place, it fits within the domain of cognitive archaeology, the aims of which is explained below.

As discussed in chapter 1, for most of the past century, prehistorians were preoccupied with explaining the seemingly abrupt changes observed in the archaeological record of the European Upper Palaeolithic, which pointed to a sudden 'explosion' of several objects and traits that define modern human populations (Pfeiffer 1982:42); among others: specialized tools (e.g. harpoons, knives, awls, nets), the use of various raw materials for tool-making (e.g. bone, wood, antler, ivory), the structured use of space, the exploitation of a wide array of resources for food (e.g. plants, seeds, small animals, aquatic resources), burials with grave goods, exchange, personal ornaments, and visual art.[98]

To many scholars, Mithen included, these changes were best explained by an enhancement in human cognitive ability that allowed the populations of the Upper Palaeolithic to create and exploit culture at a rate never before reached by any other hominin group. Thus, explaining the archaeological record could not be decoupled from explaining the evolution of human cognition.

Cognition encompasses all the mental processes involved in the way organisms learn about and interact with the world. For humans, these include perception, attention, memory, language acquisition and use, problem-solving and decision-making, among others. Explaining how cognitive processes work is a key theme in psychology and neuroscience. Up to the 1960s, psychological research was dominated by the behaviourist approach which explained behaviour as a reaction to external stimuli and thus emphasized the study of so-called stimulus-response mechanisms.[99] However, by that time some cognition scholars including George Miller, Noam Chomsky and Jerry Fodor, started to see behaviour in a different light, as the result of cognitive operations triggered by environmental inputs. They were attracted by the idea that the mind could be modelled after a computer, "both the computer and the human mind should be thought of as 'symbol systems' – physical entities that process, transform, elaborate, and, in other ways, manipulate symbols of various kinds" (Gardner 1987:34). Under their influence, psychological research gradually shifted away from behaviourism and toward a cognitive information-processing position, which focused on investigating mental representations and the 'inner workings

98 For a full list of Upper Palaeolithic innovations, see: O. Bar-Yosef (2002, 2007).
99 Behaviourists considered psychology to be the science of the physical, observable movements organisms make in space, i.e. observable behaviour (Baars 1986:7).

of the mind'. This conceptual change is known as 'the cognitive revolution in psychology' (Baars 1986; Gardner 1987; Miller 2003). As psychologist Howard Gardner explains, the cognitive paradigm is the belief that talking about human cognitive activities is to speak about mental representations, separate from the biological/neurological and sociological/cultural aspects of behaviour; that the computer is a good model of how the human mind works; and, that cognitive research should focus on operative mechanisms and de-emphasize affective, cultural, and environmental factors (1987:6). The study of language, understood as the primordial symbol system, is also central to the cognitive paradigm.

The cognitive view then, promotes a view of cognition as symbol-processing. Here, the mind's function is to create and process symbols which themselves are generated in the brain to represent knowledge or reality. Hence, symbolism is detached from the traditional semiological sense of a code or system of meanings, and redefined as a psychological (cognitive) mechanism and a form of knowing (Sperber 1975).[100] The priority given in this perspective to symbolism as the most relevant aspect in the evolution of human cognition is summarized by cognitive psychologist Merlin Donald as follows (1993:737):

> Symbolic representation is the principal cognitive signature of humans and the main phenomenon whose arrival on the scene has to be accounted for in any scenario of human evolution.

The cognitive paradigm has also had a profound effect in how art has been approached since. Whereas behaviourism had generally understood art as a non-cognitive or affective activity, the cognitive perspective established the processes of art-making and art perception as mental activities originating in the brain (Efland 2002:56).

In archaeology, the cognitive view generated a branch concerned with "the study of the ways of thought of past societies (and sometimes of individuals in those societies) based upon the surviving material remains" (Renfrew 1993:248). Cognitive archaeology, or the 'archaeology of mind', has two main fields of study: reconstructing past symbolic systems through the analysis of material culture, and reconstructing the evolution of human cognition (Renfrew 1993:249). The work of Steven Mithen is well positioned in the latter area of research. One of his main aims has been to put forward an evolutionary scenario for the human mind, using the archaeological record "to reconstruct the past thought and behaviour of our ancestors, and the selective pressures for cognitive evolution" (Mithen 1998a:9). The evolution of human cognitive traits and their manifestation in the archaeological record is a recurrent theme in the work of Mithen and other prominent cognitive archaeologists like Iain Davidson (Noble & Davidson 1996) and Thomas Wynn (Coolidge & Wynn 2009), and of

100 The basic premise is that language – as a symbol system – structures human thought, and thus "symbolic elements organise the mental representation of systems of which they are parts" (Sperber 1975:70).

palaeoanthropologists and Pleistocene archaeologists such as Richard Klein (Klein & Edgar 2002), and Francesco D'Errico (Henshilwood & D'Errico 2011).

Mithen's own ideas on cognitive evolution will be presented in the following section. For the moment, it suffices to mention that in general terms, his work follows closely the model for the origins of the human mind proposed by cognitive psychologist Merlin Donald (1991, 1993). Donald suggested that the evolution of mind had developed through the hominin line from apes to modern humans in three stages of increasing complexity. The three transitions between stages were marked by shifts in the nature of consciousness which turned the 'episodic' primate mind into the 'mimetic' mind of early hominids, into the 'mythic' mind of early *Homo sapiens*, and eventually into the 'theoretic' modern human mind. According to this model, the episodic mind that still characterizes primates and our close ape relatives changed with the emergence of what Donald calls 'mimesis', a representational form of communication through gesture and mime that made possible, among other things, the voluntary expression of emotion, the transmission of skills, the planning of actions, and the coordination of group behaviours. Mimesis would have been the main means of communication among early hominins and acted as a foundation for linguistic ability. The next shift towards the mythic stage was brought about by the development of phonology, or speech. In Donald's view, this was a late development, as recent as 45,000 years ago. But its consequences were enormous. Speech allowed for a more complex social life, and a faster means of transmission and accumulation of cultural knowledge. Narrative originated in this phase and myths became the basis of social structure. The mythic mind would have been characteristic of early 'sapient humans'. The final and most complex of all stages, the theoretic stage, is typical only of recent historical human cultures and is characterized by the use of symbolism and of artefacts as external 'memory storage and retrieval' devices. The ultimate cultural development of this stage is represented by the recent invention of writing systems. In sum, Donald argues that "During the past two million years humans have passed through three major cognitive transitions, each of which has left the human mind with a new way or representing reality and a new form of culture" (1993:737).

Mithen follows Donald in seeing symbolism as the most important human cognitive capacity, in placing the evolution of (syntactic) language late in human evolution, and in seeing external symbolic storage as the key innovation that drove the development of modern human culture and cognition. Mithen uses the archaeological record to illustrate the process of human cognitive evolution (1996a:227).

5.2 The prehistory of the mind: Key arguments

Mithen has made a name for himself as one of the few archaeologists who have ventured into the domain of the cognitive sciences. His model of the evolution and workings of the human mind and of how these processes are reflected in material culture has been highly influential in archaeology and across disciplines. In this section, I will lay out what are the central premises of that model.

The evolution of the human mind

One of the most dominant views in cognitive studies since the late 1980s has been that of modularity. This is the hypothesis that the human mind is constituted by specialized domains or modules shaped by natural selection to solve the different problems faced throughout evolution (e.g. foraging, mating, competing, cooperating, etc.). Evolutionary psychologists, for instance, have often compared the human mind to a Swiss army knife, meaning that it may be thought of as one device made up by different specific problem-solving mechanisms (Pinker 1994, 1997; Tooby & Cosmides 1992). Mithen instead suggests that the Swiss army knife mentality, composed of separate working modules, was typical of Early Humans (all *Homo* ancestor species),[101] but not of Modern Humans. In his view, modern cognition is characterized precisely by an 'intermodular' mind. To explain the evolution of modern cognitive intermodularity, Mithen invokes the metaphor of the mind as a cathedral built in three stages (1996a:64).[102]

Accordingly, the construction of the 'mind's cathedral' consisted of laying down a foundation upon which to build the mental edifice. This basis corresponds to general intelligence, i.e. a general-purpose learning and problem-solving mechanism. General intelligence is common to all apes, and for this reason Mithen supposes that it must have a long time depth in the primate order.

In a second stage of construction, chapels for special purposes were built around the central nave of general intelligence. In Mithen's view, this change occurred early in the evolution of the hominin line, where there was a trend towards increased mental modularity, i.e. cognitive specialization. The 'chapels'

101 With the term 'Early Humans', Mithen denotes *Homo erectus*, *H. heidelbergensis*, *H. neanderthalensis*, and 'archaic' *H. sapiens*. (1996a:116).

102 In this aspect, Mithen's model is well within the Western tradition of modelling the evolution of cognition: "Curiously, theories of the mind have often been divided into three parts, the number 'three' appearing to hold a magical import for intellectual philosophers. The three-category notion arose during the Middle Ages and reappeared in nineteenth-century thought, when it became known as faculty psychology. Each of the three aspects, or faculties, of the mind – reason, emotion, and will – was now thought of as a separate faculty. Cognition (reason), emotion, and motivation (the will) remain central in our times, as examination of any university curriculum in the study of psychology will show" (Candland 1993:193).

would constitute the cognitive domains evolutionary psychologists refer to, but whereas the latter conceive of a virtual infinity of such specialized modules, Mithen argues that throughout evolution hominins managed relying on four basic cognitive domains or intelligences: social, natural, technical and linguistic. Like the chapels in a cathedral, these stood apart and functioned independently of each other. The first chapel to have been erected was social intelligence for interacting with others. This is already present in chimpanzees and thus must have been the earliest mental module to arise. The second to emerge was a natural history intelligence for understanding the natural world and for foraging. Then, technical intelligence evolved for making and using tools.[103] It is in this long 'second stage of construction', Mithen suggests, that the preconditions for the eventual development of visual art were set (2001). These were: a) the ability to make intentional marks, which probably became established with the use and fabrication of tools; b) the capacity to recognize and classify natural signs, such as the sights and sounds of other individuals and properties of the environment; and c) the faculty of communicating intentionally with conspecifics.

In Mithen's view, the mind of early *Homo* and all derived species, including Neanderthals and the first *H. sapiens*, ran mainly on general intelligence and the modules of social, natural history and technical intelligence. These humans eventually excelled on each of these domains, and so we see that, for instance, Neanderthals were highly social, had an extraordinary understanding of their environment, and produced very complex and efficient tools. However, their material culture remained more or less static throughout their thousands of years of existence. Mithen attributes this apparent cultural stagnation to the fact that they were unable to make connections between their mental domains, so that they could not bring different types of information into a single idea, restraining their capacity for innovation (2005:232).

For Mithen, the human mind worked in this way until recently in evolutionary time when, sometime in the evolution of our species, linguistic intelligence emerged specifically for spoken language acquisition and use. Mithen reckons that earlier hominins, including Neanderthals, must have had some sort of prosodic 'proto-language' that was probably used only to regulate social situations, that is only to communicate with and about other people.[104] So, language was present in the hominin mind but lacked modern syntax and was restricted to the social domain (Mithen 2005:264).[105] The evolution of fully modern syntactical language (with grammatical rules and structures) would have

103 This scheme is partially based on the work of cognitive psychologist Howard Gardner, as presented in his book *Frames of Mind: The Theory of Multiple Intelligences* (1983).

104 Mithen has recently suggested that Neanderthals, and perhaps other extinct hominins, had a communication system based on holistic, manipulative, multi-modal, musical and mimetic utterances: music-like, emotion-laden vocalizations used as part of social interactions, which were accompanied by body gestures, mimesis and dance-like movements (2005:175, 2009:9).

105 As in Robin Dunbar's scenario of language evolution (Dunbar 1996a).

caused the walls that separated the cathedral's chapels from the central nave to collapse, allowing the flow of information between them. This means that language could now be used to talk about anything: tools, animals, social interactions, or the weather. In this manner, knowledge from one domain of intelligence could be applied to another in novel ways, triggering creativity and innovation. The 'creative explosion' of the European Upper Palaeolithic would reflect the transition from a social to a general-purpose language (1996a:192):

> As soon as language started acting as the vehicle for delivering non-social information and ideas into the domain of social intelligence, reflexive consciousness could also get to grips with the non-social world […] As a result, the whole of human behaviour was pervaded with the flexibility and creativity that is characteristic of modern humans.

Mithen calls the ability to use information across mental domains 'cognitive fluidity', a concept that is central to his hypothesis for the origins of visual art.

Chronology

Like Donald, Mithen favours a late chronology for the full development of modern human cognition. Based on the archaeological evidence of the Late Pleistocene, he places this transition at 50,000 years ago (1996a:20, 2000a:217, 2001:47). The latter date refers to the minimum age for the colonization of Australia, which serves as an indicator of modern cognition as this event involved planning, abstract thinking, organization and the manufacture of complex sailing technologies (as discussed in chapter 1).

In keeping with 'cognitive transition' models (e.g. Klein & Edgar 2002; Coolidge & Wynn 2009), Mithen's work highlights a 'lag' between the emergence of anatomical and cognitive modernity. It argues that even though the fossil record shows that before 100,000 years BP there already were populations that probably looked much like present-day people (e.g. Qafzeh, Klasies River), the archaeological evidence indicates that they did not start thinking and behaving like present-day people until much later. Signs of 'modern' practices like ritual, planning, abstract thinking, and art-making are only sporadic among early humans. For example, there are 'flashes' of modernity in sites like Blombos Cave, but they are few and far between. Even after the colonisation of Australia, some 60-50,000 years ago, the signal remains weak until the European Upper Palaeolithic (40-30,000 BP), whose innovations in culture and technology finally indicate a 'fully developed' modern mind. The discontinuity of the evidence for modernity poses a problem, as he explains (2000a:211-2):

> It is not until between 60,000 and 30,000 years ago that the archaeological record is transformed in a sufficiently dramatic fashion to indicate that a distinctively modern type of behaviour and mind had evolved […]

> [However,] if we wish to align ourselves to the notion of a pan-human psychology then we would have to place this mutation happening at 100,000 years ago at the very latest. For after that date modern humans had become dispersed and most probably existed in fragmented populations throughout the world. Any universal biological trait would by necessity have had to have appeared before this date.

Mithen's solution has been to argue that either prior to 60,000 years ago, "the mentality of the Early Modern Humans appears to drift in and out of cognitive fluidity" (1996a:183) or, more recently, that the changes in the record after that date may be attributed to socio-demographic factors such as group size and rates of social transmission (2005:262). Mithen has characterized his position as "gradualist, with regard to the cognitive capacities that allow symbolic behaviour, and discontinuist as regards the manifest appearance of such thought, this arising from one further step in the gradual evolution of such capacities" (2000b:149).

The origins of visual art

Mithen suggests that out of the cognitive evolution sketched above, visual art emerged as an external support for symbolic ideas (1996b, 2001, 2007). It should first be clarified that Mithen's conception of art is different from that held by the models discussed in the two previous chapters. Mithen defines art as "visual symbolism" (1996c:149) and delimits it as the group of artefacts "which are either representational or provide evidence for being part of a symbolic code, such as by the repetition of the same motifs" (1996a:175). He then focuses on visual art, and representational art in particular.

Mithen's model of the evolution of visual art somewhat parallels his scenario of the evolution of human cognition. He argues that before the emergence of our species, hominins had developed four mental abilities that eventually supported the emergence of symbolic thought and visual art: intentional mark-making, the classification of signs, intentional communication, and attribution of meaning (1996c:175). First, the ability to make intentional marks probably became established with the use and fabrication of tools. Then, the capacity to recognize and classify natural signs, such as the sights and sounds of other individuals and properties of the environment, is probably an ancient trait as well. Third, the faculty of communicating intentionally with conspecifics is also present in apes and thus must have been available to our earliest ancestors. Finally, the ability to attribute meaning to marks and objects arose exclusively in our lineage. These four elements, Mithen concludes, "could only have been integrated to form the high level cognitive process of visual symbolism after accessibility between the social and non-social cognitive domains had arisen" (1996c:150); i.e. after the emergence of syntactic language.

For Mithen, language and cognitive fluidity made visual art not only possible but also necessary. The appearance of symbolic and abstract thought brought about by a fluid mind required new ways of expressing symbols beyond vocal language. It called for external material supports in which ideas could be stored or 'offloaded'. This made it possible to "reduce the computational load on individual minds, expanding the possibilities of information storage, and enabling information and ideas to migrate between different individuals" (1998b:182). He has suggested, for example, that the prehistoric art of Europe encodes information about the natural resources that were available for exploitation to Palaeolithic hunters. Once set in a material medium, this information could be used to instruct young members of the group, and to plan optimal foraging strategies (1988a, 1988b, 1990). In this sense, art objects may be conceived of as "a tool for storing information and for helping to retrieve information stored in the mind" (1996a:192). In Donald's model, the 'externalization of memory' also constitutes the ultimate transition that led to the cognitive reorganization of the modern mind (1993:745).

For Mithen visual art flourished in response to that novel communicative need, and as the result of humans being able to use artefacts as signifiers. In this manner, the visual arts became "not only the products of a new way of thinking, but also their source" (2001:49), constituting a veritable 'extension' of the human mind (1998a, 2000, 2007). Through using material culture as a means to store and transmit information, there started "a positive feedback loop that generated a transformation in human mind, behaviour and culture within a short period of time – the creative explosion" (1998b:181). Archaeologically, this event is manifested in the diversification of technology (the incorporation of raw materials other than stone, new tool types and artefacts) the exploitation of a wider range of resources for food, the population of new territories, and the creation of figurative art.

Finally, Mithen explicitly describes art-making as "creating artefacts or images with symbolic meaning as a means of communication"(1996a:183). So, he sees art basically as a medium of communication through which people could better discuss and exchange information with one another about, for instance, animal behaviour or the weather, and use that information to their advantage. This, he explains, would have had a highly adaptive value by allowing humans, for example, to monitor environmental conditions, better plan foraging strategies, or facilitate landscape exploration (1996a:195, 2001).

The completion of the sequence of mark-making, classification and communication only became possible with the advent of language and cognitive fluidity (1996b:213). In Mithen's view, these two components working together are what allowed humans to acquire the unprecedented ability to encode ideas and meanings in material culture and develop imagination and creativity (2007).

Mithen's model, in conclusion, suggests that the basic capacities for art-making were established in our hominin predecessors, and converged gradually at a time before 50,000 BP. In contrast to the two models reviewed in the previous two chapters, Mithen's scheme allows for the possibility that art, along with other modern human practices such as religion and science, be an exaptation or "non-functional by-product from an integration of the cognitive domains that had evolved in the early human mind" (1998b:183). This is a prospect that I will revisit in chapter 6.

To recapitulate, Mithen's proposal (1996a, 1996b, 1998b, 2000, 2001, 2005, 2007) suggests that modern complex behaviour is the result of a major redesign of the human mind – cognitive fluidity – brought about by modern language. This cognitive change caused different domains of intelligence (technical, social, natural, linguistic) to interact and pass information between them, recombining it in new creative ways. One of the main implications was that humans became able to 'extend their minds' into material culture, i.e. communicate through symbols, by attributing meaning to objects and using them to express and exchange ideas. Visual art (in its representational variety) was the product of such ability.

5.3 A mind for art: Critical assessment

The present section aims to present current debates on the main aspects that structure Mithen's hypothesis of the evolution of the human mind and the origins of visual art. This assessment focuses in particular on two points: Mithen's scenario of cognitive evolution and the problems of inferring cognitive capacities from technology and art.

The prehistory of the mind revisited

Mithen's view, as laid out in the previous section, involves minimally three stages of cognitive evolution: 1) from primate general intelligence, to 2) hominin domain-specific intelligence, to 3) modern inter-modular general intelligence (2007). Using data from neuroscience, I argue that Mithen's assertions about modern primate and human mentality seem to be correct, but that his ideas about the cognition of extinct hominins are not that well supported, which weakens the basis of his general argument.

The first stage of Mithen's model involves the evolution of general intelligence, common to all primates and highly developed in apes (1996a:89, 2001:33). Certainly, comparative cognitive research on primates suggests that general intelligence is prevalent across species (Reader et al. 2011). Studies with great apes (chimpanzees and orang-utans) indicate that their cognition is actually not that different from ours regarding perception and the understanding of the physical world (Hermann et al. 2007; Tomasello & Hermann 2010). For example, apes, like human children, are able to understand the intentions, goals and perceptions of others and how these affect their actions, that is, they "understand that others have goals and behave toward them persistently, and that this is governed by what they perceive" (Tomasello et al. 2005:685). Thus, general intelligence does seem to be deeply rooted in primate phylogeny, as indicated by Mithen (e.g. 2001:50).

In the second stage of Mithen's model, members of the *Homo* lineage evolved a specialized, compartmentalized intelligence for specific problem-solving, constituted by natural history, technical, and social intelligence (1996c:148):

> It is most reasonable to infer relatively high degrees of social, technological and natural history intelligence prior to the transition. In many respects these appear to be similar to those of modern humans, and consequently we find considerable evidence for continuity across the transition. However, there also appear to have been major differences. Natural history intelligence does not appear capable of achieving the same degree of fine grained environmental adaptation as found among modern humans, and to be separate from technical intelligence. Similarly, the cognitive processes involved in the working of stone appear to be restricted to that material, although the working of bone or antler appears to require similar skills of manipulation and special thought. Overall, we may suggest that while high levels of social, technical and natural history intelligence were present, the cognitive abilities within each were restricted to that specific domain, i.e. Lower and Middle Palaeolithic hominids had high degrees of mental modularity. Their intelligence is most appropriately characterized as 'domain specific'.

Mithen argues, thus, that in the Early Human mind, tool-making pertained to the domain of technical intelligence and, for its part, 'proto-language' originated in and was limited to the module of social intelligence (1998b:181). He further claims that it was not until these two modules converged, late in human evolution, that cognitive modernity became possible. However, recent research indicates that, on the contrary, tool production and language ability may very well have a shared neural foundation, as suggested by James Rilling (2008:26):

> Human tool use depends on a network of left hemisphere cortical regions that overlaps extensively with regions involved in language and gestural communication, supporting a common evolutionary origin for these abilities.

These results are supported by functional brain imaging carried out on individuals while they were engaged in making simple stone tools, and which show a significant overlap in the patterns of activation of brain circuits between language and tool-making, suggesting that these "are likely to have evolved in a mutually reinforcing way" (Stout et al. 2008:1947). And while, as discussed in the previous chapter, musical and linguistic ability seem to be disassociated, the contrary seems to apply to motor and linguistic ability. For instance, language impediments often co-occur with some motor disabilities in both children with inborn and developmental disorders and in adult stroke and cerebellar lesion patients, pointing to shared cognitive processes between the two (Hill 2001;

Schmahmann 2004). As Tomasello and colleagues have suggested, the uniqueness of human cognitive abilities probably owes more to the way in which we deal with social situations and work together towards common goals, aspects that likely evolved "in the context of the imitative learning of complex tool-using and tool-making activities" (2005:687). Hence, Mithen's idea that for most part of our evolutionary past technical and social intelligence were separate domains seems unfounded. Rather, throughout human evolution new behaviours often have co-opted the neural networks of other functions (Jablonka & Lamb 2005:308), so that communication between cognitive domains has probably prevailed in the hominin brain.

Finally, Mithen suggests, between 100-50,000 years ago, the three modules or cognitive domains of the hominin mind started working together through cognitive fluidity, which brought about our modern type of mentality. Indeed, the human mind does seem to be intermodular rather than domain-specific. The existence of mental modules of the type put forward by evolutionary psychology (Tooby & Cosmides 1992) has not been confirmed by cognitive neuroscience. Neuroimaging studies do indicate that there is some degree of neural localization of various brain functions (perceptual and cognitive). For instance, visual-spatial attention (involved in face recognition, object recognition, and reading, among other operations) is regulated by at least three brain areas: the posterior parietal lobe of the cerebral cortex, a portion of the thalamus, and areas of the midbrain related to eye movement (Posner *et al.* 1988), and constitutes a separate subsystem from auditory-spatial attention (Bushara et al. 1999). But functional localization does not equate to the specialized domains envisioned by the 'Swiss army knife' hypothesis, rather, specialization is a gradual constructive process in which "every module is functionally connected to at least one other module" (Bunge 2010:166), as neuroscientist Olaf Sporns makes clear (2010:195):

> Functional integration in the brain must be able to cut across cognitive domains and is thus essentially intermodular in character. Brain modules must therefore be able to influence each other, through 'weak ties' that enable globally efficient information flow. Modules of brain networks define communities of structurally and functionally related areas, but they do not represent or support discrete mental faculties.

Seen in this light, a module would be like a 'hub' where various neural networks interconnect. So, modularization is not inborn "but emerges in the course of individual development" (Bunge 2010:166). The neural plasticity implied by the brain's ability to perform separate functions without the necessity of specialized domains had already been observed by the founder of modern neuropsychology, Alexander Luria ([1967]2002:22):

> The fact that in the course of human history, man has developed new functions does not mean that each one relies on a new group of nerve cells and that new 'centres' of higher nervous functions appear like those so eagerly sought by neurologists during the last third of the

> nineteenth century. The development of new 'functional organs' occurs through the formation of *new functional systems*, which has never happened in animals and which is a means for the unlimited development of cerebral activity. The human cerebral cortex, thanks to this principle, becomes an organ of civilization in which are hidden boundless possibilities, and does not require new morphological apparatuses every time history creates the need for a new function.

Mithen's cognitive fluidity or 'intermodularity' may then actually be understood in Luria's terms, or in the interactive-network view suggested by Sporns,[106] and it seems to be in accord with the findings of neuroscience, as is his suggestion that the present-day human mind is structured mainly by a general-purpose intelligence. To be sure, "most of the higher aspects of the human brain/mind arise largely from the interaction between general-purpose neural systems of the multimodal cortical association areas and the very basic life experiences encoded by more ancestral emotional/mind systems that all mammals share" (Panksepp & Panksepp 2000:116). So, as Mithen suggests, it appears that modern human cognition is guided by general-purpose mechanisms (e.g. learning and memory) that regulate both brain function and behaviour, but that are flexible enough to combine and allow for new operations to occur (Bolhuis et al. 2011:3). At the same time, this plasticity – largely shaped by developmental and sociocultural experience (Heyes 2012:2095) – can help explain cognitive variability across human populations without appealing to differences in mental capacity.

In short, Mithen's conclusions regarding general intelligence and the modern human mind seem to be consistent with current neuroscientific data, but his scenario of a previous domain-specific, modular stage does not. Moreover, if general intelligence is prevalent among primates, as is in modern humans, by the law of parsimony and because stasis is more common than change in evolution (Eldredge 1989; Gould 2002:884), it is more likely that general intelligence has been the standard mode of cognition throughout the whole of hominin evolution.[107] This point weakens Mithen's model because he sees the change in cognition as the cause, and the explanation, of modern human culture (1996a:195):

> The critical step in the evolution of the modern mind was the switch from a mind designed like a Swiss army knife to one with cognitive fluidity, from a specialized to a generalized type of mentality. This

106 This suggests the possibility that brain functions are not controlled via a central system nor by independent mechanisms but by networks that interact and work together towards specialization (Sporns 2010).

107 As philosophers of biology Kim Sterelny and Paul Griffiths explain: "The most parsimonious hypothesis about an evolutionary tree is the one that requires the fewest possible evolutionary changes, for change is rare in comparison to non-change. Such a hypothesis is assumed to be most likely to capture the actual sequence of past changes" (1999:200).

> enabled people to design complex tools, to create art and believe in religious ideologies.

So, if the initial assumption that early humans had a modular mind compartmentalized in different domains of intelligence is inconsistent, then there is no need to invoke a radical 'transition' towards a cognitive fluid mind. In fact, it is quite possible that cognitive fluidity has been an important factor in the evolution of human cognition, not its result. Evidently, it is very difficult to assess whether extinct humans had a specialized modular type of cognition or not (Langbroek 2012; Lewis-Williams 2002:110). However, the available evidence, in my opinion, does not support Mithen's view that cognitive evolution went from primate general intelligence, to hominin domain specific intelligence, to modern intermodular general intelligence (2007).

Technology and art: Products of the mind?

In this section, I will review the tenet that cultural objects and behaviours (e.g. languages, symbols, artefacts) are in themselves the direct products of mental activity. To be sure, I do not question that the human mind is involved in the realisation of all human action, but I do question the notion, recurrent in Mithen's work, that the form of material culture follows from cognitive capacity. In the paragraphs below, I argue that the objects and traces of activities that are found in the human archaeological record are not just the products of ideas, but more importantly of human actions and interactions (Ingold 1993).

In his interpretation of the hominin archaeological record, Mithen takes the presence or absence of technological traits as a relatively direct reflection of cognitive ability, that is, he sees technological sophistication (i.e. complexity and diversity) as constrained by the mental capacities of the tool makers. Along these lines, for instance, he states that the Neanderthals "were unable to design specialized hunting weapons because they could not bring their technical and natural history intelligence together into a single 'thought'" (2005:233). In this way Mithen often ascribes the apparent technological 'stagnation' of technology up to the Late Pleistocene to the way the hominin mind worked (2001:39):

> There should be little doubt that Early Human society was highly competitive, and a more efficient hunting technology would have provided individuals with considerable advantages. They seem not to have been constrained by technical skill from making these, and consequently one must conclude that the constraint was on their imaginative capacity to invent better weapons.

He attributes this constraint to the notion that the hominin specialized cognitive modules constituted separate intelligences (technical, natural, and social) that could not work in unison, restricting creativity and imagination. Two issues arise from this proposal, on the one hand, as discussed above, there is no evidence that the human mind was ever structured in separate mental domains. On the other hand, among modern humans, technology is in no way a direct indicator of cognitive capacities, so there is no reason to believe that hominin tool types were constricted merely 'by imagination', disregarding economy, diet, or social organization. This was precisely one of the issues raised by philosopher of mind John Sarnecki and evolutionary anthropologists Matthew Sponheimer in their critique of Mithen's work. They rightly argued that (2002:176):

> Changes in behaviour [e.g. tool production] do not necessarily issue from changes in biology [e.g. brain structure], and since archaeology bespeaks behaviour, it cannot *ipso facto* be used as evidence of biological change. This does not mean, of course, that biological changes could not engender observable changes in the archaeological record, but only that archaeological changes are not sufficient to demonstrate changes in hominid biology.

Surely, in human evolution "biological and technological advances do *not* go hand in hand" (Tattersall 2009:112), i.e. there is no one-to-one correspondence between cognition and technology. The importance of cultural constraints must also be taken into account in the development of technology. Likewise, "having the cognitive capacity and use for a given construct is by no means a guarantee that the construct will become available. Moreover, the availability of technological advances does not mean that they will be inevitably adopted" (Sarnecki & Sponheimer 2002:182). Sociocultural constraints, for example, also have to be considered, that is, although cognitive capacities are necessary for technological innovation, the absence of the latter is not a reliable indicator of the state of the former. Other factors such as tradition and convention are just as, and perhaps more, important in shaping material culture, at least among modern humans. This means that socio-economical explanations of the archaeological record may work just as well as cognitive ones, and have the advantage of being potentially more testable than the former.

As for visual art in particular, Mithen emphasizes figurative representation, i.e. image-making, (1996a:175) as the core characteristic that indicates highly developed mental capacities. But as I have argued for technology above, these cannot really be taken as a measure of cognitive ability. For example, in archaeology it is well-known that the pottery of Europe's earliest farmers (e.g. Linear Pottery Culture, or LBK) is decorated predominantly with linear, abstract and geometric patterns (Bahn 1992:292). We know that Neolithic peoples were well perfectly capable of making images because they did produce them in other media, but if we were to look only at their pottery in the light of Mithen's reasoning, we could argue that they were constrained by their imagination and 'could not think of making images on pottery', which of course would be an erroneous conclusion. A contemporary example is provided by the Pirahã (mentioned already in chapter 4), who have been taught to draw by missionaries and are clearly able to do it, nevertheless have not adopted any type of image-making into their cultural repertoire (Everett 2005). These cases show that the absence of representational art cannot simply be attributed to absence of certain mental abilities (e.g. intermodularity, syntax language) or to cognitive constraints on 'imagination' or 'creativity'. As Lyn Wadley noted "artwork [as in representational art] is the most obvious example of symbolic storage outside the human brain yet it is not universally practiced by hunter-gatherers and it cannot therefore be used as the sole criterion for modern symbolism and modern behaviour" (2001:215). To be sure, Wadley has also pointed out that Donald's model is useful in archaeology because it allows cognitive and cultural 'modernity' to be recognized in the record (2001:208). As I noted in chapter 2, I agree that symbolism can be a useful identification criterion, however, the archaeological absence of symbolic objects cannot be used as a reliable indicator of mental evolution.

Mithen has also argued that the key element in the transition towards a modern human mind was not the onset of symbolic thought itself, but the invention of symbolic artefacts, that is, a new class of objects that could serve for 'storing' memories, information, and ideas (1996a:180). Hence, whereas Donald's model focuses on "visuosymbolic invention" as the highest development of 'external symbolic storage systems' (1993:745-6), Mithen's encompasses all of material culture. Indeed, he suggests that, somewhere between 100 and 30,000 years ago, the human mind 'extended' into material culture (2000:208).[108] The changes in the archaeological record of the Late Pleistocene, for Mithen, reflect the point at which (the different populations of) modern humans 'discovered' how to use material culture as an 'extension' of the biological mind (2000:217), i.e. as symbols. Accordingly, this novel way of using material culture opened the possibilities of saving, exchanging, and disseminating ideas among individuals and populations which, in turn, allowed for new and increased mental abilities, setting off a continuous feedback loop between material culture and cognition (Mithen 1998b, 2000, 2001, 2007).[109] I

108 In the sense of Andy Clark's 'extended mind' hypothesis (Clark 1998, 2003, 2004; Clark & Chalmers 1998). This is the proposal that human cognition is not constricted to the brain and its processes, but rather extends into the external environment by incorporating material supports, like cultural artefacts, into its functions. It is argued that these objects then become as much part of the cognitive process as the computational operations of the brain themselves. For instance, a notebook used to retrieve information can play the same role as memory thus, according to the 'extended mind', the notebook becomes part of the cognitive system. However, I would argue that remembering and reading information on a notebook actually entail different processes, even if the result (recalling) be the same. Furthermore, as Bunge points out, all of material culture has an effect on its producers and users, so if one sees the notebook as part of the 'extended mind', "why not generalize, and regard the kitchen as belonging to the 'extended gut', the gym as part of the 'extended musculo-skeletal system, and so on? This won't do, as brains cannot be replaced, repaired, or set aside like tools." (2010:167). A similar criticism has been made by Kim Sterelny (2010:467-8). Indeed, although material culture unquestionably has an impact on the cognitive process, and vice versa, they are not the same.

109 In recent research, Mithen has proposed that not only is material culture an extension of the mind, but also that the brain may be understood as a cultural artefact. Since the time of the 'explosion', the human brain, like any technological device, has continued to evolve under the pressures of the cultural environment. During a person's lifetime, the plasticity of the brain allows it to change and adapt according to the individual's needs and the stimuli provided by the

do not question the mutual impact of 'artefacts and brains', this dialectic has long been acknowledged (e.g. Engels [1876]2012) and studied (e.g. Vygotsky [1930]1978), and is one of the main premises behind the topical concept of the 'human niche' (Whiten & Erdal 2012:2126). However, I do contend the suggestion that cognition leads and culture follows. Cognitive capacity is evidently a necessary condition for behaviour, but not a sufficient one. The emergence of symbol systems, as suggested by Vygotsky, should be understood in the light of human technological and social histories as well (Luria & Vygotsky 1992:84).

Mithen, for his part, attributes the advent of symbolism to cognitive fluidity, which in turn, he explains as "a consequence of (syntax) language" (2005:264). Because he, like Donald, sees the latter as a recent development, he directly attributes the lack of art and 'advanced' technology among Early Humans to their lack of language and intermodularity. For example, he says that among Neanderthals, "the absence of symbolic objects must imply the absence of symbolic thought, and hence of symbolic utterances. Without these, by definition, there was no language" (2005:229). And elsewhere he states: "words are symbols and so if the Neanderthals were using audible symbols, I find it inconceivable that they were not also using visual symbols. The converse must also be the case: no visual symbols, no spoken symbols" (2009:9).[110] However, the lack or scarcity of visual symbols from the archaeological record of either Neanderthals or early *H. sapiens* may be clarified by several factors other than cognitive constraints and the pre-supposed absence of modern language.

Furthermore, there is now sufficient evidence from palaeoanthropology, neuropsychology, genetics, linguistics and archaeology to argue for a long chronology of language, going as far back as half a million years. Several lines of research indicate that speech may well be a shared derived trait of several lineages, including at least Neanderthals and *Homo sapiens*, inherited from a common ancestor (*Homo erectus, ergaster,* or *heidelbergensis*). Around 500,000 BP some hominins already presented basic anatomical features involved in the production and perception of speech. *H. erectus, ergaster, and heidelbergensis* possessed a modern-like hyoid bone (Martínez et al. 2008), which regulates the movements of the tongue and larynx allowing the production of speech sounds in extant humans. They also possessed enlarged hypoglossal and thoracic

environment. Equally, throughout evolution, cultural inputs literally and metaphorically shaped the human brain and the mind (Mithen & Parsons 2008).

110 Mithen's argument may be expressed in the conditional form "if p then q", i.e. If there are visual symbols, there are spoken symbols. If the second premise is not-p, or there are no visual symbols, the conclusion not-q, or there are no spoken symbols, commits the logical error of inversion, which "is made by denying the antecedent and leads us to (incorrectly) deny the consequent. Given the two premises 'If p is true then q is true. p is not true,' it would be fallacious to conclude that 'q is not true'" (Bennett 2004:130). Indeed, the conclusion not-q is erroneous because the relationship between the premises is one of condition, not of causation, so q being true does not depend on p being true. Thus, if not-p, q may still apply, or not.

vertebral canals (Ambrose 2001:1751; Dunbar 2004:123) which allow fine respiratory control during speech. The morphology of their inner ear was also similar to that of modern humans (Martínez et al. 2004), making it adept to perceive speech sounds. Furthermore, casts made from skulls of the mentioned species show that the size and form of their brains must have sufficed to accommodate the neural regions known as Brocca and Wernicke areas, where much of the linguistic operations seem to take place (Bruner 2010). Another clue may be found in the foraging and technological techniques of archaic humans. For instance, the 400,000 year-old wooden hunting spears found in Schönningen, Germany, show that sophisticated cooperative big-game hunting took place (Thieme 1997). This complex activity is thought to have been impossible to carry out without the support of linguistic exchanges (Pathou-Mathis 2000). On the same lines, the sophistication of some Neanderthal lithic industries has been taken to reflect a degree of cognitive complexity that must have allowed for articulate language (Ambrose 2001). Finally, recent genetic data has shown that Neanderthals possessed a similar variant of the FOXP2 gene as modern humans do; this gene is supposed to be largely involved in linguistic capacity and its presence in the Neanderthal genome may suggest that these hominins were capable of speech (Trinkaus 2007). Taken individually, none of these pieces of evidence can be said to positively demonstrate the occurrence of spoken language among other hominin species (Buckley & Steele 2002; Dediu & Levinson 2013; Fitch 2009), but taken together they hint at the possibility that this trait was already in place long before the emergence of our species. On the one hand, given the evidence, models that rely too much on the incidence or absence of language to explain the archaeological record have become increasingly suspect. On the other hand, it has been noted that assessing what these different lines of evidence actually mean in regards to the evolution of linguistic ability and cognition is extremely difficult. That is, the presence of some language-related features does not necessarily mean that they were involved in speech production; many of the mentioned traits also take part in other functions. However, perhaps the initial assumption should be that spoken language is a derived trait of considerable time depth in the *Homo* genus (Dediu & Levinson 2013).[111]

Also, as I discussed in the case of technology (and elaborated further in chapter 6), among modern humans factors like labour investment, demography and social organisation offer better and more testable explanations than language.[112] Regarding Neanderthals, archaeologists Wil Roebroeks and

111 Linguists Dan Dediu and Stephen Levisnon (2013) have recently presented a convincing case for attributing full-fledged language abilities to other hominins: minimally Neanderthals, Denisovans, and our common ancestor *Homo heidelbergensis*. Their paper also offers a good review of the evidence for and against seeing language as a shared hominin trait. For a counterargument see: Berwick et al. (2013).

112 This is not to say that language has not played an important role in the evolution of human cognition and culture, it surely has, but that when it comes to language and visual art "the two

Alexander Verpoorte have argued for example that energetic constraints may have played an important role in the types of activities that these hominins invested in. Neanderthals had a larger body mass and high activity levels related to their dependency on big-game hunting, which means they had higher energetic requirements than modern humans (2009:160). The latter in combination with their high mobility and small groups could mean that it may not have been cost-effective for Neanderthals to invest in stylisation since they probably "had little need for durable symbols of group membership and individual identity, and they seldom exchanged distinctive durable goods to maintain relationships across territorial boundaries" (Kuhn & Stiner 2001b:124). In contrast, as I will discuss in chapter 6, modern humans might have developed visual art precisely as part of a social strategy to solve the same problem of energy acquisition, by means of cooperation with others.[113]

To summarize, Mithen ultimately explains the appearance of 'modern' cultural traits in the archaeological record of the Late Pleistocene (e.g. technological diversification and sophistication, and visual art) as result of a neural/biological change, and sees the change as swift and abrupt. The alternative I will explore is that the Late Pleistocene record is the result of the long coevolutionary history of cognition, material culture and social organization, and thus should be seen in a broader perspective, for, as Bunge suggests, "every major social change is likely to be biological, psychological, demographic, economic, political, and cultural – either simultaneously or in succession" (1997:417). Thus, attributing a complex phenomenon such as the emergence of symbol systems among Pleistocene humans to a single cause or event (e.g. language or cognitive fluidity) is potentially flawed.

5.4 Test against the archaeological record of visual art

One of Mithen's main aims throughout his work has been to make sense of the prehistoric archaeological record by coupling it to hypotheses on the evolution of human cognition. As discussed above, the main neural changes he suggests as causes for the development of the Pleistocene archaeological record have left

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phenomena appear to be mutually independent" (Deregowski 1993:758). The 'advent of modern language' cannot by its own explain the changes in the Late Pleistocene archaeological record (Roebroeks 2010), which we now know to be more complex than most existing models of human cognitive evolution, including Mithen's, concede. More importantly, as I mentioned at the beginning of this section, the very idea that language should be considered a cognitive ability may be put into question. Topical perspectives suggest that language had rather be understood, first and foremost, as a communication system (Bunge 2010:196), but may also be explained as a social strategy (Dunbar 1996, 2003), a technology (Dor & Jablonka 2010) or an emergent feature of human cooperative interactions (Tomasello 2008). I would argue that the same would apply to visual art.

113 As Geoffrey Miller points out, innovation is costly (2000b). So perhaps, instead of asking why Neanderthals did not innovate, as Mithen does, we should ask how modern humans became able to overcome the costs of innovation.

no trace in fossil remains (Mithen 2000:212). Nevertheless, his model does make some general predictions about the *effects* that those cognitive changes may have brought about in the material culture, and it is these expected consequences which may be contrasted with recent archaeological and palaeoanthropological data.

Mithen's proposal suggests that cognitive fluidity should be manifested in the archaeological record as greater technological diversity (e.g. more artefact types, use of various raw materials, and an increase of composite and specialized tools) and cultural complexity (e.g. evidence for religious ritual and art) in comparison to previous periods. He maintains, for example, that tool diversity arose "owing to a new connection between natural history and technical intelligence" (1996a:169), and once this connection was made "it resulted in a constant innovation of new technology" (1996a:170). Visual art (e.g. personal ornaments), for its part, would have resulted from "an integration between technical and social intelligence" (1996a:173). From these statements, we can formulate the prediction that, according to Mithen, *the earliest evidence of visual art will co-occur with an increase in technological innovation and diversity* (Prediction 1). Accordingly, once visual art is present in the archaeological record, novel tool types and raw materials are expected to appear as well, and existing forms are expected to present greater variation. We can now examine whether this proposition is consistent with the archaeological data, as reviewed in chapter 2.

The confirmation of prediction 1 is problematic. It seems that in most instances visual art does co-occur with a wider variety of artefacts than in sites with no art, but this is not consistent. For example, in one of the earliest occurrences of shell beads, in Pigeons Cave in Morocco (c. 82,000 BP), the ornaments were found alongside typical Middle Palaeolithic artefacts (Bouzouggar et al. 2007:9966). However, the evidence from the African Middle Stone Age, reviewed in chapter 2, seems to be more in keeping with Mithen's expectations. In sites like Klasies River Mouth and Blombos Cave, by 75,000 BP different forms of visual art (pigment use, personal ornaments and engraved objects) coexist with innovative stone tool types (e.g. blades, bladelets, microliths, bone tools), carefully made in fine-grained raw materials (Henshilwood & Dubreuil 2011:371; Soriano et al. 2007; Wadley 2001:203). These MSA sites also have provided evidence that their inhabitants had a broader dietary niche than earlier humans, and that they had a formal division of space at camps with separate habitation and work areas, suggesting "symbolically organized behaviour" (Wadley 2001).

For its part, the overall archaeological record of the European Upper Palaeolithic in principle fits the prediction of Mithen's account better, particularly regarding the co-development of figurative art and greater technological variability in relation to the Middle Palaeolithic (Bar-Yosef 2002, 2007), but when examined in more detail, some inconsistencies appear. For one, the record of the Middle Palaeolithic associated with the Neanderthals is not as static as presented by Mithen, and there actually was some temporal and geographical technological variability in that period (D'Errico 2007; Jöris & Street 2008; Roebroeks 2008). Furthermore, art aside, the archaeological composition of earliest phase of the Upper Palaeolithic in Europe, the early Aurignacian (45-30,000 BP), is actually not that different in composition from the previous Mousterian, the record shows equally low typological diversity (Davies 2001:205), and a similar scope of resource exploitation as the Middle Palaeolithic (Bar-Yosef 2004). The real break in the record described by Mithen in fact comes much later, around 30-28,000 BC (at the end of the Aurignacian and the beginning of the Gravettian). In the latter phase indeed all of the 'markers' of modernity identified by Mithen co-occur, but this is some 15-10,000 years after the assumed colonisation of Europe by 'cognitively modern' *H. sapiens* (Higham et al. 2011).

The previous prediction, that the emergence of visual art will coincide with an increase in technological diversity and sophistication actually stems from the a more general implication of Mithen's hypothesis, which is that *once cognitive fluidity is 'fixed', all its potential should be released generating a sort of cultural 'big bang' that should be observable in the archaeological record* (Prediction 2).

However, as seen in chapter 2, the archaeological record from the African Middle Stone Age indicates that many of the traits that the cognitive fluidity model uses to identify modern behaviour (e.g. artefact diversity, specialized tool types, the use of organic raw materials, personal ornaments, exchange networks, etc.) show a mosaic-like pattern of incidence and often did not co-occur. So, it is more probable that, as Sally McBrearty and Alison Brooks have argued (2000:531-2):

> The transition to fully modern human behavior was not the result of a biological or cultural revolution, but the fitful expansion of a shared body of knowledge, and the application of novel solutions on an 'as needed' basis. The complex content of human cultures has been built incrementally, with cognitive equipment present since at least 250 ka.

Therefore, no fundamental neural restructuration need be invoked to explain the differences in the archaeological record of modern humans. The hypothesis of a piecemeal evolution of modern human cognition, which coevolved with modern anatomy, is better supported by the archaeological data.

In brief, it is possible that whereas the co-occurrence of visual art with technological innovation and variability, and with other 'modern' behaviours may indeed indicate changes in the ways human populations lived and interacted, a) these changes need not necessarily be cognitive, and b) the absence of one is not prescriptive of either the presence or absence of the other, which, in turn, c) indicates that the correlation is not causal.

Finally, Mithen's model and main premise suggests that once the earliest symbol systems appear in the archaeological record, we may speak of human cognitive and behavioural modernity. As suggested in chapter 2, modified body ornaments could provide such evidence, as Mithen himself has also suggested (1996a:194):

> Describing beads and pendants as 'decoration' risks belittling their importance. They would have functioned to send social messages, such as about one's status, group affiliation and relationships with other individuals, just as they do in our own society today. […] To have produced such artifacts required not only specialized social and technical intelligences – as possessed by Early Humans – but also an ability to integrate these.

Hence, according to Mithen's own hypothesis, cognitive modernity should have begun before 100,000 years ago. This is in fact what he has argued in recent work (2005:251), attributing the changes of the Late Pleistocene to changes in demographic conditions (2005:261-2):

> In summary, amid a continuation of tool-making traditions that stretch back at least two hundred and fifty thousand years, there are sporadic traces of new behaviour in Africa of the type that archaeologists associate with modern, language-using humans.
>
> It was not until after 50,000 years ago that many of the new behaviours became permanent features of the human repertoire. This date was once taken to be when language and modern behaviour first appeared. That was before the African archaeological evidence had become well known, before the genetic studies and fossil discoveries confirmed the appearance of modern humans by 195,000 years ago, and before the significance of the FOXP2 gene for language had been revealed. But the date of around 50,000 years ago nevertheless marks a striking change in the archaeological record.
>
> This is now explained by the passing of a demographic threshold after *Homo sapiens* had become entirely dependent upon compositional language for communication.

Most researchers have also turned to explaining the cultural patterns of the Late Pleistocene in terms of demography and social organization instead of attributing these changes to biological transitions (D'Errico & Stringer 2011). This is precisely the possibility that will be explored in the next chapter.

5.5 Conclusion

In the tradition of cognitive archaeology, Mithen's model lays emphasis on mental capacity as the key feature that determined our development as species, and uses cognitive criteria to make sense of the archaeological record so that the earliest occurrence of visual art is attributed to the emergence of 'cognitive fluidity', and ultimately to language. In the same manner, the model sketches progressive stages of cognitive evolution ascribed to particular species of hominins in a type of 'mental ladder' from chimpanzee to modern humans.

I have argued in this chapter that such a model is incompatible with current views in evolutionary thinking, which highlight variation, diversity, and contingency as important aspects of the evolutionary and developmental processes (Langbroek 2012; Levinson 2012; Shea 2011). Also, I have argued that 1) the proposed switch from a modular hominin mind to an intermodular modular mind is not well supported by current comparative neuroscience; 2) the absence of alleged markers of cognitive fluidity and 'mental modernity' – tool variability and visual art – is not necessarily correlated with cogntive evolution, and 3) visual art perhaps should not be understood primarily as the product of mental ability, but of human technological activities and social interactions.

To conclude, Mithen's model is based on the assumption that material culture is the product of cognition, therefore it requires cognitive fluidity to be an exclusively modern human trait because without it, the model is unable to account for the technological and cultural differences between modern and 'archaic' humans. However, if we see material culture for what it actually is, namely the product of a mixture of factors like social organization, environment, economy, demography, and history, we should be able suggest explanations that do not need to invoke any sudden neural changes to account for the development of modern human culture.