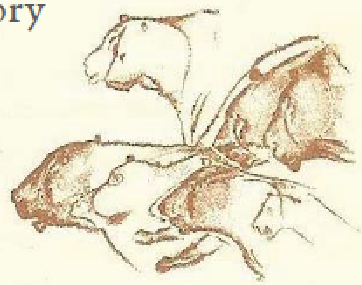
Methodology in the Evolutionary Study of Art

Perspectives in philosophical anthropology, cognitive archaeology, and evolutionary theory



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PART III - EVOLUTIONARY THEORY

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General introduction

Evolutionary approaches to the arts

In 1973, the evolutionary biologist Theodosius Dobzhansky uttered the now famous phrase that “nothing in biology makes sense except in the light of evolution.” In recent decades, humanities researchers worldwide have similarly recognized the importance and the great explanatory value of evolutionary theory for understanding human nature, its behavioural outcomes, and its cultural products. A continuously increasing body of research tackles the biological foundations of the human propensity for artmaking, our often great emotional involvement in the arts, and our persistent aesthetic engagement in it. The arts pervade human life, and evolutionary approaches aimed at studying human nature might very well provide us with partial answers to questions that have until now remained riddled with mystery. Nevertheless, it has also repeatedly been argued that biologically based approaches, such as the evolutionary approaches that will be the subject matter of this dissertation, are unsuitable to account for a cultural subject matter such as art. The arts are still largely seen as one of the most distinct features that set us apart from non-human animals, and adopting biological frameworks that address this boundary in a gradualist, rather than absolute manner, are therefore often met with resistance.

Importantly, the application of biological frameworks to subjects that are traditionally studied as part of the humanities, also brings with it a vast number of methodological questions and issues. These are not questions pertaining to whether evolutionary approaches are or are not suitable to account for art, but rather to the specific manner in which they are applied, i.e. the ways in which the theoretical and conceptual foundations of evolutionary theory and subdisciplines are extended to the present subject matter of art. While the validity of using evolutionary theory to study art is generally accepted in this dissertation, this does not obviate the need to carefully address its methodological structure. On the contrary, as the arts were for a long time not part of the classic, traditional realm of behaviours studied during the early days of evolutionary theory's onset, and still have not reached the forefront of debates on the evolutionary study of human behaviour, such methodological care seems all the more necessary. The critical analysis and evaluation of the methodologies of evolutionary approaches to visual art, will be the core matter of this dissertation.

Approaching art from an evolutionary perspective means that it is regarded as an evolved property of the human species, with art variously seen, depending on theoretical backgrounds, as a behaviour, a set of cognitive predispositions, or a range of objects. As such, the evolutionary approach to art is one of species-centrism, which means that emphasis is placed on species-wide properties of human nature (Dissanayake, 1995). This does not mean that cultural differences are unimportant, or that they should be erased in favour of a reductionist view of biological origins and foundations. Instead, an evolutionary account of art looks at the universal commonalities that underlie a vast amount of cultural differences. In doing so, the evolutionary study of art, and by extension this dissertation, makes use of evolutionary perspectives within disciplines that are traditionally concerned with understanding human nature, including its behavioural predispositions and underlying psychological machinery. The most common of these, reflected in existing explanatory hypotheses, are evolutionary psychology and ethology. In addition, evolutionary perspectives in biology and anthropology have been consistently applied to art. Moreover, evolutionary thought has surfaced in archaeology as well as in cognitive science, both of which have also formulated notable ideas and hypotheses about the evolutionary origins of art.

Terminologically, the term 'evolutionary' for denoting the present theoretical approach to art, is sometimes used interchangeably in the existing literature with several others. If not clearly defined, this can quickly lead to confusion. The term 'naturalistic', for instance, generally seems to refer to the influx of natural science, but the corresponding approach has also been described as "not in the sense that it is biologically driven (though biology will prove relevant to it), but because it depends on persistent cross-culturally identified patterns of behavior and discourse: the making, experiencing, and assessing of works of art." (Dutton, 2006, p. 368) As such, a naturalistic approach to art should be understood as being both more general - including other natural science disciplines besides evolutionary theory - and referring to cross-cultural and biologically-based regularities of human nature. Furthermore, the field of evolutionary research into art is sometimes termed 'biocultural' (Boyd, 2009). The width of this term differs from 'standard' evolutionary research on art, in that biocultural analyses are explicitely concerned with not only the evolutionary underpinnings of a certain behavioural or cognitive phenomenon, but also the sociohistorical circumstances that influence its manifestation (Clasen, 2012). For these reasons, in this dissertation the word 'evolutionary' is used consistently to refer to approaches that are based on evolutionary theory only. These approaches include evolutionary perspectives in various fields such as psychology and biology, on the condition that they integrate key insights from Darwinian thought.

A methodological perspective

When undertaking evolutionary research into the arts, a wide range of questions immediately present themselves. What are the phylogenetic roots of what we today consider to be artistic behaviour? Can we find similar behavioural patterns in other species, for example among great apes, our closest extant relatives? Is human art perhaps linked to ritualized or play behaviour in other species? Or is art uniquely human, with similar-looking behaviours in other species merely being a product of anthropomorphization? How does artmaking develop on an ontogenetic level, i.e. over the course of a lifetime, and especially during early childhood? How is it linked to other developmental processes? Which connections are there to be made between the development of various cognitive abilities in young children, and can we find parallels with larger-scale, perhaps species-wide patterns of cognitive evolution? When in human history do we find the earliest traces of a behaviour we now refer to as art? Did art have a crucial adaptive function for our ancestors? What might this function have been, and is it still the same in contemporary society? Which evolutionary theories and hypotheses exist, and what functions for art, if any, do they propose? Is artmaking an adaptation, or rather a non-functional byproduct? Was artmaking a driving force in its own evolution, i.e. were processes of cultural evolution involved? Or is culture, including art, merely an outcome of more fundamental levels of evolved biology and psychology?

Most evolutionary explorations of the arts have so far addressed only one or at best a few of these questions. As the most common disciplinary frameworks tend to be those of psychology and ethology, and to a lesser extent biology and anthropology - rather than disciplines specialized in the study of art, notably art history but by extension also archaeology - the answers provided for some of these questions are not always finetuned with regard to the complexities of art and its aesthetic appreciation. Often, the arts are explained as part of a wider hypothetical framework for the evolution of the human mind, or as illustrations within broader theories such as, for example, social group formation. As such, the methodological foundations of evolutionary theorizing about the arts are not always as strong as they should be. Indeed, another range of more specific methodological or meta-level questions can be asked in addition to the abovementioned primary questions.

How should we frame the evolutionary study of art in philosophical terms? Do evolutionary approaches contradict, or even conflict with those used in the traditional humanities? How should we address the time gap between the late Pleistocene when cave art arose, and the present? Can we, perhaps, use extant human cultures as living representatives of human ancestors' cultural practices around the time of the Upper Palaeolithic transition some 45.000 years ago? Can we at all gather reliable knowledge of ancestral artistic cognition, given the fact that brains, unlike crania and other skeletal remains, do not fossilize? Can we use the archaeological record as a window to the past? How does this record fit into evolutionary thinking on human behaviour and cognition? In what ways can it help us, widely discussed as this record may be in itself, to develop, strengthen and test evolutionary hypotheses? And conversely, to what extent can palaeoarchaeologists make use of theoretical reasoning in evolutionary psychology, ethology, biology, and anthropology to interpret their findings? Are there criteria we can use to assess archaeological findings in terms of their potential 'artness'? If so, what is 'artness' then, and how should we determine its criteria? Should we have a concept of art in mind when looking for its earliest traces, or would this merely bias our judgement when encountering objects that do not fit this preconceived view? But if we do intend to use an operational definition of art, what should it look like, or be composed of? Is it possible to outline any fitness-enhancing effects art may have had for our ancestors, keeping in mind that functions may have shifted over the course of time? Can we approach art at different explanatory levels of behaviour or cognition, and how could their integration shed light on art's evolution? Which subdisciplines of evolutionary theory can we use for studying art, and are some perhaps more useful than others? How could various disciplinary perspectives be combined? How can evolutionary hypotheses be tested empirically, and how powerful are empirical results achieved with present-day study participants when trying to shed light on behaviour that occurred during ancestral times? Which methods would be most suitable, and which weaknesses will inevitably remain?

This is only a fraction of the virtually endless list of methodological and conceptual queries of importance when researching art's evolutionary origins. But even the limited number of questions provided above already clearly sketches the breadth of the subject matter, and the necessity of drawing together insights from a variety of perspectives. Aside from taking into account traditional fields such as art history, archaeology and philosophy of art, and evolutionary perspectives within psychology, ethology, biology and anthropology, gaining a completer understanding of the subject matter requires smaller and larger detours into cognitive neuroscience, developmental psychology, philosophy of mind and behavioural economics, to name but a few. For reasons of space, not all of the disciplines that are of use will be dealt with in detail. Instead, a number of issues will be addressed as clustered within three overarching perspectives, which will be outlined shortly.

'Art in this dissertation'

Lewis-Williams once remarked that art is among those words "that everyone believes he or she understands - until asked to define them." (2002, p. 41) The definition of art, if in any way possible to achieve, has preoccupied numerous researchers throughout history, but these scholarly investments do not appear to have led so far to a significant convergence of opinions. Because an evolutionary framework naturally requires a different take on art - traditional philosophical and art historical approaches to the concept of art are in a sense subordinate to the understanding of art as a natural and evolved phenomenon - a separate chapter will be dedicated to questions about how to approach this matter within the particular context of evolutionary research. However, it is still necessary to provide a general view of what kind of concept of art is used in this dissertation.

First and foremost, this dissertation will be mainly concerned with visual art. Other kinds of art such as storytelling, music, and dance have equally been studied from an evolutionary perspective, sometimes to a greater extent than visual art. Because these arts are clearly very complex in themselves, their evolutionary explanations often differ significantly from those provided for visual art. For example, the cultural manifestations, cognitive basis and evolutionary origins of music are likely very different from those holding for visual art. As a consequence, it is probable that methodological issues concerning the evolutionary study of music will also be very different. Nonetheless, despite the focus on visual art, some of the findings in this dissertation can also be relevant for other kinds of art, especially the arguments discussed in the third part on evolutionary theory in itself.

When preliminarily conceptualizing visual art, a classic Western perspective may not be of much use, as this does not recognize the cross-cultural occurrence of art. As Dissanayake notes, "(…) the present-day Western concept of art is a mess. (…) our notion of art is not only peculiar to our particular time and place, but, compared with the attitude of the rest of humankind, aberrant as well." (1988, p. 5) Several researchers have indeed pointed out that any definition of art is unlikely to cover the phenomenon in its entire, global nature, when such a definition does not fully recognize and attempt to mediate the often strong influence of specifically western historical and sociocultural ideas (e.g. Davies, 2012; Pinker, 1997). Taking a cross-cultural point of view, however, quickly leads to broadening the scope of a concept of art again: "more specifically, one may talk not about Art but 'the arts,' which include not only visual objects but music, dance, poetry, drama, and the like - such as Baroque painting, Somali poetry, Javanese dance." (Dissanayake, 1988, p. 4) Even more so, "in most cases, it is not even necessary to use the word 'art' at all (…). It should not hamper our thinking (in fact, the reverse) to say 'Oceanic sculpture,' 'chimpanzee painting,' 'children's drawing,' and leave the word 'art' to the philosophers, who at least are aware of the abysses that await them." (1988, p. 4) Clearly, following such a proposal will hollow any concept of art to the extent that it virtually loses all of its analytical meaning.

Of the wide range of cross-cultural examples, including those from the West, those instances should be kept in mind that correspond to the category of visual art. When delineating the subject matter in the prehistoric record, this includes any kind of material medium where visual elements were added or created, with the intent, or at least the impression of intent to bring about artistic or aesthetic effects. This includes evident examples such as figurative cave paintings, mobiliary artefacts and iconic imagery on portable objects, but also geometric markings and patterns on different surfaces, including on utility objects that were perhaps not in themselves seen as objects of artistic or aesthetic expression. Moreover, it would also include aesthetic elaborations of the human body, such as body pigmentation by means of red or yellow ochre. Objects for personal ornamentation can also be placed in the same category. These include pendants made from a variety of materials such as bone, ivory and animal teeth, and items such as shell beads. Both archaeologically and ethnographically, these are often regarded as artistic in nature. The first chapter of this dissertation opens with a brief overview of generally accepted and more debated instances of art in the prehistoric archaeological record.

In this sense, crosscultural and transhistorical perspectives on visual art seem to converge in that the archaeological and ethnographic record are fairly similar. Evolutionary explanations should be primarily understood as referring to these types of visual art. Over the course of this dissertation, the terms 'visual art' and 'art' will be used interchangeably and with reference to the same category, except where indicated otherwise. From a contemporary point of view, the category outlined above excludes a wide range of instances of more recent kinds of visual art. These include phenomena such as architecture and photography, atypical media used in modernist and contemporary art, and kinds of art that bridge the realm of visual art and those of others such as narrative, e.g. cinema. Like more ancient kinds of visual art, artistic expressions in these media also ultimately depend on our evolved human nature. Nevertheless, their more recent emergence is at odds with the aim of evolutionary hypotheses, which is to explain art's origins. As a consequence, it would seem anachronical to uncritically extend evolutionary explanations to kinds of art that were certainly not part of our ancestors' behavioural repertoire around the time artistic behaviour emerged. If regarded conservatively, and pragmatically not including heavily debated findings, these origins are to be found around 40.000 BP. At the same time, it is quite possible that some of the evolutionary explanations proposed for art's emergence can indeed be extended to more modern media. This seems particularly salient for those kinds of art that are structurally very similar to ancestral kinds of art, such as cinema making extensive use of narrative properties, which in turn connects back to cognitivist explanations for the original practice of storytelling. An evolutionary framework might turn out to be additionally relevant for modern visual artistic media if it includes processes of cultural evolution, which can account for fast developments under the influence of a variety of immediate circumstances, as opposed to the relatively slower trajectories of gene-based natural or sexual selection.

Research objectives and methodology

This dissertation is explicitely concered with a critical examination of the methodological foundations of evolutionary research into the origins of art, with the eventual aim of advancing the progress of this research. As such, it does not attempt to formulate a new explanatory hypothesis in addition to those that are already available. Instead, it generally wishes to identify and address a number of outstanding methodological issues, questions and unclarities, such as tacit assumptions underlying some interpretations of the archaeological record, epistemological premises in various disciplines such as palaeoarchaeology, the conceptual foundations of evolutionary thought in general, and adaptationist thought in particular, and the argumentative structure of existing hypotheses. These include, but are not limited to the following outstanding matters:

- Some explanations for parts of the archaeological record, such as the figurative imagery of the European Upper Palaeolithic, are almost unequivocally accepted without addressing their argumentative foundations. Cave paintings, for example, are commonly explained by reference to a magico-religious framework, although any conclusive evidence for this is absent.
- Non-human primates, and especially their paintings and drawings, are sometimes invoked as an informative comparison for understanding the earliest roots of art, but important aspects such as intentionality are not always closely investigated.
- The archaeological record may be severely biased, especially where earlier phases are concerned. As such, our picture of the prehistoric roots of art may be very different from how art was actually made and used during this time.
- Archaeological findings are in essence merely material remnants, devoid of the rich cognitive context that must have surrounded their creation. As a consequence, this knowledge must be inferred, which brings with it a new set of methodological difficulties.

- Evolutionary hypotheses do not always clearly distinguish between explaining a trait's current function and its original ultimate function, whereas only the latter would be valid as an adaptationist explanation.

Examples abound, and not all outstanding matters can be addressed within the scope of this dissertation. Instead, the focus will be on

- Addressing a few of many overarching philosophical and anthropological questions concerning the evolutionary connection between art and human nature (Part I: Philosophical anthropology).
- Inquiring about the cognitive foundations of a number of delineated parts of the archaeological record, and exploring the extent to which new cognitivist approaches might also bring along new interpretations of this record (Part II: Cognitive archaeology).
- Critically assessing the theoretical structure of evolutionary hypotheses, with an emphasis on evolutionary psychological and adaptationist ones (Part III: Evolutionary theory).

To this end, the dissertation follows a case study-based structure within these three broad disciplinary categories. These studies will be used as instruments within the general goal of addressing and strengthening the methodological foundations of evolutionary research on art. The dissertation is literature-based, and attempts to fulfill its methodological goal by joining together disciplines and strands of evidence that were previously largely unconnected. Such connections can yield insights that might remain hidden when not taking an interdisciplinary view. In addition, empirical data are adopted where available, and where they can help in answering some of these outstanding questions.

General outline and structure

This dissertation is made up of three thematic sections. Part I is entitled 'Philosophical anthropology', and explores a number of ways in which art is evolutionarily tied to human nature. It starts out with a general chapter that situates the evolutionary study of art within the broader picture of the evolutionary analysis of human behaviour and cognition. It provides an overview of seven major evolutionary hypotheses of art's origins, and describes these in a non-evaluative manner. In following chapters, especially those in the third part on evolutionary theory, several elements will be picked up and be critically assessed in the light of specific methodological issues. Next, a philosophical chapter discusses the various ways in which art has been defined in an evolutionary manner, and which issues arise with this. It also proposes a pragmatic outcome in the form of a pluralist view of art concepts. The final chapter in this section turns to comparative anthropology and primatology, investigating claims of 'ape art' in a cognitive manner. Specifically, this chapter wishes to address whether non-human primates are informative for understanding the very early phylogenetic roots of art (e.g. Morris, 1962).

Next, Part II, 'Cognitive archaeology', investigates the archaeological record from the perspective of cognitive evolution. This subdiscipline investigates the ways in which material artefacts are useful for informing us about evolutionary trajectories of human cognition, and conversely, how our knowledge of the human mind might help us understand the mere material remnants of ancestral times (Coolidge & Wynn, 2009). This section follows this route with regard to three parts of the archaeological record. Chapter 4 looks at Middle Stone Age and Middle Palaeolithic geometrically engraved artefacts and inquires about their presumed symbolic nature, whereas Chapter 5 zooms in on the figurative record of Upper Palaeolithic Europe, and the role of metarepresentational thought in its appearance. Finally, Chapter 6 addresses recent findings of art that have been attributed to other hominin species, notably Homo neanderthalensis. It argues that, in this light, some of our longstanding beliefs about the nature of art may have to be revised.

The final Part III, 'Evolutionary theory', returns to the foundations of the evolutionary approach in itself. Chapter 7 looks more closely at the methodological structure of evolutionary psychology and its implications for research on art. Key issues are named and discussed, and one of these - adaptationist thinking on art - is taken up again in Chapter 8. Here, four adaptationist explanatory hypotheses are examined in terms of their soundness, and their correspondence to theoretical evidentiary standards in general evolutionary thought. All three sections are introduced by a brief overview of the contents of the chapters concerned. They are followed by a general discussion where the ideas discussed in the three preceding sections are tied together.

Although the field of evolutionary research on art is intertwined with a variety of other disciplines, not all of these will be addressed over the course of this dissertation. Neurocognitive research, for instance, is briefly outlined in the first chapter, but is not a main analytic subject in itself. The same goes voor developmental psychological insights into the ontogenetic emergence of art: while clearly important in itself, the psychological perspectives adopted here are limited to evolutionary and cognitive psychology. Because the pragmatic concept of visual art does not include instances of storytelling, fields such as literary Darwinism are also absent, except where they contribute to insights into visual art. Importantly, this dissertation is also not primarily concerned with the aesthetic appreciation of artworks. Although the subject of evolutionary aesthetics is also generally clarified in the first chapter, the chapters to follow do not treat disciplines such as empirical aesthetics, or topics such as the aesthetic appreciation and judgement of art, and psychological studies related to visual aesthetic perception. Finally, although evolutionary theory could yield valuable insight into subjects such as the content of artworks, or evolutionary patterns *within* the history of western art, for instance, these subjects are also not discussed at length in this dissertation. Some of these topics will, however, briefly surface where they are illustrative for evolutionary hypotheses. Because any methodological analysis must begin with the theory itself, the foundations of these hypotheses, and their embedding in the wider evolutionary study of human behaviour, are laid out first.

PART I
Philosophical anthropology

Introduction to Part I
Philosophical anthropology

Philosophical anthropology is generally concerned with questions pertaining to what it means to be human. Rather than merely being based in one discipline, it takes a variety of approaches to address matters that include, but are not limited to the relative extent of human uniqueness, free will and autonomy, what 'good' behaviour is and whether humans are naturally endowed to display this kind of behaviour, the quest for the meanings of life, the relationship between mind and matter, and between nature and culture. In sum, philosophical anthropology explores the foundations and boundaries of human nature. While this subject in itself can be explored from a variety of perspectives, including those from the traditional humanities, an evolutionary approach is of particular use here. It can often provide, among other things, empirical foundations to issues that might otherwise remain in the realm of speculation. In addition, evolutionary theory highlights the biological basis of many properties that are thought to be either the components or products of human nature, although the boundaries between these are not always clear. Among the most striking dimensions of human nature are the arts.

Approaching art and its evolutionary origins from the perspective of philosophical anthropology is relevant in many regards. It provides an overall framework for placing the evolutionary analysis of art not only in a wider setting of evolutionary approaches to human behaviour, but it also explores - in line with questions concerning human uniqueness - the ways in which the human propensity for artmaking might extend beyond our species. Furthermore, it makes us aware of a variety of historical aspects of anthropological and philosophical matters that might impact, in this case, the evolutionary study of art. Retracing the history of evolutionary theory, for example, brings forward a number of historical developments that may play a role in our current evolutionary understanding of art. Pre-evolutionary ideas, which were later debunked by the onset of Darwinian evolutionary biology, envisaged the relationship of humans to other species as a progessivist, ladder-type structure, where a species followed up on its predecessor by being more advanced in certain ways. Although this view was later replaced by Darwin's tree metaphor, determining that evolution took place in a much more organic and decidedly non-linear way, it is still partially reflected in present-day attempts to formulate evolutionary accounts of human behaviour that include a gradualist evolutionary trajectory from ancestral species to current humans. This is particularly evident in researchers' great interest in determining whether non-human primates such as chimpanzees possess human-like capacities for altruism, social reasoning, and specific aspects of culture. The last chapter in this section undertakes a methodological analysis of so-called 'ape art', or seemingly aesthetic behaviour among non-human primates. According to some, these primates hold great explanatory potential for uncovering the ancient phylogenetic roots of art. The chapter investigates, with the help of present-day research on human artistic cognition and existing empirical studies of non-human primate painting and drawing, whether this assumption is justified.

If philosophical anthropology is concerned with the study of human nature, and the arts are a part of this, it appears self-evident that this perspective can also address the matter of defining art. While this is a notoriously difficult subject in itself, an evolutionary approach to art additionally requires a more thorough exploration of its biological foundations. The second chapter therefore reviews current attempts at defining art in a naturalistic, evolutionary manner, and notes how none of these are sufficient to be a solid foundation for evolutionary theorizing. Rather than adding another evolutionary definition to this brief list, the chapter proposes a more pragmatic approach, which does not only involve a recognition of the complexity of the phenomenon of art itself, but also of the necessity of modifying concepts or definitions of art that are used, in the light of the variety of disciplines that study art in an evolutionary manner. These two chapters are preceded by a general overview of the evolutionary study of art, framed within the wider evolutionary study of human behaviour, but also reaching out to related disciplines such as cognitive neuroscience, archaeology, and evolutionary aesthetics.

1

Art and the evolutionary framework

1.1. Introduction

Evolutionary approaches to the arts attempt to uncover the reasons for their presence in the human behavioural repertoire, i.e. they seek to find a biological rationale for why our ancestors started the new practice of artmaking, in the light of many possible environmental pressures and variables that could have sparked the onset of this behaviour. Artmaking may have had a particular, fitness-enhancing function for our ancestors, which would make it an adaptation, or it could have emerged as a byproduct of one or more functional traits. Alternatively, artmaking could be the outcome of another evolutionary process, or a combination of processes, such as exaptation and co-evolution. This overview describes seven explanatory hypotheses that span the width of these conceptual categories - adaptation, byproduct and co-evolution in combination with exaptationist elements - and that are representative for the main theoretical disciplines of relevance for studying art within an evolutionary framework. They are the artification hypothesis (Dissanayake, 1979, 1980, 1982, 1988, 1995, 2000, 2008, 2009, 2014), the aesthetic fitness indicator hypothesis (Miller, 2001a, 2001b), the ancestress hypothesis (Coe, 2003), the simulation hypothesis (Boyd, 2009; Carroll, 2005; Tooby & Cosmides, 2001), the cheesecake hypothesis (Pinker, 1997, 2006, 2007), the sensory exploitation hypothesis (Verpooten & Nelissen, 2010, 2012) and the indirect bias hypothesis (Boyd & Richerson, 1985; Richerson & Boyd, 2005).

These explanatory hypotheses are here distinguished from supporting frameworks that draw from disciplines such as archaeology and neuroscience. While such perspectives equally provide valuable insight into the phenomenon of art, addressing, for example, patterns in the archaeological record with reference to the neural architecture of the brain, they do not involve evolutionary explanations in themselves, i.e. they explain the mechanics, rather than the nature of the behavioural trait of artmaking. In order to anchor the aforementioned explanatory hypotheses in their wider research context, archaeological accounts such as the concept of cognitive fluidity (Mithen, 1996a) and neurovisual resonance theory (Hodgson, 2006a) are additionally discussed.

This theoretical lay-out will be preceded by a brief overview of notable parts of the archaeological record for visual art. This will be done in a reverse chronological way: findings are discussed from the time periods between 50.000 and 10.000 BP, between 100.000 and 50.000 BP, and preceding 100.000 BP. Many of the specific elements of the archaeological record that will be mentioned here, will be taken up again and discussed within a more explicit evolutionary framework in the chapters of the second thematic section on cognitive archaeology. The current chapter concludes with brief summaries of research in evolutionary aesthetics and cognitive neuroscience, noting each time how these fields might be relevant for understanding the evolutionary origins of art.

1.2. The archaeological record for visual art

A discussion of art's origins must begin with the subject matter itself, i.e. the earliest traces of human engagement in artistic practices. Records of prehistoric art are numerous, often heavily debated, and constantly at risk of becoming overturned by a single new discovery that resets what was thought to be established knowledge. Mapping prehistoric art in itself is challenging, and the endeavour is made even more difficult by the great methodological challenges that accompany the study of an elusive phenomenon such as art in ancestral times. Often, biases are present that influence not only archaeological interpretations, but also evolutionary and cognitive frameworks, provided they are at least in part based on the archaeological record. As a consequence, it is important to be aware of several methodological elements that can potentially be of great influence in attempts at understanding art's origins. Among these are the necessity to take a cross-cultural perspective and to critically approach commonly used temporal boundaries, an awareness of various preservation biases that can occur and that often have a marked influence on how archaeological findings are interpreted, and a recognition of the sociocultural contexts of present-day research, and how these may affect the establishment of explanatory frameworks. Within a brief chronological overview of highlights of prehistoric art, these and other issues are touched upon in this section.

1.2.1. Human evolution and migratory patterns

Prehistoric art is almost without question attributed to Homo sapiens. Some have argued that the last stages of Homo neanderthalensis' existence, alongside Homo sapiens, were equally characterized by symbolic practices such as artmaking (d'Errico, 2003; Pike et al., 2012; Rodríguez-Vidal et al., 2014; Zilhão, 2007). Others have contradicted this, arguing instead that any apparent art is likely to be either courtesy of Homo sapiens and is erroneously attributed to Neanderthals, or that mere emulation was involved, without necessarily carrying the same symbolic load (e.g. Mellars, 2005). Yet in order to fully understand artmaking as a behaviour characteristic of our species, it is useful to frame Homo sapiens within a wider palaeoanthropological context.

Extant Homo sapiens is often referred to as anatomically modern humans, or Cro Magnons, named after the French discovery site Abri de Cro Magnon, when merely referring to those Homo sapiens that occupied Europe from around 45.000 - 40.000 BP. According to currently found and analyzed fossil evidence, modern humans arose around 195.000 BP in Eastern Africa, the site yielding this date being Kibish, Ethiopia (McDougall et al., 2005; Rightmire, 2009). Homo sapiens is characterized by a number of important formal features such as an overall taller and more gracile built than previous species, but importantly, a larger brain of around 1400 cm^3, in comparison with the 1100 - 1300 cm^3 that were characteristic of its immediate ancestor, Homo heidelbergensis. The explanations that have been provided for the process of encephalization observed in Homo sapiens are varied, and include accounts based on an impulse towards increasing cognitive creativity via a process of sexual selection (Miller, 2001a), or pressures caused by natural selection in order to meet the new demands of increasing group sizes (Dunbar, 2009).

Homo heidelbergensis, sometimes referred to as archaic Homo sapiens, was probably the last common ancestor of both Homo sapiens and Homo neanderthalensis. The split between these two groups occurred before the actual speciation itself, when part of the heidelbergensis population left the African continent between 400.000 and 300.000 BP. Of those that left, an eastern branch ended up in Siberia, where it evolved into the Denisova hominins. Based on genetic analysis, these are regarded as a separate species that is not to be joined together with either sapiens or neanderthalensis (Dunbar, 2014). A western branch settled in Europe and the Middle East, where it started to evolve around 300.000 BP into Homo neanderthalensis. This process was probably sparked by the considerable changes in living environment that presented themselves, which would have not only created selection pressures for new anatomical features, but also for different kinds of sociality in order to cope with a new socio-ecological niche.[1]

Heidelbergensis is thought to have arisen around 500.000 BP as a descendant of either Homo ergaster or Homo erectus, as the relationship between these last two is heavily debated. They are sometimes seen as two separate species, where ergaster is associated with Africa and erectus with Asia, but it is more likely that Homo erectus is the more general term that should be used to generally denote the species that arose around 1.8 million years ago in Africa, before finally perishing around 60.000 BP in Southeast Asia. Homo ergaster, then, would be a more ancestral group within Homo erectus, that already disappeared around 500.000 BP through an evolution into Homo heidelbergensis (Dunbar, 2014). Although it was long assumed that with Homo erectus, all pre-modern human occupation disappeared from Asia, a 2004 report noted the presence of Homo floresiensis, or 'the hobbit', on the Island of Flores, Indonesia, until around 12.000 BP (Brown et al., 2004).

It is usually agreed upon, though, that the species preceding these two was Homo habilis, who is at the same time regarded as the first species to be classified in the genus Homo. Its name, the handy man, was derived from palaeoarchaeological associations with the earliest stone tools. These tools, part of the Oldowan industrial complex, have been dated to around 2.6 million years ago, around the same time that Homo habilis appears to have emerged. Another debate surrounds this species: because of its smaller size and brain and its many ape-like features, it has been argued that habilis does not belong in the genus Homo, but is instead a tail of the Australopithecines, or the 'southern apes', or at least a transitional figure (Dunbar, 2014). The genus Australopithecus is also composed of a number of different species, such as africanus and afarensis, or Lucy, that bridge the gap between the appearance of Homo and the split from the chimpanzee lineage around 6 million years BP.

[1] Homo neanderthalensis and its relationship to art is discussed in more detail in Chapter 6.

Migratory patterns of members of the genus Homo are not limited to anatomically modern humans. The first out of Africa movement probably took place from around 1.5 million years ago, when Homo erectus seems to have left the continent on its way to Asia and parts of Europe. The migration of anatomically modern humans was, however, the movement that would eventually result in the colonization of the entire world. After having arisen around 195.000 BP in eastern Africa, the sapiens brain underwent another, final growth process around 100.000 BP, probably due to increasing population size which created new selection pressures for regulating a new kind of sociality (Schultz et al., 2012). It is fairly certain that the exodus from Africa took off at least around 70.000 BP, although Homo sapiens seems to have been present considerably earlier in some areas of the Middle East. At Qafzeh Cave, an anatomically modern human burial was dated to 92.000 BP (Hovers et al., 2003), whereas evidence of modern human occupation around 120.000 BP was also found at the site of Jebel Faya in the present United Arab Emirates (Armitage et al., 2011). It is debated whether this early presence was the result of an early but fairly limited migratory movement that came to a halt relatively soon after (e.g. Mellars, 2005), or whether this instead truly set off the Out of Africa migratory movement of Homo sapiens.

What is certain, is that anatomically modern human occupation dates back to some 50.000 years ago at the Niah Cave archaeological complex in Sarawak, in the Malaysian part of Borneo (Barker et al., 2007). Around the same time, Homo sapiens is thought to have entered Australia (Bowler et al., 2003). It is not entirely clear whether these different land masses were at these times conjoined because of lower sea levels, but according to some (e.g. Dunbar, 2014), at least part of the migration to Australia must have taken place with the help of boats, because distances between current Indonesia and New Guinea had to be travelled over sea. Occupation of New Zealand and other Polynesian islands took place a lot more recently, likely over the last few thousand years. For the entire continents of North and South America, human occupation is absent until well into the last phase of each temporal classification, i.e. the Upper Palaeolithic and the Later Stone Age. A recent analysis found, for example, that human presence in the southern areas of South America dates back to around 11.000 BP, broadly coinciding with the end of the Palaeolithic as a whole (Steele & Politis, 2009). North America was reached sooner, ca. 15.000 BP, as Homo sapiens migrated via the northeastern regions of present-day Russia, which were at the time connected by means of the Bering Street land bridge (Dunbar, 2014).

When discussing the first traces of art, the archaeological record is commonly divided into set temporal boundaries. For the European record, the Lower, Middle and Upper Palaeolithic are employed, with the first phase broadly dated between 2.5 million and 300.000 - 250.000 BP, followed by the Middle Palaeolithic, which eventually ended at the dawn of the Upper Palaeolithic around 50.000 - 45.000 BP. This last era presumably ended with the advent of the Neolithic, which took off around 12.000 - 10.000 BP. The African record is described in terms of the Early, Middle and Later Stone Age, with the dates of these eras broadly coinciding with the European classification. The separate terminology for the African continent was originally developed out of concern that the European record had dominated archaeology to such a significant extent that transmitting its temporal classifications, in particular its list of presumably characteristic behavioural and cultures features, to the African record would create additional biases on top of those already inevitably characteristic of archaeology in general (McBrearty & Brooks, 2000).

When taking a worldwide perspective, the classification of either the Lower, Middle and Upper Palaeolithic, or the Early, Middle and Later Stone Age have virtually no meaning for certain areas, especially those where no human occupation is known before the recent advent of Homo sapiens. This is true for the Americas and for parts of Southeast Asia and Oceania that were only colonized by sapiens, and not by preceding species such as Homo erectus. Like the African record until recently, the archaeological record of Asia is yet to be explored more extensively, so the width of Homo erectus behaviour, manifested in material remnants, is difficult to grasp. A recent set of striking and even crucial discoveries in Southeast Asia, such as Homo floresiensis, has indicated that key insights into human evolution might also be found here in the future (Roebroeks, 2014). The material record of these regions preceding the eventual colonization by anatomically modern humans from around 70.000 BP has not received a separate temporal classification, but can be assessed by means of the general Palaeolithic chronology. For Homo erectus in Asia, there appears to be a difficulty in that this species is seen as a chronospecies, or a species that changes considerably over the course of time, because if its longevity (Dunbar, 2014). This means that Asian Homo erectus would have singularly crossed the artificially placed boundary of the Lower to Middle Palaeolithic, whereas such transitions are usually associated with the appearance of new species in the African record. However, because the Asian record is relatively unclear, it is difficult to assess whether any patterns corresponding to the European or African record at all took place, so this is not a pressing issue for the current subject. In this dissertation, the separate terminologies will be used consistently for the record of Africa on the one hand, and Europe, the Middle East and Western Asia - or Eurasia - on the other. However, as the terms 'Palaeolithic' and 'Stone Age' broadly have the same meaning,[2] the difference between Palaeolithic and Stone Age classifications may be largely semantic, rather than reflecting a fundamentally different record, requiring a different temporal structure.

1.2.2. Classifying prehistoric art

Overviews of prehistoric art can be structured in various ways. As traditional accounts are often focussed on Southwestern and Central Europe, one option is to discuss the archaeological record of Europe, with its different cultural and technological complexes, before providing findings from other continents. This would have as an advantage that different regional traditions are comprehensively summarized. Yet such an approach often does not take into account the depth of the archaeological record outside the West, which will be illustrated below. A eurocentric view is also not justified by referring to the migration into Europe of Homo sapiens, the species typically linked to the emergence of figurative art (e.g. Mellars, 2005). This probably happened around 45.000 BP, and the apparently contemporaneous appearance of new hunting and foraging techniques, innovative technology, and purported to be symbolic behaviours such as personal ornamentation, burial, and figurative art, are termed the Upper Palaeolithic transition (e.g. Bar-Yosef, 2002; d'Errico, 2003; Henshilwood & Marean, 2003; McBrearty & Brooks, 2000; Mellars, 2005). Yet lifting this singular episode of world colonization by Homo sapiens, and linking it to the ultimate breakthrough of modern cognition and behaviour, is rather arbitrary. As was clear from the short overview above, migratory movements already took place significantly earlier than 45.000 BP, and Homo sapiens reached Australia roughly around the same time as it

[2] With the difference being that etymologically, the palaeo-part of Palaeolithic appears to specify that an *old* stone age is referred to. This, however, is explained by the fact that this prefix is used to distinguish this era from the subsequent Mesolithic and Neolithic. Literally translated into Stone Age terminology, these would then be the Old or Early, Middle, and New or Later Stone Age, although these last terms should be only used for the African parallels of the Lower, Middle and Upper Palaeolithic.

reached Europe. Notably, the arrival in Oceania was equally accompanied by the appearance of figurative art.

Another possibility is to broadly subdivide prehistoric art into parietal and portable art. While the first refers to art applied to immovable rock surfaces, the second involves any detached artistic object that can be carried around. Evidently, this distinction is not as straightforward as it sounds: if a depiction is found on a slate of stone, it in unclear whether the original image was applied on the separate slate, or whether the slate itself was part of a cave wall that detached at a later stage, resulting in an object dat would, according to the present distinction, be classified as portable art (Bahn & Vertut, 1997; Moro Abadía & González Morales, 2013). A lot of variation is present within these categories, but broadly defined, parietal art can be both the result of painting or sculpture, referred to as petroglyphs, while portable art can be both independent, or applied to utility objects such as weapons or tools. In the European record, combinations of figurative and abstract elements often occur, but parietal and portable art are uncommonly found in the same sites.[3] Sites where both of these art forms are found, are sometimes thought to have been of special significance for the inhabitants or artists, and they have been described as potential "storehouses, meeting-places, ritual foci and socio-economic centres not only for local groups but also for a far wider area (...)." (Bahn & Vertut, 1997, p. 47). Alternatively, this apparent separation may be due to a number of coalescing environmental and occupational factors, that together create a pattern suggesting special significance. Although the moderate and stable climate in deep caves, protective in winter and cool in summer, would have been suitable for human occupation (Bahn & Vertut, 1997), there is no reliable evidence that they actually lived in caves (Guthrie, 2005). It is more likely that humans occupied semi-sheltered and open air sites, and mobiliary objects have often been found among the debris at these occupation sites (Guthrie, 2005; Porr, 2010a). As such, the finding that parietal and portable art objects do not seem to occur together very often, may be simply due to these living circumstances in addition to conservation issues: if paintings were made at all at semi-sheltered sites, they would have been a lot more susceptible to the elements than those made in deep caves.

As earlier candidates for art are typically of a geometric nature, as opposed to the figurative characteristics of the record that is heralded as the first unequivocal

[3] Answering the same question for art outside of Europe is difficult because of the significantly smaller number of sites, and accordingly, the overall more limited record available.

evidence of art in the human lineage, one other division would be to separate all seemingly aesthetic practices and products into figurative and abstract categories. Yet this disregards the fact that these types of decoration very often appear together, such as in the case of figurative cave paintings that are complemented by abstract motives, or when utility objects receive both figurative and abstract ornamentation. In addition, such a distinction biases the record towards artefactual findings starting from around 100.000 BP, and disregards other instances of material culture such as decorative shell beads, and artefacts that do not have applied decoration, such as handaxes.

For the above discussed reasons, the present overview takes a straightforward chronological perspective, and discusses worldwide findings from three different phases. This makes contemporaneous parallels clearer, such as the emergence of figurative imagery.[4] In the most recent phase, spanning around 40.000 years between ca. 50.000 and 10.000 BP, figurative art first appears in the archaeological record, only to disappear again around the time of the Neolithic transition. Before this time, starting from around 100.000 BP, geometric mark-making seems to have emerged, in addition to other practices that continue into the European Upper Palaeolithic and Later Stone Age, such as ornamental beads. Finally, the phase predating 100.000 BP contains several instances of practices that have been interpreted by some to be of an aesthetic nature, but that are debated as to their status as the potential earliest art in human history. Among these are ochre use and the manufacturing of handaxes.

Where available, the dates for the art are calibrated radiocarbon dates, or dates corresponding to the date of manufacture. Radiocarbon dating measures "the time of cessation of replenishment to the dated material of carbon isotopes in equilibrium with the environment, rather than directly the painting or other cultural event itself." (David et al., 2013a, p. 3) Because carbon levels have not necessarily been constant over the course of the timeframe that is being measured, the additional method of calibration is usually applied in order to achieve dates that are closer to the actual date of manufacture. Calibration curves are established with the help of datings that have been provided for other findings through other methods. The differences between calibrated and uncalibrated dates can be significant, and reliable dates as to the actual origin of the art are important if they

[4] A chronological perspective cannot, however, accommodate the apparent absence of such parallels, assuming that such an impression might very well arise from preservation biases and fragmented discoveries of the archaeological record.

are to be connected to certain socio-environmental circumstances, or if they are to be used as illustrations in evolutionary hypotheses or proposed processes of cognitive evolution. In some cases, calibration cannot be added to raw radiocarbon dating, if for a particular region, no reliable calibration curves are set up yet (e.g. Conard, 2003 for the deep Aurignacian of southwestern Germany). Here, the uncalibrated dates are provided, with the important remark that their actual origin probably lies in a more distant past.

1.2.3. ca. 50.000 - 10.000 BP

This most recent temporal phase generally coincides with the Upper Palaeolithic or the Later Stone Age. Because the record of the second is still relatively limited in comparison with the European record, there is an inevitable bias of European findings. Nevertheless, a cross-cultural perspective is possible, as will be illustrated below. The European record of the Upper Palaeolithic is traditionally subdivided into different archaeological complexes, which are defined based on cultural and technological innovations and differential patterns that appear to be clustered during certain periods. These complexes are notoriously difficult to delineate, and listings of beginning and end dates can be reported with differences of several thousand years. Generally, they follow these lines:

- Aurignacian cultural complex: ca. 45.000 - 30.000 BP
- Gravettian cultural complex: ca. 30.000 - 22.000 BP
- Solutrean cultural complex: ca. 22.000 - 18.000 BP
- Magdalenian cultural complex: ca. 18.000 - 12.000 BP
- Azilian cultural complex: ca. 12.000 - 10.000 BP

The Châtelperronian cultural complex is sometimes added to this list, with similar dates between ca. 45.000 and 35.000 BP. The Châtelperronian is linked to the presence of the last Neanderthals in Europe, whereas traditional overviews of the Upper Palaeolithic are usually concerned with Homo sapiens only. The different cultural complexes are not neatly separate, and the Azilian, for instance, may be a tail of the Magdalenian, rather than a more independent cultural complex.

The oldest figurative art found in Europe dates back to the Aurignacian. The best known site is Chauvet Cave, the dates of which have been confirmed as lying between 35.300 and close to 38.700 BP (Sadier et al., 2012). Not all paintings in the cave date to the same timeframe, which is not surprising given the fact that many caves do not always appear to have been occupied continuously. Nevertheless, the presence of at least one painted rhinoceros being dated within the 35.300 and 38.700 range indicates that artmaking took off at least around this time. Other European findings which are notable in terms of their antiquity, are a painted oval shape, accompanied by handprints and a bison from the now partially submerged Cosquer Cave, France (ca. 31.500 - 34.000 BP), and a charcoal drawing from Coliboaia Cave, Romania (ca. 31.500 - 32.800 BP) (Clottes et al., 2011; Valladas, 2003; Valladas et al., 2001). While Chauvet is certainly most famous, it is not the oldest one that has currently been found. Red pigment traces on rock were found at Fumane Cave, Italy, and were dated between 41.000 and 36.000 BP (Broglio et al., 2009). This cave yielded, among other things, an image that has been interpreted as a shamanistic figure. The site of El Castillo Cave, Spain, is also thought to contain at least a few instances of painting that cluster around 40.000 BP, with a painted red disk at this cave receiving a minimum date of 40.800 BP (Pike et al., 2012). Here, discussion has arisen as to the makers of the art. Because this date falls exactly into the time range when Homo neanderthalensis and Homo sapiens co-existed in Europe, it is possible that Neanderthals were responsible for these paintings. Arguments in this regard will be discussed in Chapter 6.

Although it was long assumed that the paintings of Chauvet Cave were the oldest in the world, this has recently been challenged on the grounds of findings in other parts of the world that are not only figurative, but also older than Chauvet. The Asian sites in this cross-cultural record are increasingly gaining a reputation as the earliest currently known figurative art in the history of humankind. Aubert et al. (2014) applied meticulous biochemical analysis to a record of limestone cave paintings on the island of Sulawesi, that had already been discovered and discussed by Indonesian researchers starting from the 1950s. A recent phase in the cave art record of this region is thought to be linked with Austronesian occupation of a few thousand years old, and contains zoomorphic and anthropomorphic images, and geometric signs. The early phase in this record contains both figurative images and handprints, which were found both close to cave entrances, and in darker chambers and passages. An image found at the Leang Timpuseng cave site was interpreted as a babirusa (pig-deer) and is at least 35.400 years old. Handprints at the cave site of Leang Jarie were dated to be between 30.700 and 39.400 years old, whereas a handprint close to the babirusa image is thought to be 39.900 years old, making it the earliest currently known example of a handprint stencil (Aubert et al., 2014).

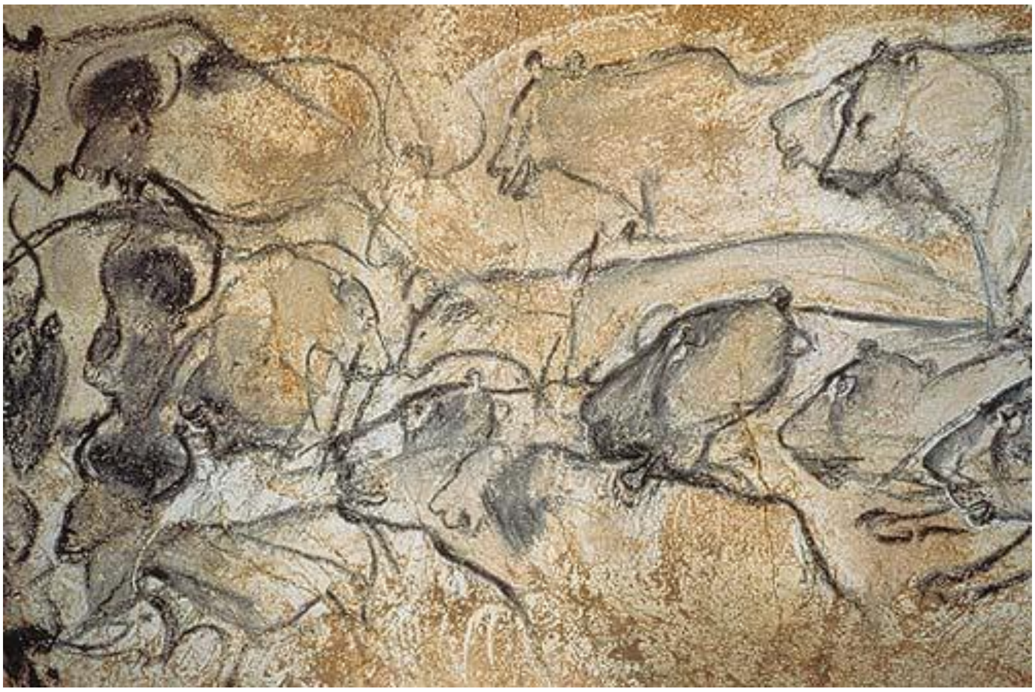
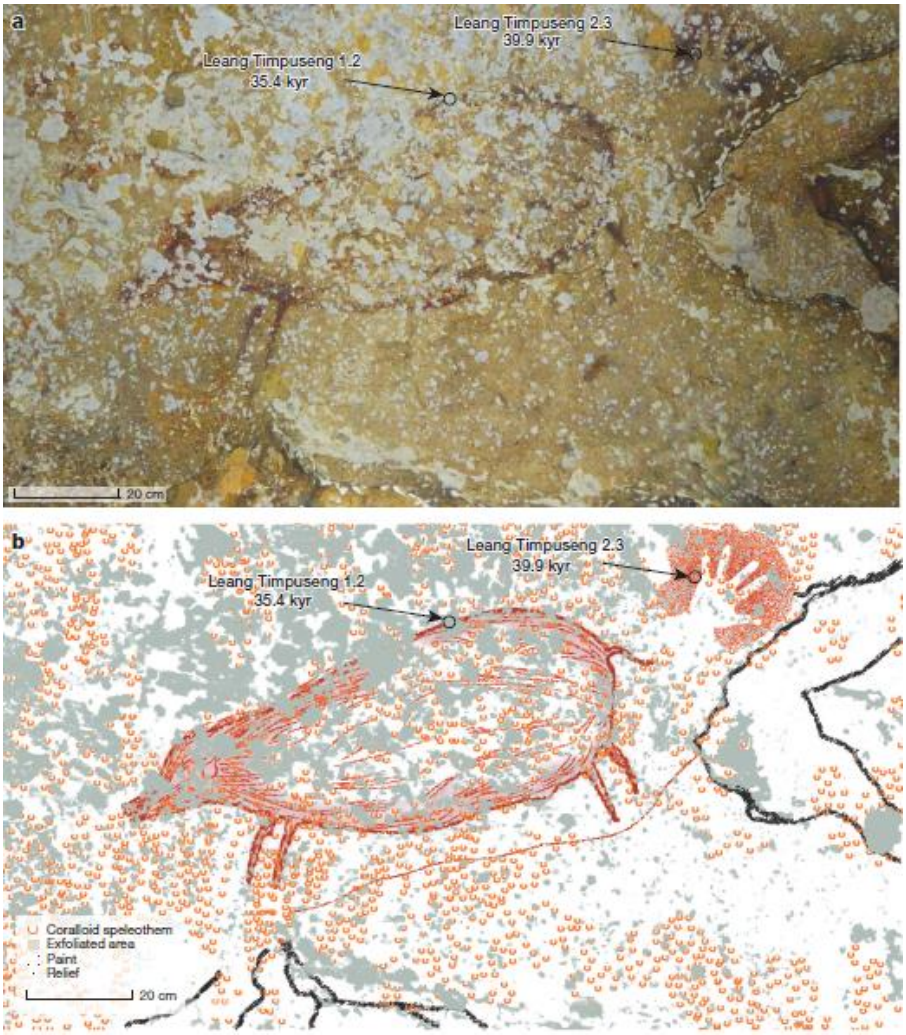


Fig. 1. Depiction of lions supposedly hunting a bison, Chauvet Cave, France, dated between 35.300 and 38.000 BP.

Fig. 2. Rhinoceros depiction from Coliboaia Cave, Romania, dated between 31.500 and 32.800 BP.

Fig. 3. Black horses panel at Cosquer Cave, France, dated between 31.500 and 34.000 BP.

Fig. 4. Stag outline at Cosquer Cave, France, dated between 31.500 and 34.000 BP.



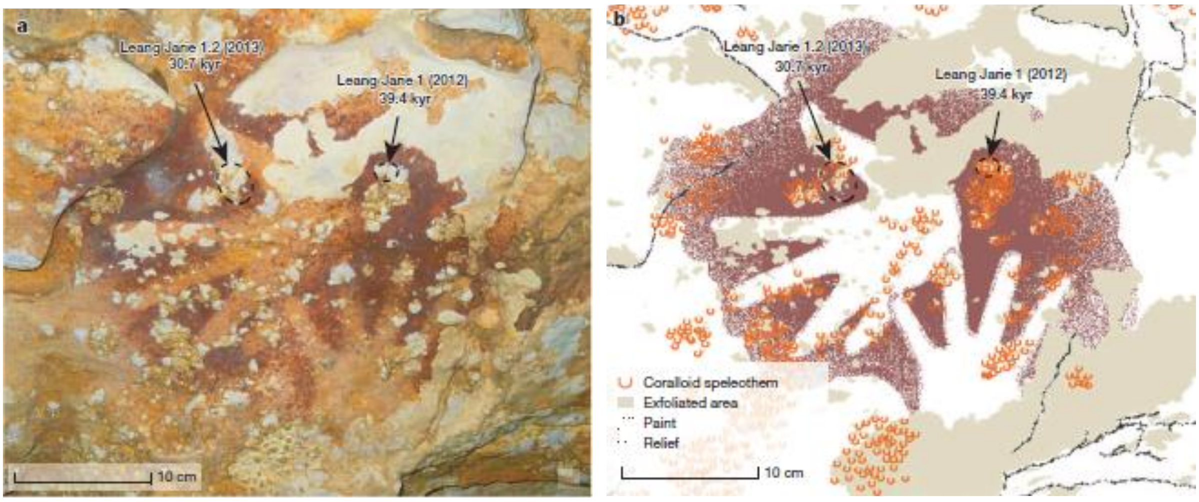


Fig 5: Photograph and tracing of a figurative depiction, interpreted by the authors as a female babirusa (pig-deer), at least 35.400 years old.

Fig 6: Photograph and tracing of handprints found at the Leang Jarie cave site, dated as being 30.700 (left) and 39.400 (right) years old. The dates reported for both the figurative image and handprints shown are minimum ages.

Homo sapiens probably reached present-day Australia already around 50.000 BP, and this is confirmed by findings attesting to ochre use around the same time (David et al., 2013a). Overall, however, Aboriginal rock painting is difficult to date, and much discussion surrounds both the methods for dating and the dates themselves (for a review, see David et al., 2013a). Among the earliest dates of currently known findings is a charcoal painting on quartzite from Nawarla Gabarnmang, Arnhem Land, which is between 27.000 and 28.300 years old (David et al., 2013b). Paintings in the Kimberley region of Western Australia may be much younger, following the end of the Pleistocene although here too, issues with dating are prevalent (Aubert, 2012). Indeed, in various regions of Australia, the paintings that are currently present are thought to be relatively recent, decidedly dating from after the end of the Palaeolithic era (Bahn & Vertut, 1997; Layton, 1992). However, many paintings were made in semi-sheltered areas or at open-air rock surfaces, which would have led to their faster decay than European paintings that were made and preserved in deep caves. It is often suggested that recently made imagery in fact constitutes the latest phase in a process of repeated renewal of the same or similar paintings at the same rock surface locations, as a part of a tradition that might, in some places, go back to around 40.000 BP. This has been proposed for the site of Ubirr in the Northern Territory, for instance, where the current paintings seem to go back only a few thousand years (Layton, 1992). Famous cases such as the stick figures at Ubirr, or the x-ray style of Arnhem Land, should be seen in this regard. Because the dates of the earliest confirmed findings are wide apart from the hypothesized 50.000 BP date for the first use of ochre crayons, with the colonization of Australia thought to have taken place around the same time, it would seem that more instances of either abstract or figurative imagery remain to be discovered. Finally, although figurative art dated between 40.000 and 30.000 BP usually only brings to mind the continents of Europe and Oceania, with the recent addition of the Sulawesi findings, the African record also sees the first presently known instance of figurative depiction towards the end of this phase. In the Apollo 11 Cave of Namibia, several decorated stone tablets were found, one of which depicts an animal that is not clearly recognizable, but that is nonetheless an unequivocal instance of iconic imagery (Vogelsang, 1998; Wendt, 1976).

Although discussions of cave art tend to emphasize striking figurative elements, at various instances iconic imagery was combined with geometric markings. Their abstract nature sparked much debate among early researchers, leading to, for example, structuralist or oppositional attributions of meaning, such as patterns thought to be differentially associated with femininity and masculinity (Guthrie, 2005). Lewis-Williams (1988, 2002), endorsing a shamanist religious explanation for the appearance of figurative art, explained them as externalizations of entoptic phenomena, or visual experiences based on particular neurophysiological elements of altered states of consciousness, or hallucinations. Although not immediately abstract in nature, handprints are also prevalent in rock art around the world, with these marks being found as wide apart as Franco-Cantabrian Europe, Aboriginal Australia, the Sulawesi site in Indonesia, and, dated to the more recent phase of human colonization of the continent, in Argentina. They are usually made by placing a hand on a rock surface before blowing pigment around it. Alternatively, pigment can be applied on a hand before creating stamps on the rock. Handprints have stirred great interest among researchers, as they are the closest indication for discovering who the cave painters truly were. Various attempts have been undertaken to derive from these prints information such as the age (Bednarik, 2008; Gunn, 2006, 2007; Guthrie, 2005), body height (Manhire, 1998) and sex of the makers (Guthrie, 2005; Snow, 2006, 2013), but the results from such studies are often ambiguous, and leave a great deal to be guessed (Galeta et al., 2014).

Fig. 7: Quartzite slabs with animal figurines, Apollo 11 Cave, Namibia, ca. 30.000 BP.

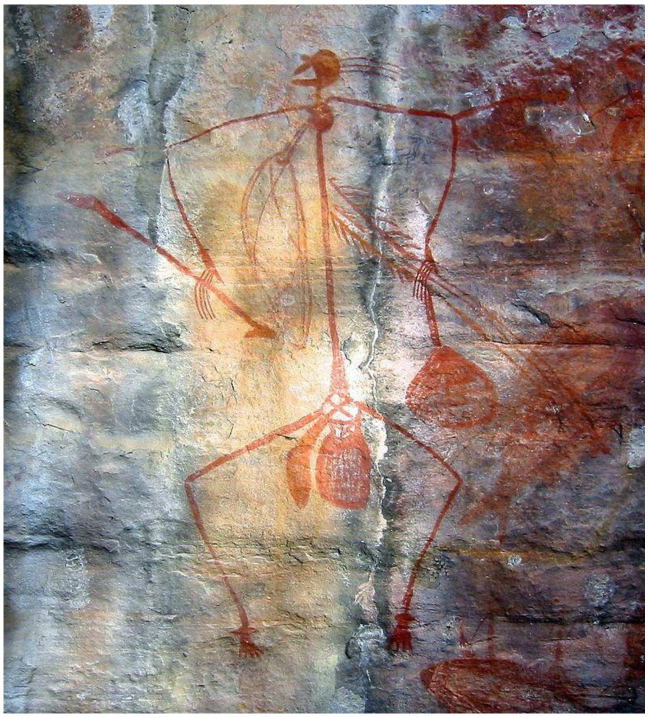


Fig. 8. Charcoal on quartzite drawing from Nawarla Gabarnmang, Arnhem Land, Australia, dated between 27.000 and 28.300 BP.
Fig. 9. Stick figure from Ubirr, Northern Territory, Australia, probably a few thousand years old, within a tradition that might go back to ca. 40.000 BP.

Fig. 10. X-ray style in Arnhem Land, Australia, beginning from ca. 4.000 BP.

In additional to parietal art, the early stages of the Aurignacian also saw the emergence of portable art objects. According to the current evidence within Europe, portable art was made around the same time that Homo sapiens embarked upon painting caves. Among the oldest known objects is the so-called Venus of Hohle Fels, southwestern Germany (Conard, 2009). It is at least 35.000 years old, and depicts a crude but clearly recognizable female figure, made from mammoth ivory. The presence of this statue also further highlights the significance of this central European region for Aurignacian mobiliary art. Not only did the site of Hohle Fels yield several other figurative artefacts, these were additionally found in Geissenklösterle, Hohlenstein Stadel, and Vogelherd Cave (Porr, 2010a). Among these, several objects have gained a steady place in many overviews of prehistoric art, either because of their aesthetic qualities, or because of the presumed presence of symbolic and religious considerations during their manufacture. For the latter, the ivory 'Lion Man' of Hohlenstein Stadel is often said to combine formal properties of a human and a lion. If such elements were truly intentionally mixed, this might indicate that its maker attempted to create an unrealistic, perhaps religious or shamanistic being - an explanation that is popular among those attaching much symbolic and religious significance to the earliest appearance of figurative art in the Upper Palaeolithic (e.g. Dowson & Porr, 2011; Lewis-Williams, 2002).[5] This shamanistic interpretation is further supported by its discovery, from which it would appear that the statue was given a special depositional treatment: it was found in the deepest area of the cave, where other remains are rare. Another hypothesized therianthrope was found at Geissenklösterle, along with what appear to be a few anthropomorphic but especially animal figurines (Porr, 2010a). Among these are renditions of a horse, mammoth and lion's head from Vogelherd Cave, a water bird from Hohle Fels, and a bison from Geissenklösterle (Conard, 2003; Porr, 2010a). The precise dates of their manufacture are not entirely clear as no reliable calibration curves are available for this area, but the non-calibrated dates range between 30.000 and 34.000 BP for the bison, 31.000 and 33.000 BP for the water bird, and between 30.000 and 36.000 BP for the Vogelherd artefacts (Conard, 2003). If these dates were to be calibrated, the antiquity of the objects would probably be greater.

[5] This prevailing view has been criticized (e.g. Guthrie, 2005), a point that will be taken up again in Chapter 5, 'Metacognition and the origins of art'.

Fig. 11. Aurignacian mobiliary artefacts: horse, mammoth and lion's head from Vogelherd Cave, Germany, and water bird from Hohle Fels, Germany, dated between 31.000 and 33.000 BP (water bird), and 30.000 to 36.000 BP (Vogelherd artefacts).

Fig. 12. 'Lion Man' from Hohlenstein Stadel, often interpreted as a therianthropic image, and dated between 31.000 and 32.000 BP (uncalibrated, probably older in calendar years).

After transitioning to the Gravettian cultural complex from around 30.000 BP, the archaeological record yields more notable findings. This period is commonly equated with the Venus figurines who appeared abundantly across Europe. Yet as the above cited example shows, they appear to have been a recurring image type in prehistoric art, emerging already with the 35.000-year-old Venus of Hohle Fels (Conard, 2009), and extending into the Madgalenian, at which time they became increasingly more schematic (De Smedt & De Cruz, 2012). They are popularly explained as fertility symbols, but more detailed analyses of their formal properties indicate that they may have fulfilled gender-related functions in ancestral societies (Soffer, 1999). Alternatively, Guthrie's critical view (2005) explains the occurrence of objects of this sort as evidence of the male testosterone hypothesis, i.e. large parts of the archaeological record were, in his view, made by adolescent males who were naturally concerned with the domains of hunting - reflected in the abundance of animal depictions - and mating - derived from the equally wide occurrence of female figurines. The periods of the Gravettian and the Solutrean, though sometimes used almost synonymously with these Venus figurines, also saw the continuation of animal figurine manufacture. Aside from the already existing use of bone and ivory, figurines are now increasingly made from baked terracotta, which is also the case for the Venus of Dolni Vestonice. In addition, an increasing trends towards more dynamism in portable art objects seems to have taken place. At the Zaraysk site in Russia, archaeologists found a 22.000-year-old bison made from a mammoth ivory tusk and covered in ochre. Its front view in particular, indicates movement in its legs, and detailed properties of the bison's head, such as its open mouth and wide nostrils, give it a kind of vivacity not observed in Aurignacian animal figurines (Cook, 2013).

Around the time when the Gravettian transitioned into the Solutrean, painting occurred at Altamira Cave, Spain. While the cave has long been seen as limited to this era, or even Magdalenian in nature, recent analyses have yielded dates that place some phases of its painting in the Aurignacian cultural complex. A red dotted horse outline was shown to be around 22.000 years old, making it Solutrean, but a claviform shape at Techo de los Polícromos was found to be at least 35.600 years old (Pike et al., 2012). Additionally, the overall timeframe of the Gravettian also contains the cave of Pech Merle, France, which was dated to around 25.000 BP, although here too, additional occupation and painting seems to have taken place during the Magdalenian (Bahn & Vertut, 1997).

Fig. 13. Venus of Hohle Fels, Germany, ca. 35.000 years old.
Fig. 14. Venus of Willendorf, Austria, ca. 24.000 - 26.000 years old.

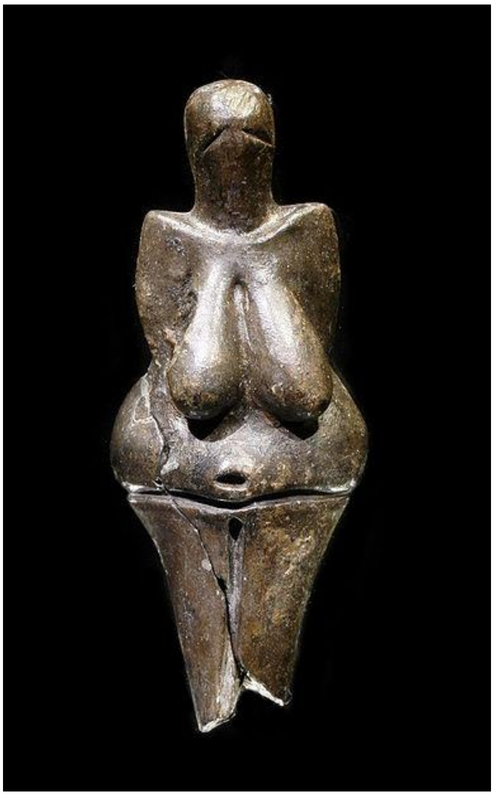


Fig. 15. Venus of Dolni Vestonice, Czech Republic, 27.000 - 31.000 BP.
Fig. 16. Venus of Monruz, Switzerland, ca. 11.000 BP.

Fig. 17. Mammoth ivory tusk bison from Zaraysk, Russia, ca. 22.000 years old.

Fig. 18. Front view of the Zaraysk bison.

The advent of the Magdalenian brings along the paintings of Lascaux, sometime around 17.000 BP. Along with Chauvet, they are the most widely cited examples of figurative imagery of the Upper Palaeolithic. Accompanied by a wide range of animal depictions, the cave of Lascaux also displays a single representation of a human figure, in a strikingly abstract way compared to the manner in which animals are usually naturalistically depicted (Humphrey, 1998). Other notable caves from this timeframe are the 13.000 BP dated site of Les Trois Frères, France, which supposedly contains an image of a therianthrope or shaman, and the 17.000-year-old site of Le Rouffignac, France (Cook, 2013). Portable art is also continued, and even proliferates during this era. Engravings of animals are now commonly made on elongated materials such as tusk ivory and bones, or as independent portable objects, such as the swimming reindeer of Montastruc, Tarn et Garonne, France, which are thought to be 13.000 years old (Cook, 2013). Figurative imagery is also increasingly applied to utility objects, such as in the case of the spear thrower of Le Mas d'Azil, which is adorned with a reindeer-like figure and which is part of decorating antler batons with both figurative and abstract engravings (Bahn & Vertut, 1997).

While the term 'Magdalenian' does not appear to have much relevance for a record outside Europe, where this categorization was developed for, the same timeframe nonetheless sees the appearance of the first art in North and South America. This accompanied the arrival of Homo sapiens on these continents, a move that happened from around 15.000 BP. At the Pedra Furada Rock Shelter in Brazil, figurative imagery was found and dated to being around 11.000 years old (Bahn & Vertut, 1997). Around the same time, the famous Cueva de las Manos in Argentina was created, containing unrivalled amounts of both negative and positive handprints. On the African continent, the Qurta petroglyphs in present-day Egypt were created around 15.000 BP (Huyge et al., 2011).

The Magdalenian, and prehistoric art, come to an end around 12.000 - 10.000 BP. The Azilian cultural complex that either briefly follows the Magdalenian, or is its last tail, is characterized by an overall more crude and simple appearance of the art. Palaeolithic art already moves towards an increasing trend of abstraction by the last stages of the Magdalenian (Guthrie, 2005). This is probably due to a combination of factors. As time, and thus the evolution of human artistic cognition progressed, the attribution and understanding of meaning probably became increasingly clear even from simpler markings and schematic renditions, obviating the need for more elaborate naturalistic representations. Great climatological changes also brought along not only changes in ecology, but also new pressures for different types of social organization and subsistence. After the end of the Last Glacial Maximum, the European climate became warmer and more humid, with a shift towards more forest-bound mammal fauna. This significant change from the large migratory herds travelling across the glacial plains probably posed great challenges to the then existing human behavioural repertoire, which might in turn have led to different kinds of production of, and interaction with art (Guthrie, 2005). At the same time, these more favourable conditions led to considerable population increases, sparking more colonization movements, and leading to the establishment of larger living groups than could be previously sustained. As this was accompanied by a more extensive division of labour, this could also have affected the manufacture of art, leading to different developments in this record. At the same time, increasing group size probably created pressures for perhaps more abstract and simple markers of individual and group identity (2005).

That Eurasia transitioned to the Neolithic between 12.000 and 10.000 BP, does not mean that the art that was characteristic of the Palaeolithic was not continued elsewhere in the world, where the boundaries of different temporal eras are less clear. Around 7.500 BP, the great murals of Baja California were made. Aboriginal imagery, the creation of which probably started around 40.000 or perhaps even 50.000 BP, was, and still is continuously repeatedly painted over time. Schematic looking figurative imagery was also produced sometime after 7.000 BP at the site of Tassili n'Ajjer, a giant plateau around the borders of Algeria with Libya, Mali and Niger (Mercier et al., 2012).

Clearly, this overview of the most recent 40.000 years of prehistoric art is anything but exhaustive. It did not mention many interesting sites and findings, nor did it explore those that were mentioned in sufficient detail. Nonetheless, this section provides a brief cross-cultural assessment of the nature of art around this time. The preceding phases of the archaeological record, predating 50.000 BP, seem to be considerably more flat in terms of artefact variety and depiction, yet at the same time, some of the features emerging in earlier times appear to have laid down important foundations, with elements such as abstract marking crossing the artificial boundaries of archaeological eras.

Fig. 19. The swimming reindeer of Montastruc, Tarn et Garonne, France, ca. 13.000 years old.

Fig. 20. Galloping horse on a baton antler fragment, La Madeleine, France, ca. 12.500 years old.

Fig. 21. Cueva de las Manos, Argentina, probably around 11.000 years old.

Fig. 22. The Pedra Furada Rock Shelter, probably around 11.000 years old.

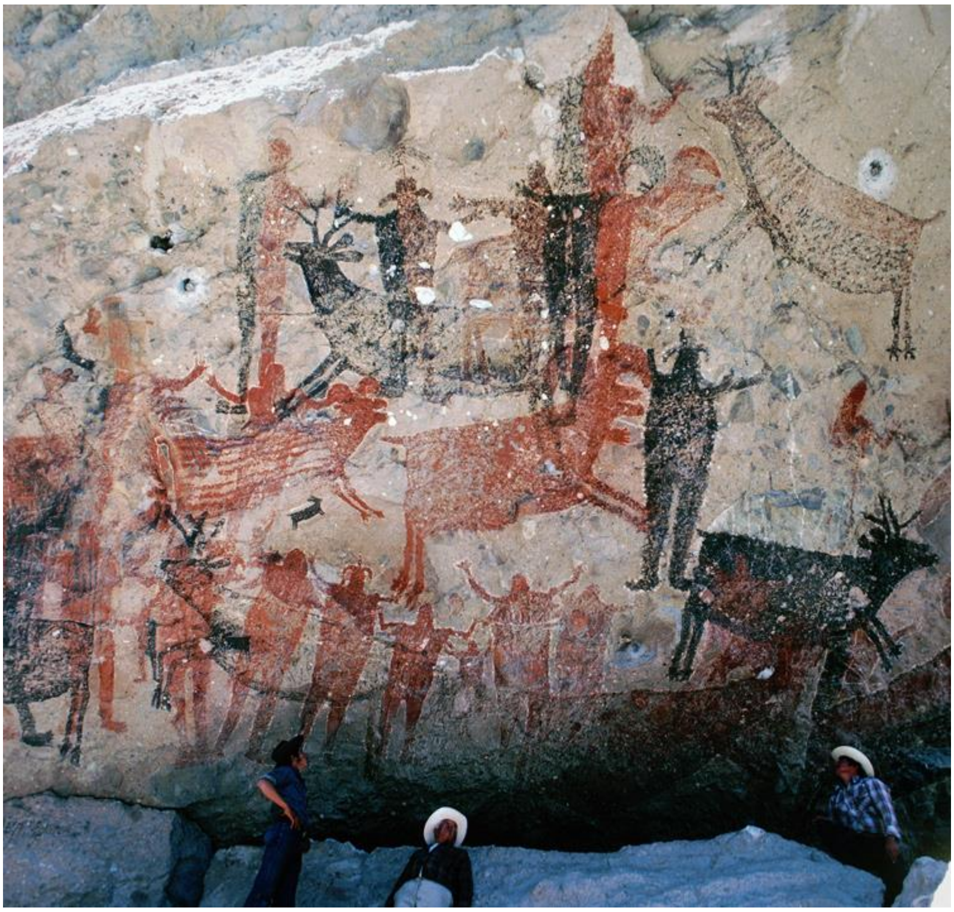


Fig. 23. The Great Murals of Baja California, probably made around 7.500 BP.

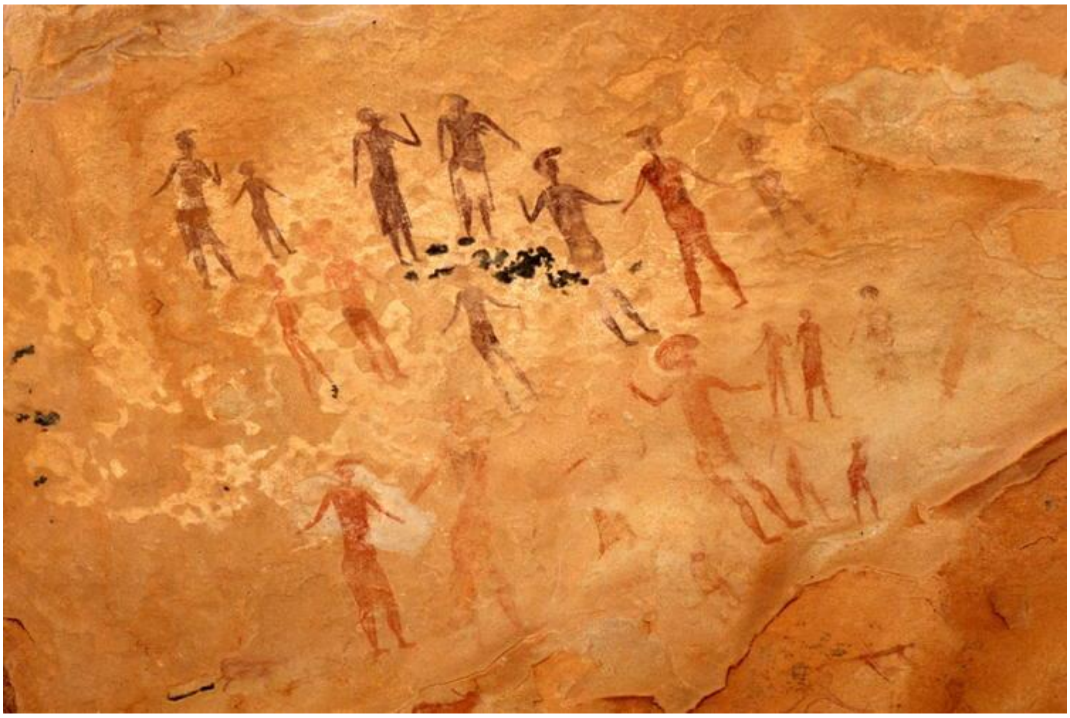


Fig. 24. The paintings of the Tassili n'Ajjer Plateau on the borders of Algeria, Libya, Niger and Mali, probably made after 7.000 BP.

1.2.4. ca. 100.000 - 50.000 BP

Recent excavations outside Western Europe have added to the record of figurative representations a set of objects that bear what appear to be geometric markings. Such objects can broadly be dated between 100.000 and 50.000 BP, and have until now mainly been found in Southern Africa and the Middle East.[6] The artefacts tend to be pieces of ochre, bone, stone or eggshell that have been engraved with linear markings. In various cases, such markings have been shown to be intentionally produced, which has lead some researchers to conclude that we might be looking at the earliest currently known works of abstract art in human evolutionary history (d'Errico et al., 2003; Henshilwood, 2007; Lewis-Williams & Pearce, 2004; Mellars, 2005). Potentially, they provide insight into the question how figurative art could arise so suddenly in the European Upper Palaeolithic, while preceding developmental stages, such as abstract art, had until recently not been found (Hodgson, 2006a). While geometry is clearly also a notable characteristic of Upper Palaeolithic and Later Stone Age art, as evidenced from the examples above, such mark-making appears to have arisen immediately in conjunction with figurative art, adding to the riddle of the latter's seemingly, and surprisingly sudden appearance. The potential explanations for early geometric mark-making are varied and often speculative, but many archaeologists are convinced that they embody symbolic cognition, in turn considered to be one of the hallmark features of modern human behaviour and cognition (e.g. d'Errico et al., 2001, 2003; Henshilwood et al., 2002, 2009; Hovers et al., 1997; MacKay & Welz, 2008; Marshack, 1996; Texier et al., 2010). Specifically, it is thought that the marks were produced with symbolic intent, i.e. that they contain a certain meaning that is difficult for us to deciphere, but that nonetheless would have entailed the presence of a mental, conventionalized relationship for our ancestors.

During the same timeframe, the first cases of shell beads manufacture appear in the archaeological record of Middle Stone Age Africa. Beads were usually made from different species of Nassarius, and have been found so far near the coastlines of both southern and northern Africa, as well as in marine areas of the Middle East (Bouzouggar et al., 2007; d'Errico et al., 2005, 2009; Vanhaeren et al., 2013). Shell beads are referred to as such because they tend to yield evidence of deliberate size choice, intentional piercing, use-wear and ochre colouring. It is highly unlikely that they were manufactured for reasons other than personal ornamentation, although

[6] These objects are discussed at length in chapter 4 of this dissertation, 'Symbolism and the nature of art: the case of geometric engravings'.

the extent to which any symbolic meaning was involved remains unclear. It is also uncertain whether shell beads qualify as art, and if they should then be included in overviews of prehistoric art. Perhaps the aesthetic care clearly taken, together with the possibility that symbolic thought was at work, may be sufficient to at least provisionally classify them as art objects (Davies, 2012). Although the original intent of their makers is unknown, the beads tend to be widely cited along with practices such as established artmaking, as clear indications that Homo sapiens had acquired modern behaviour and cognition.

Shell beads must be seen as part of a wider range of objects and practices for personal ornamentation, where not only ochre use might play a role, but also direct body modification such as tattooing and scarification, cranial deformation and the filing of teeth (Coe, 1992). As for material artefacts, shell beads can be classified as personal ornamentation along with a number of other object types, such as pendants made from bone or ivory. Already in the Middle Stone Age, these additional types appear in the archaeological record. While shell beads are the best known example of personal ornamentation, McBrearty and Brooks (2000) have, in their overview of Middle Stone Age precursors of modern behaviour, additionally included a bone pendant from Grotte Zouhra, Morrocco, and drilled quartzite flakes from Seggédim, Niger, both of might go back to 130.000 BP. It is additionally important to note that the practice of shell beads manufacture is not limited to the Middle Stone Age and Middle Palaeolithic, but instead extends into the Upper Palaeolithic and Later Stone Age. At African sites where shell beads have been found in both Middle and Later Stone Age levels, there are clear formal differences between both, with the second being considerably smaller and even more uniform than the already sought for similarity during earlier phases. This is particularly evident at the site of Blombos Cave (d'Errico et al., 2005). In the European Upper Palaeolithic and the Later Stone Age, examples of personal ornamentation are both more varied and more abundant (White, 1989, 2007). From this time, instances of personal ornamentation are also found in combination with burials, where the presence of such artefacts is often endowed with special significance. At the 30.000-year-old site of Sungir, Russia, for example, hundreds of polar fox teeth were found that were probably part of a belt, as well as ivory pendants (Coolidge & Wynn, 2009).

1.2.5. Before 100.000 BP

One of the earliest kinds of visual art may be cupules, or circular indentations in a rock surface that were probably created by hammering. Although their shape and manufacturing process appear to be quite straightforward, Bahn and Vertut (1997) have noted that making a single cupule could take up to one hour. As such, the effort taken in making cupules, sometimes also referred to as cupmarks, could be seen as an early instance of aesthetically enhancing the surrounding environment (Dissanayake, 2009). Among the earliest examples is the site of Bhimbetka Cave in India, where the markings are said to date back to at least 200.000 years BP (Bednarik, 1993, 1995, 2003a). Cupulus seem to be a relatively ancient phenomenon that is practised less often in later phases of prehistoric art. A notable more recent example is the Upper Palaeolithic site of La Ferrassie in France, where cupules are found in combination with engravings.

While cupules can be cited as very early examples of abstract art, the same antiquity has been claimed by some for figurative art. While nobody would question the intentional iconicity of the Upper Palaeolithic, some have controversially advocated that intentional, figurative shaping goes back to the early Middle Stone Age and Middle Palaeolithic. These claims concern two objects which are also referred to as 'Venuses'. The Venus of Berekhat Ram was found on the Golan Heights in present-day Israel, and is thought to date back to ca. 230.000 BP (Marshack, 1997). A later re-analysis showed that the markings were anthropogenic in origin, with the hypothesis being that early humas found a pebble with a human-like shape, and further modified the object so as to achieve a clearer rendition of a female (d'Errico & Nowell, 2000). An even older date was provided for the Tan Tan Venus, found in Morocco. It was contextually dated by means of nearby Acheulean tool assemblages, which seem to have gone back to the time between 300.000 and 500.000 BP. According to one analysis of the object, natural grooves were deepened with a stone tool so as to enhance the suggestion of a human shape, whereas the object might additionally have been covered in ochre pigment (Bednarik, 2003b). Whether there was any actual intentionality involved in the attribution of markings for figurative purposes is debated, partly because of their seemingly isolated occurrence outside any clearly observed artistic tradition (e.g. Davies, 2012; Mithen, 1999). The microscopic analysis cited does appear to support some degree of intentionality in the attribution of the markings as a way of emphasizing the pre-existing impression of a female figure. The additional question whether this then translates into the presence of symbolism or other art-related properties, is difficult to answer, although inferences in this direction have been suggested (d'Errico & Nowell, 2000). Morris-Kay (2010) notes an alternative possibility: the recognition of human likeness in naturally occurring objects might have been the first step in an ever more elaborated process towards eventual two- or three-dimensional artmaking. As such, even though it is questionable whether the Berekhat Ram and the Tan Tan Venus should truly be regarded as early prehistoric figurative depictions, they might still contain a kernel for the later development of intentional iconic imagery that is created without a pre-existing basis.

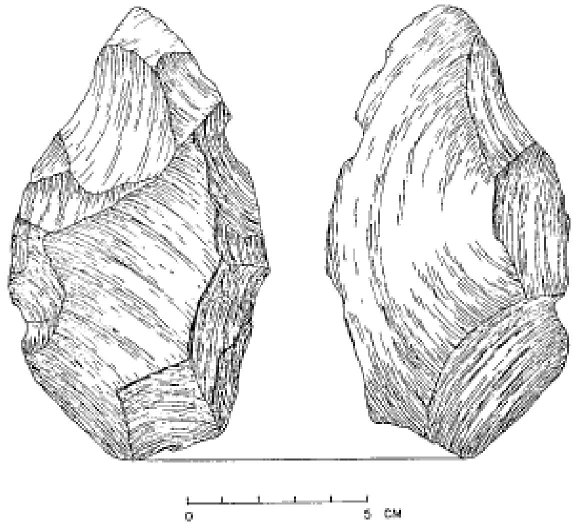
All of the aforementioned parts of the archaeological record constitute objects or modifications to material surfaces, the concrete properties of which can be studied with the aim of determining whether they should be called the earliest known artworks in human evolutionary history. Aside from objects, one should additionally not overlook the possibility that some of the first cases of art may have been instances of body decoration *without* the use of adornments in the form of objects, such as shell beads. Based on its worldwide prevalence and numerous ethnographic examples, it is indeed a likely possibility that early utterances of the human propensity to make art resulted in making aesthetic additions to the human body, for example by using ochre pigments. McBrearty and Stringer (2007) note that the earliest traces of the use of ochre pigments are found close to 300.000 BP at several sites in the African Middle Stone Age. As will be discussed later in this dissertation, the interpretation of ochre traces is a difficult matter. It is indeed possible that aesthetic or even symbolic interpretations apply (e.g. Knight et al., 1995; Power, 1999; Watts, 1999), but a variety of utilitarian functions have also been put forward. Ochre may have been used for medicinal purposes, as a means for hide preservation, or as a component in adhesives used to construct hafted, composite tools (see, e.g. Wadley, 2001).[7] In sum, ochre as a form of art, especially during its earlier phases of use, is questionable as a form of art (e.g. Corbey et al., 2004; Mithen, 1999). It is of course possible that ochre was originally used for different, more functional purposes, and was later co-opted as a medium for artmaking, potentially with symbolic connotations. In this case, ochre use would be a kind of art, but it would be out of place under the current heading of potential art preceding 100.000 BP as it did not gain artistic value until much later in the course of its use.

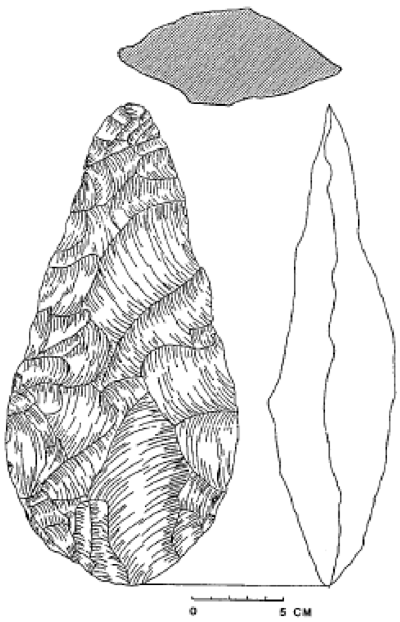
[7] This point is referenced again in Chapter 4.

Research on prehistoric practices such as shell beads, ochre use and object engraving is often heavily focussed on attempts to demonstrate the presence of symbolic cognition, which is in turn commonly taken as proof that the archaeological findings under consideration constitute the first known art in human history (e.g. Deacon, 1997). Others have questioned this view, either by reconsidering the record in itself (e.g. Humphrey 1998), or by looking at any assumed premises characteristic of the art concept taken to interpret the archaeological record. Along this line, Currie doubts symbolism as the quintessence of art, and argues instead that the first works of art, or the oldest objects we tend to regard as artworks based on our present-day Western conceptions of what art is, might be aesthetically enhanced tools, and handaxes in particular. The practice of making handaxes is thought to have originated with the beginning of the Acheulean technological complex, which followed the more crude Oldowan stone tools, that are usually associated with the earliest members of the genus Homo, which was habilis. Whereas the Oldowan technological complex was characterized by modifying stones so as to achieve flakes that could subsequently be used for cutting purposes, Acheulean handaxes were probably the first tools where the makers were concerned with the final shape of the stone itself.[8] Wynn (2002) has compellingly described how this shape gradually became the focus of aesthetic, rather than functional or utilitarian concern. As time progresses, symmetrical properties become increasingly notable, and are not immediately explained by means of a functional account. On the contrary, the effort taken in the aesthetic rendition of the object is at odds with the chance that the artefact could easily break if it was used for its original functional purposes. Other archaeological findings also suggest that mere functionality may not be the only explanation of the appearance and continued manufacture of handaxes over the course of around a million years. They are often found in large quantities at the same site, with some handaxes being too large to have been of much use for tool purposes, and others displaying no use-

[8] "There is a problem with intentionality. All stone tools have a shape, and this shape preserves spatial relationships, but how intentional were they? (...) The basic action of stone knapping will produce useful results without the knapper intending the final core and flakes to have any specific appearance whatsoever. It is even possible for the iterative application of a specific flaking procedure to produce a final core with a regular shape, completely unintended. The shape itself, and the location and extent of modification producing the shape can often, but not always, document intention." (Wynn 2002, p. 392) Empirical evidence concerning the apparent absence of intentional shaping in Oldowan technology, and its counterpart in Acheulean handaxes, has been produced by looking at the neural processes and brain areas involved in each case (Stout et al., 2000, 2006, 2008).

wear traces consistent with such a purpose (Miller, 2001a). If handaxes were indeed at least in part aesthetic objects, it is not unlikely that they can be explained in an evolutionary manner. An explanation in terms of sexual selection has repeatedly been endorsed (Currie, 2011; Kohn & Mithen, 1999; Mithen, 2003; Voland, 2003). An extensive analysis that involved a regional comparison of Acheulean handaxes in terms of variation in overall shape and degree of symmetry, found that within-assemblage variation in shape diminishes as the sites under analysis are more distant from the African origin of this technology, but that within-site variation in symmetry is consistently maintained, a pattern to be expected if specific selection pressures targeted this formal property (Lycett & von Cramon-Taubadel, 2008). In yet other instances, such as the 'Excalibur' handaxe, raw materials appear to have been chosen for their already inherent aesthetic properties.





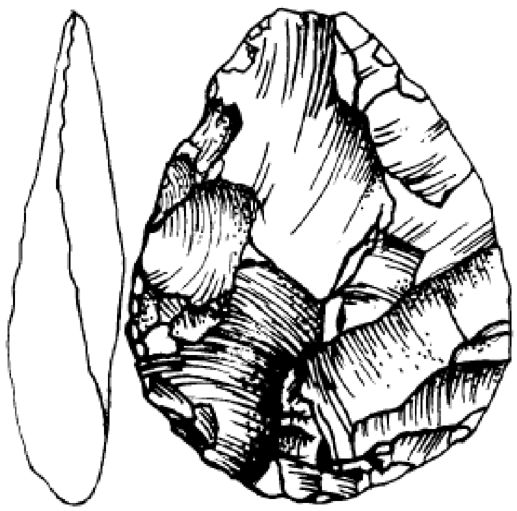


Fig. 25. "1.4 million year-old handaxe from West Natron, Tanzania. The artifact has a "global" bilateral symmetry. The lateral edges mirror one another in quality of shape, but are not congruent." (Wynn, 2002, p. 394)
Fig. 26. "A handaxe from the Tanzanian site of Isimila (about 300,000 years old). This artifact has congruent symmetry in three dimensions." (Wynn, 2002, p. 396)
Fig. 27. "A "twisted profile" handaxe (about 200,000 years old) from the English site of Swanscombe (after Roe 1981). This is another example of broken symmetry." (Wynn, 2002, p. 396)
Fig. 28. The Excalibur handaxe, where red quartzite was probably chosen because of its aesthetic appeal (Currie, 2011).

1.2.6. General issues with interpreting this record

Because it is evidently impossible to observe the contexts of prehistoric artmaking directly, archaeologists need to complement their own study of material culture with various other interpretative disciplines, such as social and cultural anthropology (Barnard, 2012). As Guthrie (2005) already pointed out, this quickly leads to the application of concepts and theories well-known within anthropology, which are often based on extensive fieldwork and the vast body of ethnographic information that emerges from this. Theoretical insights such as Levi Strauss's structuralist oppositions were swiftly applied to the record of figurative art, whereas ethnographic examples such as the San's shamanist rock art were, based on mere formal resemblance, transmitted to the Upper Palaeolithic (e.g. Lewis-Williams, 2002). While this is not necessarily an issue - there is no a priori reason why insights drawn from anthropology and ethnography could not translate to prehistoric populations - it appears that the predominant interpretations of prehistoric art are indeed heavily influenced by anthropological insights that are not corroborated by independent, empirical data. The prevalence of religious interpretations of cave art might be due to such an inferential process. Many early researchers, such as Abbé Breuil, were clergy members, and Catholicism prevailed in southern Europe around the time when the first cave paintings were discovered, which very likely biased their interpretation.

Apart from common religious interpretations being influenced by researchers' disciplinary background and additional features such as personal conviction, it is not even certain whether cave art was generally imbued with any significant meaning. Halverson (1987, 1992) uttered the option that we might be looking at the very earliest instances of *l'art pour l'art*, indicating that the art, rather than carrying a bundle of religious, symbolic and ritual meaning, was in a sense 'meaningless', but does provide us with a window into our ancestors' cognitive evolution towards conceptual thought.[9] Guthrie (2005), in turn, added to the discussion the possibility that the art was made by adolescent teenagers and children. This was based on the fact that large parts of the art appear to be of fairly low graphic quality, a finding that is usually passed by through the citation of famous and strikingly aesthetic examples such as the paintings at Chauvet Cave. Yet overviews of prehistoric art commonly formulate their discussion in ways that already imply the presence of meaning, the content of which is inacessible to us: "There may appear to

[9] For a more detailed discussion of this matter, see Chapter 5.

be a huge difference between the apparently simple markings of the early periods, and the sophistication of Upper Palaeolithic art. However, we shall never know the thought processes behind the earlier markings, which may have been highly complex – these apparently meaningless markings may have been filled with meanings for the people of the time, meanings so obscure in our eyes that we would find them hard to comprehend." (Bahn & Vertut, 1997, p. 26)

Questions of meaning are additionally closely intertwined with taphonomic factors such as preservation biases. Taphonomy refers to the study of processes of decay, and is important to take into account considering the large consequences that preservation biases can have for any explanations that are subsequently developed. In a particularly interesting example, Guthrie discusses how the Hall of the Bulls, located in Lascaux Cave, may be subject to a significant interpretative error that, perhaps unjustly, supported a specific interpretation:

> "The main hall of Lascaux is spectacularly beautiful with its large-scale images of multicolored animals. While Lascaux is a deep cave now, in the late Paleolithic the 'mouth' of Lascaux Cave was huge and sloped downward and inward at a shallower angle. The dense array of art was just inside, with sun reflecting back into the main chamber, the Hall of the Bulls (...). Most of the images in this part of Lascaux were made by very accomplished artists. (...) The lower walls of this part of Lascaux had too rough a surface for artwork, so poles were dragged in as scaffolding to reach the brilliant white and smooth surface of the upper walls and ceiling (imprints of these remained at the time of discovery in 1940). The wide entrance hall at Lascaux made other passages more accessible. Further back in the cave, where lamps were used, one finds hundreds of engravings. The lack of smoke stains on the ceiling, lack of deep refuse, and other clues indicate that, even with its large mouth, the cave was used for only a short time by a limited number of people (...). Actually, the open "mouth" may have been available only during a brief window about 17,000 years ago. Then the overhanging stone entrance collapsed (...), sealing the cave and preserving the artwork. After some 17,000 years, an uprooted tree tore loose a chunk of covering soil, and in 1940, Lascaux was discovered by adventuring teenage boys." (Guthrie, 2005, p. 39)

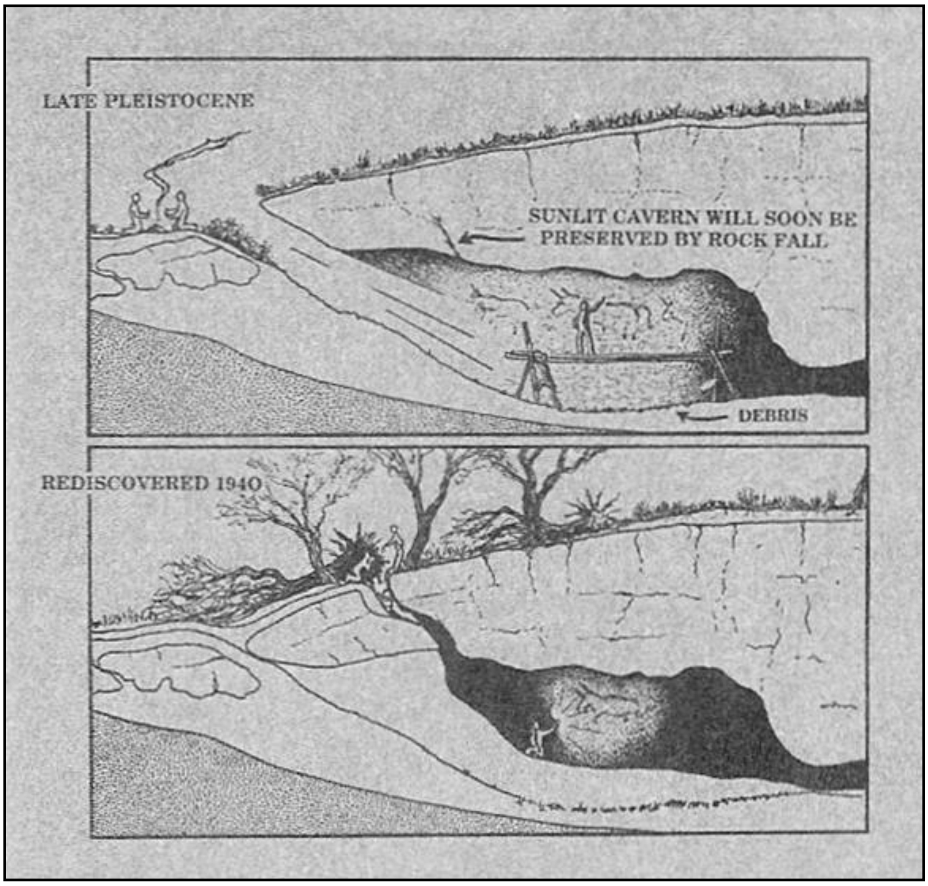


Fig. 29. Late Pleistocene vs. discovery condition of the entrance to Lascaux Cave.

As Guthrie described, and as the images illustrate, the cave was discovered in a state where the Hall of the Bulls was covered in darkness. An archaeologist unaware of the geological process that took place and that shut of the entrance, would readily conclude that painters would have had to use torches due to the room's darkness, as they indeed did in subsequent rooms unreached by sunlight. If this much effort was taken in order to apply the paintings - in a room unlit but by torches, and on a difficult to access ceiling rather than the walls themselves - it would not be far-fetched to think that special significance was involved. Such significance has been attributed from the perspective of the shamanist paradigm of Clottes and Lewis-Williams (Clottes, 1997, 2003; Clottes & Lewis-Williams, 1996; Lewis-Williams, 1997, 2002), who compellingly argued that shamans retreated in the deepest cave chambers, where they subsequently would have experienced hallucinations which purportedly put them into contact with the ancestral world. While this explanation has been criticized in itself (e.g. Hodgson, 2006b), the example of Lascaux cited above also clarifies that even if the supporting evidence for shamanist explanations was stronger, it would still be partially, yet significantly dependent upon our knowledge of any taphonomic or geological processes that took place.

Apart from geological events with potentially great consequences for our present-day interpretation, it is important to recognize the variety of other ways in which biases can distort our interpretations. This is particularly salient in the case of preservation bias. Whether the subject of analysis is prehistoric art or another aspect of material culture, such as tool use, archaeologists are commonly confronted with the issue of having to take into account that some environments are more suitable than others for preserving perishable materials. Cave halls, especially if they were located in deeper areas, tend to have a relatively stable climate where pigment applied to walls is less exposed to fluctuation in temperature and humidity, and is thus better preserved. Open-air shelters or abris, on the other hand, where human ancestores tended to live rather than in the often assumed caves, would have quickly lost any decorative applications that could not withstand the influence of climatological conditions (Bahn & Vertut, 1997; Guthrie, 2005; Wynn, 2002). In addition, some materials will stand the test of time much better than others. It is no coincidence that the record of prehistoric tools and mobiliary art objects consists of solid stone, bone, ivory and antler, and not the more perishable wood or fibres. While, precisely because of preservation bias, we cannot be sure that they were used, it is likely that they were indeed processed and applied in practices such as body ornamentation or the additional decoration of portable art objects (Guthrie, 2005).

The archaeological record is also biased in a eurocentric sense. As is evident from the above examples, which only represent a very limited part of the actual record, prehistoric art occurred around the globe. Overviews and analyses tend to focus on the European record in general and the Franco-Cantabrian region in particular, with additional references to sites in southwestern Germany, where some of the most well-known mobiliary artefacts have been unearthed. This might potentially cloud our insight into cross-cultural regularities, and into how artistic patterns perhaps accompanied the migratory patterns of Homo sapiens. Some have attempted to remedy this eurocentric bias by explicitely emphasizing the world-wide and even very old instances of what appears to be artmaking (e.g. Bednarik, 2003a), but such analyses are likely also heavily influenced by the still relatively limited exploration of sites outside Europe and, more recently, Africa. In addition, studying earlier stages of the Palaeolithic era is probably significantly influenced by the fact that taphonomic processes tend to affect these early stages the most, which may have as a consequence that the actual first instances of art are unavailable to us (2003a;

Bahn & Vertut, 1997). Moreover, as is clear from examples such as the Venuses of Berekhat Ram and Tan Tan, interpretation becomes more difficult as the age of the objects also raises, through the increasing absence of contextual information for earlier times.

In sum, several biases impact our chances of getting a clear insight into the nature and breadth of the archaeological record. This can have a variety of consequences for our interpretation of the objects. If the earliest traces of art are out of our reach, it becomes difficult, for example, to hypothesize about which cognitive capacities were involved in early artmaking. Additionally, the fragmentary state of the archaeological record, with its many uncertainties pertaining to dates and any meaning in objects that are found, complicates the framing of this record within other realms of data, such as those from palaeoanthropology, palaeodemography and palaeoclimatology. In sum, such points should make us aware of the limitations of our window to the past. Nevertheless, the archaeological record is the only available material dataset for the origins of art, and it should be kept in mind that disregarding its importance in favour of mere theoretical approaches. This might bring along yet other conceptual issues: as Bahn notes, “once a phenomenon is accepted as real, it starts to be looked for and to be found.” (1997, p. 26)

1.3. Connecting art and evolution

1.3.1. Historical antecedents of current evolutionary research on art

Present-day evolutionary research on art is the outcome of several historical developments that have subsequently been joined in our biological understanding of art. The history of evolutionary explorations of art’s origins is fragmented, not only consisting of different disciplinary perspectives, but also of applications to different kinds of art. Historically, two different research trajectories are of particular relevance for framing present day research into art (Aiken, 1999). Evolutionary perspectives, originating with Spencer and Darwin, have long attempted to provide biological explanations for the arts, either independently or as an outcome of more functional characteristics such as speech. Experimental aesthetics, on the other hand, looks at the psychological and neuroscientific underpinnings of aesthetic perception and preferences, which can subsequently be applied to art.

Evolutionary insight into the arts originated around the same time as Darwinian evolutionary biology in itself. In 1857, Spencer published an essay entitled *The Origin and Function of Music*, in which he proposed that human music making was closely connected to the evolution of speech. This led to a discussion with Darwin, who, in *The Descent of Man* (1871) argued in favour of a different causal connection: music, according to Darwin, was more likely to be phylogenetically based on the sounds made by a variety of animals during courtship displays, because such emotional sounds preceded the development of speech among humans. Still in the nineteenth century, the courtship origin of music's evolution was endorsed by others such as Sully (1879), who drew parallels between the auditory system of humans and other animals, and Allen (1880), similarly referring to ornamentation and song present in the behavioural repertoire of numerous animal species. Attention was not limited to music. Parry (1906) proposed that the shared appreciation of artworks - a feature that would today perhaps be referred to as shared attention (e.g. Boyd, 2009; Dissanayake, 1995) - might have originated in collective emotion and excitement occurring among groups in functional situations such as hunting. Allen (1877, 1879) additionally focussed on graphic elements such as symmetry and primitive shapes, and hypothesized that our propensity for liking these could be due to the ways our brains and bodies are structured, often seeking out regularities in the surrounding environment. Long preceding modern cognitive neuroscience, these ideas nonetheless anticipated many of the points that are today argued to be of relevance for understanding our aesthetic perception and enjoyment of artworks. With regard to figurative imagery, Sully (1876) thought that we perhaps prefer those images that suggest resemblance to ourselves or nature, which can be achieved by creating corresponding objects. Haddon (1895), in turn, connected evolutionary ideas with anthropology and sociology, in suggesting that the functions art fulfilled among so-called "primitive peoples" were indicative for its reasons for existing at all (Aiken, 1999, p. 420).

Around the same time as early evolutionist writings on art, research in experimental aesthetics took off. Pioneered by Fechner (1871), Wundt (1874), Helmholtz (1875) and others, this field attempted to use scientific methods to assess the human perception of visual aesthetic stimuli, including but not limited to art. Of specific interest were questions about whether certain stimuli elicit particular emotional responses. Music again turned out to be a popular subject, with analyses of which emotions were invoked by certain musical elements (Heinlein, 1928), and by the intentions of a singer (Sherman, 1928). Research on emotions associated with different types of lines found that zigzag lines tended to be perceived with agonistic emotions in mind, whereas curves were approached more positively, in an affiliative manner (Coss, 1968; Lundholm, 1921; Poffenberger & Barrows, 1924). Later research in experimental aesthetics became increasingly concerned with behaviourist ideas, such as the connection between aesthetic preferences and the quest for arousal and excitement (Berlyne, 1974), sometimes paired with the avoidance of repetition and boredom, such as Martindale and Uemura's analysis of stylistic change in European music (1983). As interest in experimental aesthetics increased and became anchored in cognitive neuroscience, review works soon appeared (e.g. Berlyne, 1971; Livingston, 1988; Pickford, 1972).

In more contemporary times, these two lines of research appear to have diverged. Experimental aesthetics and its applications to art are now largely the domain of cognitive neuroscience, which are nonetheless of great relevance where intersections with evolutionary insights occur. These will be discussed briefly at the end of this chapter. The evolutionary approach to the arts has, in recent decades, sparked a number of theories and hypotheses. This may be partly due to the fact that the subject of art was integrated in the work of some of the founding fathers of the more general evolutionary study of human behaviour. Among these is E.O. Wilson, who pioneered the application of evolutionary biological and ethological insights not only to the realm of social behaviour - explored in the then newly arising field of sociobiology - but also to the behaviour of humans (1975). This was met with considerable controversy as to the validity of presumed to be reductionist or genetical deterministic ideas for understanding humans, who were often regarded as having adopted cultural evolution in directing their own evolutionary trajectories (Dissanayake, 1988). In his 1998 book *Consilience*, Wilson awarded a separate chapter to the arts, which gained art an increasing presence in the breadth of evolutionary studies of human behaviour. Other ethologists also awarded attention to the arts, but as Dissanayake (1995) notes, they usually did so in an indirect manner. Functional values for the arts specifically were rarely discussed, in favour of supporting explanations for other behaviours and functions such as communication, prestige acquisition, play, the need for unity and order, exploration, amusement, and others (e.g. Eibl-Eibesfeldt, 1989a, 1989b; Geist, 1978; Young, 1971).

Because the variety of evolutionary perspectives developed over the last decades of the previous century encompasses different kinds of art, the explanations provided do not always apply immediately to visual art. The perspectives that do, can be grouped together under themes that are today still argued to be crucial explanations for the arts. Earlier ethological views tend to focus on identifying biologically relevant stimuli, for which the arts can provide a training ground, developing the cognitive processing of, and emotional response to these stimuli (Aiken, 1998; Arnheim, 1988; Collins & Onians, 1978). Other cognitive perspectives endorse evolutionary explanations for art such as the development of cognitive skills such as imagination, and the acquisition of a better understanding of the surrounding world through pattern recognition and perception (Allott, 1994; Barrow, 1995; Humphrey, 1983; Joyce, 1975; Peckham, 1965). A variety of social functions have also been endorsed. Art might have been responsible for socializing individuals and channeling aggressive impulses, elements such as style may have been of great importance for both identity definition and group formation, or art could have evolved for the purpose of emotional expression and communication (Alland, 1977, 1989; Brothwell, 1976; Kagan, 1983; Koch, 1984, 1988; Pfeiffer, 1982; Ralevski, 2000). Sexual selection has similarly been invoked (Diamond, 1991, 1992; Low, 1979), whereas others propose multiple functions for art (Lumsden, 1991).

Not all of these hypotheses explicitely endorse an adaptationist or byproduct account, or another explanatory category. In addition, not all of them distinguish the cognitive and neural foundations of aesthetic perception and preference from overall explanations for art's evolution, sometimes making these hypotheses ambiguous, and less clear-cut for understanding art's origins. These historical antecedents, and the continuing elaboration of theoretical frameworks such as human ethology and evolutionary psychology, eventually gave rise to the main, and considerably more developed explanatory hypotheses that will be the subject of this dissertation.

1.3.2. Why use evolutionary theory to account for art?

An evolutionary approach to the arts generally involves assessing this subject from a naturalistic perspective, outlined before as referring to a set of underlying, universal regularities rooted in human nature, that should be addressed from a range of biologically-based or -inspired disciplines providing insight into why and how this human nature came into being. But what precisely justifies this approach in the case of art? Are there features characteristic of artmaking that appear to make it particularly prone to a biological explanation? Why is art often seen as rooted in a universal human nature? The relevance of evolutionary theory for understanding art is based on a range of empirical findings about properties of art that suggest a biological basis, and ultimately, a biological origin. Art is commonly identified, for instance, as being a universal phenomenon. It is present in all known cultures across the globe (Dutton, 2009), and the propensity for engaging in artistic activities is prevalent across cultures as well as throughout earlier stages of human history.[10] Davies (2012) has argued that art's universality additionally lies in its recurring presence in all individuals, to various degrees and with regard to various kinds of art. In this view, artmaking should not be regarded as the vestige of a limited sample of highly talented artists, but is instead a panhuman phenomenon (Dissanayake, 1988). It might even be more adequate to talk about "art-behavioral competence," rather than artmaking in itself, in order to acknowledge the worldwide frequent engagement by individuals with varying levels of such competence, in a wide variety of art forms - not all of which would be easily recognized as 'proper' art if we were to depart from more narrow, elitist Western definitions (Davies, 2012, p. 52). Universal patterns in particular behaviours strongly suggest that they may be part of a human nature that is common across cultures. This in turn points towards the influence of biology: "(...) if art is rooted in human nature, then it is a response, at least in part, to elements of our evolved cognitive, perceptual, and emotive architecture that are either necessary for social life, or conducive to it, or that are side-effects from features that are." (Carroll, 2004, p. 95)

Aside from art's striking universality, several other features have been pointed out as being indicative of its biological origins. Making and perceiving art is commonly linked to emotional experience, with pleasure involved in aesthetic appreciation - otherwise referred to as the perception of beauty - as the most outspoken feature. From an evolutionary perspective, which tends to identify emotions as evolved motivational mechanisms for directing behavioural choices, pleasurable emotions are often linked to psychological adaptations (e.g. Miller, 2001b; Orians, 2001; Thornhill, 2003). This means that if a particular behaviour, such as artmaking, involved considerable fitness benefits for the individuals engaging in it, evolution is likely to have endowed the behaviour with neurocognitive rewards so as to elicit its repetition - a point often made in explanatory hypotheses (e.g. Boyd, 2009; Dissanayake; 1995). Indeed, some have employed the feature of pleasurable

[10] Claims as to art's universality should however take into account that not every type of art known in the West will be found in every culture studied. Conversely, local cultural innovations, may be regarded in their culture of origin as utterances of art while they may not be immediately considered as such when looking from another culture's point of view.

experience through art as a specific indicator of the functional value of artmaking (e.g. Carroll, 2005; Miller, 2001a).

Art's biological roots have additionally been supported by referring to its species-specificness and its spontaneous emergence and reliable development from an early age, i.e. among young children. The idea behind art's often proposed uniquely human practice appears to suggest that evolution selected underlying cognitive mechanisms and behavioural features involved in art because they conferred fitness benefits that are specific to the environmental circumstances humans were confronted with throughout their evolutionary history.[11] Spontaneous development among young children is evident from the fact that art-like behaviour apparently does not need to follow specific instruction. Enjoyment of artistic stimuli also occurs naturally: "(...) young infants respond with special pleasure to lullabies and spontaneously play with colors, shapes, rhythms, sounds, words, and stories." (Boyd, 2009, p. 73) Such characteristics are, taken together, indicative of art's roots in our evolved human nature.

1.3.3. Mapping evolutionary hypotheses of art

Evolutionary accounts of art's origins generally aim to investigate to what extent we can account for the apparently universal human behaviour of artmaking by referring to the methodological apparatus of evolutionary theory. Hypotheses of art can be subdivided in various ways. On a meta-level, they can be teased apart by looking at their explanatory intent, i.e. which particular range within the realm of the arts they are trying to account for. Davies (2012) awards much attention to adaptationist hypotheses, which can be subdivided in "general theories of art", and "art-form-specific theories." (Davies 2012, p. 123) While the first provide a similar evolutionary account for different kinds of art, such as Dissanayake's group cohesion or Miller's sexual selection, the second address single kinds of art, such as visual art or music, and attempt to provide an explanation for each of these in itself. Davies additionally discusses the categories of art as a byproduct and art as technology. Byproduct accounts of art include Pinker's cheesecake perspective, whereas the art as technology approach proposes that art is a purely cultural product, built upon basic

[11] Characteristics such as universality and uniquely human practice do not, however, automatically indicate adaptations for fitness benefits, a point that will be taken up again in Chapter 8.

biological mechanisms, but without clear links to an evolved human nature containing art-specific elements, and without a corresponding evolutionary explanation (Davies, 2012).[12] A similar position is briefly considered, but swiftly rejected by Boyd, who describes this culturalist position as follows: "humans exist within and are shaped by their own particular culture, rather than by some universal human nature. Behaviors that *we* may call art happen to be engaged in - but may not necessarily be considered art - in all known cultures, but within the culture the role of these activities can be radically different from case to case." (2009, p. 70-71, original italics). This perspective appears unsuitable as it relies heavily on the influence of culture in itself, creating the possibility that art might not evolve at all in some cultures, which is clearly not true (Boyd, 2009; Dutton, 2009). Davies (2012) additionally notes that the distinction between nature and culture is too severe, making 'art as technology' a very artificial option that does not correspond to empirical reality.

The seven hypotheses mentioned below can also be subdivided according to their main disciplinary outlook, in which case evolutionary psychology would make up the bulk of this literature, with several adaptationist hypotheses and a notable byproduct perspective represented (Miller, 1999, 2001a, 2001b; Pinker, 1997, 2007; Tooby & Cosmides, 2001). Other hypotheses can be broadly grouped either under evolutionary ethology, such as the artification and ancestress hypothesis (e.g. Aiken & Coe, 2004; Coe, 1992, 2003; Coe et al., 2010; Dissanayake, 1988, 1995, 2000, 2008, 2009), or under biology and anthropology, such as the two sensory exploitation and indirect bias proposals (Boyd & Richerson, 1985; Richerson & Boyd, 2005; Verpooten & Nelissen, 2010, 2012). Another option is to map the hypotheses according to their thematic focus. Subjects such as sexual selection, signalling and social status are represented by Miller (1999, 2001a, 2001b), Pinker (1997, 2002), Verpooten and Nelissen (2010, 2012), and Boyd and Richerson (1985, 2005), whereas cooperation and social cohesion are endorsed by Dissanayake (1988, 1995, 2000, 2008, 2009) and Coe (1992, 2003; Aiken & Coe, 2004; Coe et al., 2010).

[12] An 'art as technology' explanation should be distinguished from an 'art as byproduct' explanation. While both are linked to evolved cognitive, emotional and perceptual systems, not all non-functional behaviours should be seen as actual byproducts of general cognition: "We should reserve the term 'spandrel' for non-adaptive, ancillary behaviors closely connected to the adaptations that bring them about. In other words, it seems reasonable to view some behaviors neither as adaptations nor as spandrels. They are better described as technologies. Technologies are *enabled* by, rather than *produced* by, our biological natures. They are learned via culture and are achieved by us, rather than being genetically transmitted." (Davies, 2012, p. 148, original italics)

In order to point out structural differences in the argumentation of the seven hypotheses, distinctions based on theme or disciplinary background are discarded in favour of an overview based on the attributed presence or presumed absence of functional value for art. The following sections therefore map the seven main hypotheses on art's origins according to whether they describe art as an adaptation, a byproduct, or a product of co-evolution and exaptation. This way, the hypotheses are subdivided according to the presence or absence of the intent to endow upon art a crucial survival or reproductive function for our ancestors. Before presenting these hypotheses in combination with any empirical support available, the categories of adaptation, byproduct, and exaptation are briefly defined. An adaptation is an inherited trait, and the evolved outcome of a process of natural or sexual selection, both of which are outlined below within the framework of hypotheses that make use of these selective processes in order to account for art's origins. A trait is classified as an adaptation if it has been selected for the benefits it provides for an organism in terms of survival and reproductive opportunities. A trait is a byproduct if it has not been selected in itself, but instead co-opts one or several existing adaptations for a non-functional, secondary use. An exaptation is a similarly co-opted trait, but does entail a beneficial effect for an organism, contrary to a byproduct. An exaptation does not, however, reflect a history of selection for this effect (Andrews et al., 2002). These categories are not always clearly distinguishable, considering the complexity of the subject of art (Davies, 2012). A more extensive discussion of the applicability to art of categories such as adaptation and exaptation will therefore be undertaken in Chapter 8, which specifically deals with adaptationist thought on the origins of art.

In order to fully grasp the main explanatory hypotheses provided here, they would have to be framed within contextualizing research on the cognitive neuroscience of making and perceiving art, and within archaeology and its various subdomains that are of relevance, such as Palaeolithic archaeology, cognitive archaeology, and neuroarchaeology. For reasons of focus and space, not all of these are extensively discussed in corresponding thematic parts of this dissertation. The present chapter does, however, conclude with a general outline of the ways in which cognitive neuroscientific and archaeological research might be informative in understanding art's origin and evolution.

1.4. Adaptationist thinking on visual art

1.4.1. The artification hypothesis

Human societies and cultures are often characterized by elaborate ritual practices, such as prolonged, socially learnt and culture specific ceremonies. These rituals can facilitate communication between individuals in a group, for example by expressing common cultural values. In addition, they can be powerful tools for social control, partly because of their ability to canalize a variety of emotions (Dissanayake 1979, 1995, 2009). Related research, not directly focussing on art, has indeed yielded supporting evidence for the positive effects of ritual practices, sometimes mediated by the presence of religion or sacred values, on social bonding and cooperation within groups (e.g. Cohen et al., 2013; Fischer et al., 2013; Xygalatas et al., 2013). In addition, engaging in rituals might have been a powerful tool for countering feelings of uncertainty and anxiety that could have accompanied a growing awareness of the environment, by making connections between past, present and future: "humans could remember or even dwell upon good and bad things and imagine them happening again." (Dissanayake, 2008, p. 255) Through focussing on subjects that were central to early human life, such as assuring subsistence, fecundity, health and safety, and dealing with transitory phases such as birth, sexual maturity, pregnancy and death, rituals may have relieved some of these anxious feelings.

According to Dissanayake, rituals are probably an outcome of biological and cultural co-evolution: "in general, one can assume that in human biological evolution behaviour that facilitated sociality would have been selected for and retained; similarly, in cultural evolution one can assume that societies that performed socially binding ceremonial practices would have been more cohesive and therefore better equipped for survival than those that did not." (1979, p. 29) Naturally, longer and more complex ritualized ceremonies would have been more efficient in transmitting community-relevant information, and in achieving the various beneficial effects of collectively engaging in ritual practice. At the same time, such time-consuming and intense rituals must have entailed significant costs for the individuals and groups taking part in them. This is where the arts come in.

Art may have been a cultural element emerging from ritual practice itself, as "the response to novelty, variety, pattern and rhythmic sequence, intensity and other effects closely associated with pleasurable physiological and psychological processes found in living creatures." (1979, p. 30). Possible artistic elements present during ceremonies would have been the addition of rhythm and euphony which facilitate the memory of myths and ceremonial sequences, elaborated bodily movements such as dance, colours and patterns in objects and costumes that create visual pleasure, and songs or instrumental music that increase the aural pleasure experience of ritual ceremonies (Dissanayake, 2008, 2009). The metaphorical and symbolic use of words, objects, movements, and so forth - characteristic of both art and ritual, and described by Dissanayake as "circumlocution and figurative and deviant modes of expression" (1979, p. 28) - contributes to the overall emotional effect. The use of out-of-context elements, transforming ordinary reality in an extraordinary mode, is referred to by the concepts of 'making special' and 'artification' (e.g. Dissanayake, 1995, 2008, 2009). Both can be used interchangeably, referring to "the ancestral activity or behavior that gave rise to and continues to characterize or imbue all instances of what today are called the arts." (2008, p. 252) In practice, artification occurs as follows:

> "For example, in *dance*, ordinary bodily movements of everyday life are exaggerated, patterned, embellished, repeated - made special; in *poetry*, the usual syntactic and semantic aspects of everyday spoken language are patterned (by means of rhythm, rhyme, alliteration, assonance), inverted, exaggerated (using special vocabulary and unusual metaphorical analogies) and repeated - made special; in *song*, the prosodic (intonational and expressive) aspects of everyday language (the ups and downs of pitch, pauses or rests, stresses of accents, louds and softs, fasts and slows) are exaggerated (sustained), patterned, repeated, varied, and so forth - made special; in *visual display*, ordinary objects like the natural body, the natural surroundings (e.g., cave walls, logs, anthill mud), and common artifacts (e.g., house walls, canoes) are made special by cultural shaping and elaboration that make them more than ordinary." (2008, p. 252)

According to Dissanayake, making special makes up the core of art (1995). It sets art apart from a number of behavioural and psychological features such as "communication, play, display, exploration and curiosity, amusement and pleasure, creativity and innovation, transformation, the joy of recognition and discovery, the satisfaction of a need for order and unity, the resolution of tension, the emotion of wonder, the urge to explain, and the instinct for workmanship." (1999, p. 27) While those features are evidently involved in many kinds of art, they are not exclusive to it. Such a behavioural or psychological component in itself can therefore not be seen as the key to discovering the nature of art. Making special, on the other hand, provides such an insight. However, as Dissanayake notes: "even though not all instances of making special may be art, all art is an instance of making special." (1999, p. 31) The phenomenon of making special, or artification, occurs only in two other domains, which are ritual and play.

Ritual was described above as the behavioural realm of human ancestors where artmaking originally arose as a supporting element, where it attracted and sustained joint attention, thereby establishing a mutually strengthening feedback loop with ritual practice in itself. This resulted in several beneficial effects, because "by artifying in a culturally-sanctioned manner, individuals had 'something to do' in uncertain circumstances, giving them a sense of control and thereby relieving anxiety." (2009, p. 158) As a result, "through participation in temporally-organized activity or performance, a group reinforces its social bonds." (2009, p. 145) The relevance of ritual for understanding the origins of art is clarified further when the concept of 'ritual' is not only taken to refer to elaborate, ceremonial, and often religious rituals, but more generally to a range of human variants of basic ritualized behaviour, also found across a wide variety of other species. Many animal species adopt ritualized types of behaviour where ordinary behaviour is modified, exaggerated and stereotyped in ways that enable the communication of emotional states or intent for action. Among humans, a similar, purified form of everyday behaviour is found in mother-infant interaction. Dissanayake points out that such interaction is typically characterized by features such as the use of a soft, high-pitched voice, rhythmic body movements, unusual and exaggerated facial expressions, and the repetition of verbal or motoric elements. Babies respond to this with bodily movements, vocalizations and facial expressions of their own, which creates a remarkable unity that, according to Dissanayake, will achieve emotional attunement between the mother and her baby, as well as spark language acquisition, cognitive development, and general socialization (e.g. 2000, 2008, 2009). Because of the formalization, exaggeration and repetition of multimodal signals, Dissanayake sees the roots of eventual artmaking in these patterns of interaction. The components are therefore termed protoaesthetic, and comprise a behavioural reservoir where humans could make use of in later stages of evolution, when such extraordinary treatment of ordinary life was applied in the realm of art (2000, 2008, 2009).

Finally, the behaviour of artifying shares its making special component with play. As Dissanayake notes: "in most instances both play and art use make-believe, illusion, and metaphor; neither is directly concerned with primary ends of direct survival (like eating, fighting, escaping danger) but is performed 'for its own sake';

as behaviors they are labile and relatively unpredictable; they make use of novelty, incongruity, surprisingness, complexity, change, variety; they have an inherent dynamic of tension and release, arousal and relief, deviation and recurrence or restatement." (1980, p. 401) Rather than play being a constructive feature of art, Dissanayake regards play, art, and ritual as manifestations of a root proclivity of making special, which may have been intimately related in earlier evolutionary times. She argues that it is even possible that they were indistinguishable in the initial stages of their development, and only later evolved along different trajectories (1974, 1979). Like play and ritual in themselves, artistic behaviour, or artification, became gradually more refined over the course of time, through the positive feedback loop established between art and ceremonial ritual practice, eventually resulting in increasing autonomy and ultimately producing the arts as we think of them today.

Dissanayake's approach to the origin of art can be described as an evolutionary ethological one (Sütterlin et al., 2014). Ethology involves the study of animal behaviour, often with an emphasis on natural conditions. This field also takes humans as a subject - otherwise referred to as 'human ethology' - and often refers to, but does not always necessarily incorporate evolutionary theory. Using terms as 'ethological' and 'bioevolutionary' interchangeably, Dissanayake questions "whether one can identify a general behaviour of art that is as characteristic of humankind as toolmaking, symbolization, language, and the development of culture." (1988, p. 6) Importantly, Dissanayake takes the ethological perspective to imply that art contributes "something essential" to those who engage in it, "not in the usual sense of being good for his soul or pleasurable for his mind and spirit (...), but beneficial for his biological fitness." (1988, p. 8) The human ethologist thus studies human nature as "a collection of behavioral traits universally possessed by each member of the human species." (1988, p. 20) An ethological perspective translates to the arts as follows:

> "Art too can be regarded as a behavior by describing what people do or accomplish when they make something art - when they 'artify.' It is easier to conceptualize art as behavior if we think of art as music (chanting, singing, playing an instrument) or performing (dancing, reciting, miming, acting, telling a story), since these arts take place, like 'behavior,' in time. In a similar way, one can also think of the plastic or visual arts as making, marking, image-making, adorning (in any medium) - that is, as the process or activity rather than the product or outcome of the artifying." (Dissanayake 2008, p. 251)

Elsewhere, Dissanayake points out that the term 'behaviour' does not immediately refer to the artistic acts described above, such as painting or playing an instrument, but rather to a more general behaviour or art, or the process of artification (1988, p. 7). In addition, artistic behaviour does not only encompass making, but also experiencing art, although both of these may sometimes have to be studied separately in order for each to be accounted for in itself (1988).

The behavioural view endorsed by Dissanayake implies that the history of art as a behaviour predates the history of art itself, i.e. its material record (1988). While the latter can be dated, given the extent of human evolutionary history, fairly close to the present day, the behavioural propensities at its basis have older roots, "at least in the pre-palaeolithic phase of hominid evolution." (1980, p. 399) Art is therefore not an independently arisen adaptation, but part of a larger behavioural complex that does not only involve ritual, and on a larger scale religion, but also play behaviour and a variety of psychological mechanisms responsible for emotional experience, mother-infant interaction, and so forth.

The above explanation closely links art's emergence to the mechanism of natural selection, one of the primary theoretical foundations of Darwinian evolutionary biology. Together with the proposition of descent from a common ancestor - metaphorically referred to as 'the tree of life' - it makes up the basic facts of evolution (Huneman, 2007). The classic view of natural selection entails three principles which are jointly necessary for this process to occur: variation, inheritance, and selection (e.g. Buss et al., 1998; Darwin, 1859). Variation implies that different members of a population must necessarily possess different variants of a trait in order for selection for a particular variant to become possible. Specifically, one or more organisms may acquire a variant, usually caused by a genetic mutation, that is more advantageous in relation to environmental pressures. This variant will be favoured by selection, giving the organisms possessing it a relative benefit over others. Inheritance refers to the fact that a variant must be genetically based in order to be transmitted to future generations. This means that acquired variants or traits, which developed over the course of an organism's lifetime but did not immediately result from its genotypic structure, in principle cannot be transmitted to offspring. This refers to the distinction between Lamarckian and Darwinian principles of evolution: while the latter is still taken to be the foundational author of modern evolutionary biology, Lamarckian principles of the inheritance of acquired variation became gradually less and less accepted, to the point where it was fully understood that a variant needs to be genetically based in order to be reliably transmitted. Finally, selection involves the maintenance of more advantageous traits and the removal from the gene pool of other variants that may either be deleterious - in which case they would immediately be selected against - or neutral, which would put them at a disadvantage in comparison with variants that are better suited to accommodate environmental pressures. The causal engine of natural selection is differential reproductive success (Buss et al., 1998). While an increase in survival chances is often described as the outcome of a process of adaptation, survival in itself will not aid in the transmission of genetic material to future generations, as this requires reproduction. An organism does not only have to survive at least until reproductive age, it must also be capable of producing viable offspring, who in turn can reproduce again in the next generation.[13] The concept of differential reproductive success thus implies a combination of survival and reproduction, and ultimately refers to the fact that selection will favour the spread of genetic material of organisms who possessed variants that were advantegeous relative to others.

The idea that artistic behaviour is an outcome of natural selection implies that it has survival benefits, or in parallel, that it increases the relative reproductive success of the organisms engaging in it. This connection between artmaking and survival benefits is precisely what has made the behaviour appear so paradoxically in evolutionary terms: how can activities that take up considerable time, energy and resources be linked to evolutionary success, given the often very challenging environmental conditions of the Pleistocene? Would it not have made more sense for human ancestors to engage in clearly functional behaviour securing a better chance of survival, such as foraging, finding shelter, or finding and maintaining mates? Although the obvious answer to such questions appears to be yes - artmaking should not be a priority in trying times - an adaptationist perspective such as Dissanayake's proposes just this: if a considerable benefit is associated with art, and if the individuals that engage in it will gain survival and differential reproductive success from this behaviour, natural selection will maintain the behaviour despite its costs. The behaviour will persist and prosper if its net outcome inclines towards benefits, rather than costs. This cost-benefits ratio in the maintenance or removal of a particular trait becomes nowhere more clear than in sexual selection, which is the

[13] A more precise description of reproductive success involves not only the production of offspring by an organism, but specifically the production of fertile offspring that will in turn be able to reproduce themselves, as this will avoid the discontinuation of genetic material after one generation of offspring (see, e.g. Clutton-Brock, 1988).

evolutionary process - and explanatory framework for the arts - where attention will turn to next.

1.4.2. The aesthetic fitness indicator hypothesis

The aesthetic fitness indicator theory is firmly rooted in the field of evolutionary psychology. This discipline emerged in the eighties as an new scientific perspective based on sociobiology on the one hand, and cognitive science on the other. Sociobiology, notably endorsed by E.O. Wilson (1975), generally aimed to apply insights from evolutionary theory to both human and non-human animal social behaviour. The contribution of cognitive science resulted in a methodology of psychological adaptationism, the main argument being that the mental structures and operations characteristic of a species, such as humans, have arisen according to evolutionary processes that are similar, if not the same, to those responsible for anatomical evolution. Evolutionary psychology is often associated with the standard account developed by Tooby, Cosmides and others, commonly referred to as the Santa Barbara School (e.g. Barkow et al., 1992; Buss, 2005, 2008; Cosmides & Tooby, 1997; Pinker, 1997, 2002; Symons, 1979; Tooby & Cosmides, 1992). Its premises have become the central point of reference for numerous applications of the evolutionary psychological framework to a wide variety of subjects.

Among the central features is an emphasis on the level of cognition, or psychology. Contrary to behaviour-oriented approaches such as evolutionary anthropology and human behavioural ecology, evolutionary psychology aims to identify the underlying psychological design producing behaviour (e.g. Symons, 1987). Behaviour in itself is not seen as the level of selection, but focus is instead directed towards the psychological design of humans that is considered to be the actual level at which natural or sexual selection operates. In order to understand the current psychological make-up of the human species, evolutionary psychologists are interested in uncovering ancient selection pressures, stemming from ancestral environmental problems. Any current functions of a trait are thought to be a lot less informative, as they may not yield insight into the evolutionary processes that led up to the current structure of the mind (e.g. Thornhill, 1990). Among these problems would have been, for instance, having to find and secure suitable mates, determine whether a new environment was suitable to spend more time in, map social interactions, assess cooperative and cheater intent in conspecifics, avoid ingesting harmful substances and provide adequate infant care. Selection pressures acting upon our ancestors likely produced cognitive modules or psychological mechanisms, which are basically computational algorithms designed by selection to tackle a particular environmental problem. In order to be effective in solving these problems, a mechanism must be specifically suited for its purpose, i.e. the proposed module must be domain-specific (e.g. Cosmides & Tooby, 1987, 1994; Ermer et al., 2007; Tooby & Cosmides, 1992). Psychological mechanisms can in themselves be analyzed at different levels. Interest may be directed at cognitive functioning in itself, such as particular decisions that are made in response to certain stimuli, but may also focus on the underlying neural architecture of presumed cognitive functions (e.g. Cosmides & Tooby, 1997). Human nature can, according to many evolutionary psychologists, be regarded as an evolved, species-typical collection of such mechanisms (e.g. Symons, 1992; Thornhill, 2003). This view is often contrasted with the so-called Standard Social Science Model, which claims, among other things, that the mind instead possesses a small number of general purpose mechanisms such as learning, reasoning, and the capacity for culture, that can be applied in a wide variety of contexts. The mechanisms concerned are then domain-general, or content-independent, as they are not a priori teamed up with a particular adaptive problem and the corresponding selection pressures (Tooby & Cosmides, 1992). This model of the mind is also closely related to blank slate views of human nature, where culture is seen as the primary determinant of our development, thinking and behaviour, with the importance of biological evolution being strongly downplayed (for an extensive discussion, see Pinker, 2002).

As stated before, evolutionary psychologists are mainly interested in ancestral selection pressures. In order to make predictions about the nature of these pressures, standard evolutionary psychology commonly makes use of the concept of an Environment of Evolutionary Adaptedness, abbreviated as the EEA. Contrary to faulty interpretations sometimes being made, the EEA does not refer to a specific geographical area or temporal phase. Instead, it is the statistical composite of selection pressures responsible for the emergence of a particular adaptation. This means that multiple EEA's exist, which additionally do not have to be the same for an entire species, as a single adaptation may evolve as a result of an entirely different set of pressures than another adaptation within the same species (Hagen, 2005; Hagen & Symons, 2007; Tooby & Cosmides, 1990). The abstract concept of an EEA is often difficult to fill in with concrete predictions, but any EEA is generally based on the assumption that our Pleistocene ancestors adopted a hunter-gatherer lifestyle, and that they were confronted with a set of recurring adaptive problems, such as those already linked before to the emergence of particular, domain-specific cognitive modules. The EEA and domain specificity in modularity make up the main elements of standard evolutionary psychology, and are also reflected in its overall research strategy:

> "The standard evolutionary psychology approach, then, encourages the following research strategy: (1) a researcher first identifies an *adaptive* problem that recurred in ancestral human groups; (2) the researcher performs a *task analysis*, which asks what kind of computations (information acquisition and processing) would have effectively and efficiently solved the problem in an ancestral world, typically in a domain-specific manner; (3) the researcher tests the hypothesis that modern humans possess these computational procedures." (Gangestad & Simpson, 2007; see also Tooby & Cosmides, 1992).

Criticism towards some of these principles has resulted in alternative views of how evolutionary psychology should be structured with regard to, for example, different evolutionary forces involved and an increasing role of culture (e.g. Dunbar & Barrett, 2007), the validity of evolutionary psychology's adaptationist claims (Richardson, 2007), and of massive modularity and the environment of evolutionary adaptedness (Bolhuis et al., 2009, 2011; Buller, 2006; Fodor, 2000). Evolutionary psychological accounts of art will be the subject of Chapters 7 and 8, where they will be framed within this wider debate. Broadly speaking, they differ from the ethological perspective and from other disicplinary perspectives such as evolutionary anthropology, in their emphasis on the psychological underpinnings of behaviour, rather than on behaviour in itself. Because of the subject matter aimed at, its methods are generally also more directed at assessing the evolution and operation of cognition, such as laboratory experiments and survey-based research. Evolutionary anthropology and ethology on the other hand, make greater use of field-based methods, with ethologists preferably investigating behaviour as it occurs in a natural environment.

While Dissanayake refers to natural selection, aided by cultural practices in a feedback loop, Miller is convinced that the key to understanding the emergence of art, in the aesthetic fitness indicator hypothesis equally considered to be adaptive, lies in sexual selection. Adaptations can thus be seen as either the product of natural selection – they enhance an organism's survival chances – or as the outcome of sexual selection – they increase the organism's reproductive opportunities, thereby resulting in higher differential reproductive success compared with conspecifics who are not in possession of the relevant trait (Miller, 2001a). While some authors tend to regard sexual selection as a process subordinate to natural selection and affecting traits that are relevant for reproduction, Miller follows Darwin in considering sexual selection in itself as a theoretically independent process, potentially having very large consequences for the evolution of a species, and perhaps even being a crucial explanatory tool to account for many phenotypic traits that do not appear to make sense from a survival perspective (Darwin, 1871; Miller, 2001a).

Observations across a wide range of species yield numerous examples of sexually dimorphic traits, or phenotypic characteristics that differ between male and female organisms within a species. In practice, males are often the ones in possession of complex, costly traits. The recurring gender difference in such traits, in combination with their costliness, makes them unlikely candidates for having evolved through natural selection – uncompensated costliness would be selected against, and a crucial survival trait should not be gender biased - but makes all the more sense from the perspective of sexual selection. The evolution of such costly traits through sexual selection was already noted by Darwin, who determined that two main processes are at work in a mating context: within a species, males compete with each other over the attention of females, referred to as intrasexual competition, while intersexual competition occurs when males attempt to convince females that they would make suitable mates to produce and perhaps rear viable offspring. While the first process tends to result in phenotypic features such as weaponry, agression and physical strength, the second is what will eventually lead to the evolution of ornamentation (Darwin, 1871; Miller, 2001a). Darwin already noted that ornamentation might have to be explained within a reproductive context, and described how many of the display features of males that occur in the animal world, are probably linked to female aesthetic preference and their mate choice:

> "This sense has been declared to be peculiar to man. I refer here only to the pleasure given by certain colours, forms, and sounds, and which may fairly be called a sense of the beautiful; with cultivated men such sensations are, however, intimately associated with complex ideas and trains of thought. When we behold a male bird elaborately displaying his graceful plumes or splendid colours before the female, while other birds, not thus decorated, make no such display, it is impossible to doubt that she admires the beauty of her male partner. As women everywhere deck themselves with these plumes, the beauty of such ornaments cannot be disputed. As we shall see later, the nests of humming-birds and the playing passages of bower-

> birds are tastefully ornamented with gayly coloured objects; and this shows that they must receive some kind of pleasure from the sight of such things." (1871, p. 92)

> "The sweet strains poured forth by many male birds during the season of love are certainly admired by the females, of which fact evidence will hereafter be given. If female birds had been incapable of appreciating the beautiful colours, the ornaments and voices of their male partners, all the labour and anxiety exhibited by the latter in displaying their charms before the females would have been thrown away; and this it is impossible to admit." (1871, p. 92)

Naturally, such a distinction is in need of an additional explanation for why choice appears to be mostly the privilige of females, whereas advertising is usually a male task.[14] This matter was elaborately treated in Trivers' parental investment theory (1972), which states that females are more cautious in choosing a particular mate due to their much greater physical and metabolic investments in gestation and childcare. Males, on the other hand, obtain higher reproductive success by continuously looking for new mates, to the detriment of paternal investment in earlier offspring. For this reason, they need to invest large amounts of time, energy and resources in attaining the best possible image towards future mates, whereas females require the ability to discriminate between males of different quality.

Yet even if the structural bias in male ornamentation and female choice is understood by referring to differential levels of reproductive and parental investment, there are still various possible explanations for its development. One possibility is that ornamentation, and by extension cultural behaviours such as artmaking, evolved as the result of a runaway process. Elaborately described by Fisher (1930), runaway sexual selection occurs when a female preference and a male display trait evolve in a constant feedback loop where both the strength of the preference and the extravagance of the trait drive each other's evolution. On the condition that the display trait is correlated with reproductive success, runaway can occur because of the transmission of the display trait into future generations, where, because of the ever evolving female preference, the most striking variants will be selected. They will be driven to an extreme that can, however, be constrained by natural selection if the exaggerated nature of the trait exceeds the fitness costs the organism is able to carry. The cause of such a runaway process can be very minimal,

[14] While in many species display and choice on average coincide with a male-female division within a species, this does not imply that phenomena such as intrasexual competition among females, or mate choice for females among males do not occur. The extent to which these various processes occur is partly dependent upon the mating system that characterizes a species.

and does not have to be correlated with fitness, i.e. the female preference can stem from an arbitrary mutation, which will accordingly direct a basic variant of the male display trait in a runaway direction towards increasing exaggeration.[15] A very similar runaway process could have occurred with regard to human creative intelligence, and thus, with regard to big brains. Even if a preference for slightly more creative mates arose merely incidentally, runaway evolution could occur on the basic conditions that creative intelligence was heritable, and that the same would go for the female preference, making the two genetically correlated (Miller, 2001a).

A second possibility is provided by the concepts of fitness indicators and good genes. Fitness indicators were equally already explored by Fisher (1915), but have been extensively researched and framed by other researchers who developed partial theories about how this process could occur. The overall idea behind good genes sexual selection is that mate choices are very often not made on arbitrary grounds, such as in the case of runaway selection that is based on a randomly mutated preference. Instead, the features regarded as desirable are thought to be often closely linked to underlying genetic quality and general health of the organisms involved. If female choice evolves on such grounds, it does not have to be, and will almost certainly not be founded on conscious awareness or deliberate intent. Rather, a female choice for a particular trait or a variant of it will persist because the initial, perhaps coincidental preference resulted in better quality, i.e. fitter and healthier offspring for the female. The offspring would then not only inherit the 'good genes' of their father, they would also pass on their mother's preference for the corresponding trait or variant. If, on the other hand, the female developed a preference for a trait that signalled deficiencies in health or fitness, the resulting lower quality offspring would automatically stop both the trait and the preference from spreading significantly further within the population.

Good genes sexual selection has been explored in different ways. Ideas such as parasite resistance theory (Hamilton & Zuk, 1982) and perceivable developmental stability as the outcome of immunocompetence (Gangestad et al., 1994; Thornhill & Gangestad, 1993; Watson & Thornhill, 1994) generally imply that phenotypic traits, such as morphological properties of an organism, can be indicative of underlying genetic quality and overall health. Two frequently studied phenotypic features in this regard are symmetry and averageness. The absence of symmetry in human

[15] While popular examples such as the peacock's tail, if explained through runaway selection, often focus on the ever more striking presence of the trait, runaway selection could also occur in the opposite direction, i.e. diminishing a traits presence or decreasing its size (Miller, 2001a).

bodies and faces is often indicative of developmental normalcy, and therefore the absence of parasites, bacteria and viruses that might interfere with regular development (Gangestad et al., 1994). Averageness, most clearly recognizable in facial anatomy, is linked to genetic heterozygosity which in turn correlates with better immunocompetence (Thornhill & Gangestad, 1993; Watson & Thornhill, 1994). Another notable interpretation is Zahavi's handicap principle (Zahavi, 1975; Zahavi & Zahavi, 1999), a theory pointing out that, counterintuitively, some features that are detrimental to an organism's health may be likely to be adopted within a context of sexual selection, because they signal a surplus of health, vital energy, and other resources.[16] An organism, such as an advertising male displaying a trait or a variant that negatively affects its survival chances, thus signals that *despite* the fitness costs, it can sustain the trait or variant in question. One example of this might again be the peacock's tail. Not only is it an honest signal - the bird needs to be fit in order to grow and maintain its elaborate tail - it is also a costly signal and therefore a handicap, as the tail comes at a fitness cost that will, however, on average be compensated by the bird's increased reproductive success. Perspectives such as the handicap principle, immunocompetence and parasite resistance theory can all be regarded as instances of indicator hypotheses, which means they provide insight into how specific physiological or behavioural features may be a secondary signal of underlying health and genetic quality, which is obviously not immediately observable in itself. The concept of a fitness indicator will also prove to be relevant for understanding art.

Runaway evolution and good genes sexual selection do not necessarily have to be independent or alternative processes. It is possible that the original inclination for runaway to occur, i.e. a female preference, is indeed correlated with the genetic quality of the males assessed, instead of following up on a random mutation. This would be the case, for instance, when a female peahen develops a preference for larger size or the number of eyespots in peacocks' tails. While this could theoretically be an incidental preference built upon a random perceptual bias, it is more likely that in this instance, the peahen acquires considerable fitness benefits for her offspring - and thus indirectly for herself - because larger and more complete

[16] A handicap can be either a strategic or a revealing handicap. A strategic handicap is a trait that draws its indicator value from the fact that its cost differs for a low-fitness versus a high-fitness individual, with the latter on average achieving the strategic handicap with fewer costs. A revealing handicap corresponds largely corresponds to an honest signal, i.e. a trait that cannot easily be faked because of positive correlations between underlying fitness levels and the trait's manifestation (Miller, 2000b).

tails tend to belong to fitter males. It is uncertain whether the number of eyespots additionally affects female preference, but this element may be mostly used by peahens as a secondary indication of size or completeness of the tail (Dakin & Montgomerie, 2011). Such examples show that different processes of sexual selection cannot be easily, and perhaps should not be, teased apart.

Despite the framework of evolutionary psychology, Miller's hypothesis draws much of its empirical support from ethological examples of animal behaviour. The roots of visual art are perhaps most clearly illustrated by the example of the bower bird. The males in all species of bowerbirds, native to Australia and New Guinea, construct elaborate bowers, apparently only for the purpose of attracting females. These bowers are often symmetrical, impressive in size relative to the size of the birds, and contain natural and artificial coloured objects. Some species are known to produce a 'theatre angle' for female birds by a particular arrangement of objects and the creation of an avenue in which the female is supposed to take place as a spectator (Endler et al., 2010). Males have also been commonly observed to steal the decorations from other bowers, while at the same time defending their own constructions, and gathering new appealing objects from their immediate surroundings (e.g. Borgia, 1997). Recent research has pointed out that the number of decorations can be regarded as an honest signal of male quality (Doerr, 2010). Females tend to mate with the males responsible for the most impressive bowers, and have evolved discerning abilities to determine which male will father the most viable offspring, based on the aesthetic qualities of the bowers. Over time, this interaction has produced a significant correlation between relative brain size of male bowerbirds and the complexity of their displays, indicating pressure through sexual selection (Madden, 2001).

The arts, according to the aesthetic fitness indicator hypothesis, are similar manifestations of mating psychology and behaviour, in a very similar way as observed among the aforementioned birds, as well as in a variety of other species. Like runaway evolution and good genes sexual selection, the signalling trait - artmaking - and the corresponding aesthetic preference appear to be inherited and correlated: "In sexual selection, genes do not code just for the adaptations used in courtship, such as sexual ornaments. They also code for the adaptations used in mate choice, the sexual preferences themselves." (Miller, 2001a, p. 68). This means that the aesthetic fitness indicator hypothesis explains both the prevalence of artmaking in our species, and the equally widespread concern with art's aesthetic properties. Like the peacock's tail and the bowerbird's bower, art should also be seen as an honest, as well as a costly signal: "applied to human art, beauty equals difficulty and high cost. We find attractive those things that could have been produced only by people with attractive, high-fitness qualities such as health, energy, endurance, hand-eye coordination, fine motor control, intelligence, creativity, access to rare materials, the ability to learn difficult skills, and lots of free time." (Miller, 2001a, p. 281)

In this sense, Miller's hypothesis is not unlike Pinker's concept of the psychology of status, except for the crucial difference that Pinker thinks of visual art as being a byproduct, mostly just eliciting pleasure. But equal to Pinker, Miller suggests looking at popular forms of art, rather than 'high art' only available to, and usually appreciated by, a small number of the general population. The aesthetic fitness indicator is particularly useful for understanding the perception and judgement of folk aesthetics, because here, "the focus is on the art-object as a display of the creator's craft." (2001a, p. 284). Elite aesthetics too, can become enlightened by sexual selection theory, albeit in a different way: "with elite aesthetics, the focus is on the viewer's response as a social display." (2001a, p. 284) Apart from good genes sexual selection, other perspectives linked to sexual selection, such as runaway evolution and sensory exploitation, appear to be less suitable to account for art's evolution. Neither of these informs us much about why we have certain preferences over others, merely stating that we do possess preferences, sometimes linked to our neural anatomy, and potentially with an entirely arbitrary basis (Miller, 2001a).

The aesthetic fitness indicator hypothesis is framed within a wider cultural courtship model that explains historical tendencies of cultural production by making reference to the dynamics of sexual selection (Miller, 1999). In other words, some cultural practices can be seen as the human equivalent of ornamentation in animal species.[17] They are, in the words of the evolutionary biologist Richard Dawkins, part of the "extended phenotype." (Dawkins, 1982; Miller, 2001a, 2001b) Specifically, the model accounts for striking gender and age patterns in various production areas of what Miller calls "creative intelligence" (2001a, p. 7), such as painting and music. Based on analyses of jazz music, books and modern painting, Miller finds that a clear peak in activity takes place among males that are either in late adolescence or young adulthood, reproductively the most crucial phases in life. Females are represented to a much more limited extent in these analyses.[18] The

[17] Of course this does not exclude the presence of ornamention in humans, or the presence in animals of practices termed cultural by some researchers (Richerson et al., 1996).

[18] The sexual selectionist perspective is an excellent tool to explain not only gender differences in a particular trait – for example a stronger male propensity to engage in the behaviour of

cultural courtship model does not state that female cultural production should be absent, but that it will be exercised in a less public manner, most often following the establishment of a relationship in order to maintain the pairbond. In addition, while cultural production equally indicates desirable qualities such as creativity and overall fitness in women, public advertisement during mate choice could comprise risks in the form of harassment by males, also explaining its less outspoken appearance. While creativity is thought to be only moderately heritable (Davies, 2012), correlated capacities such as general intelligence are (Miller, 2001a), as might other properties such as manual skill, suggesting that female offspring of highly talented males may possess a similar array of artistic abilities. Its proposed relative absence in display contexts therefore doesn't necessarily imply the overall absence of the relevant talents and skills in females.

The variety of ways in which creative intelligence manifests itself in circumstances where it appears to influence the reproductive opportunities of those involved, suggests that the hypothesis desribed does not only apply to the arts in particular, but also to a broader set of behavioural practices and cognitive mechanisms that can all be regarded as mental fitness indicators (Klasios, 2013; Miller, 2000b). Very similar to the above described concept of fitness indicators in good genes sexual selection theory, a mental fitness indicator is a behavioural or psychological trait that is indicative of an organism's overall underlying fitness. Like art, features such as humour, creative storytelling or scientific innovation are also good candidates for being mental fitness indicators (Greengross & Miller, 2011; Kanazawa, 2000; Miller, 2001a). The idea that different mental features evolved as fitness indicators from a sexual selectionist perspective, can also account for some striking palaeoanthropological and palaeoarcheological patterns. Among these is the apparent time lag between the brain increase of our ancestors from the ca. 400 cm^3 characteristic of Australopithecus afarensis - better known as Lucy - and the 550-650 cm^3 of Homo habilis as the earliest members of the genus Homo, to ca. 900 cm^3 in 1.8 tot 1.3 million-year-old Homo ergaster, eventually reaching 1600 cm^3 in Homo neanderthalensis, and 1400 cm^3 in modern Homo sapiens. As these

making art – but also individual differences in its manifestation. According to Miller, sexual selection amplifies these differences so as to allow them to be judged within a mate choice context, as fitness indicators of an organism: "For art to qualify as an evolved human adaptation, not everyone has to produce art, and not everyone has to show the same artistic ability. On the contrary, if artistic ability were uniform and universal, our ancestors could not have used it as a criterion for picking sexual partners." (2001a, p. 14).

developments took place in relatively short timeframes and remained constant for longer periods, this might be due to sexual rather than natural selection, which would have created a much more gradual, steady pattern of volume increase whenever beneficial traits arose (Miller, 2001a). Another striking pattern, perhaps linked to the dynamics of sexual selection, is the advent of apparently sudden instances of great cultural and technological innovation such as composite tool use, agriculture, and civilization, alternated with long periods of technological stasis, such as in the case of the Acheulean handaxe (Miller, 2001a). If our large brain's function was in the reproductive realm, i.e. if it can be explained through sexual selection, it becomes unnecessary to develop paradoxical ideas about pressures through natural selection that clearly did not result in the contemporaneous appearance of survival benefits (2001a).

Of the major explanatory hypotheses dealing with the evolutionary origins of visual art, the aesthetic fitness indicator hypothesis has received the largest amount of empirical support. Aside from the aforementioned non-human animal observations that suggest analogues with phenotypic features such as the male bowerbird's bower and the male peacock's tail, experimental studies with human subjects yielded similar insights. Haselton and Miller (2006) found that women prefer creative men - hypothesized to be a sexually selected fitness indicator - for short term mating at peak fertility. This effect was not found for long-term mating, nor did other fitness indicators such as wealth contribute to short-term mate choices in an equal manner as creativity, suggesting that the latter might indeed be sexually selected for the purpose of identifying good genes. According to Clegg et al. (2011), male artists that were more professional and successful had more partners, a result not found for female artists. Griskevicius et al. (2006) assessed whether creative efforts were increased in subjects that were primed with mating goals. Men uplifted their creative output when primed with both long-term and short-term mating stimuli, whereas women displayed the same tendency only when primed with stimuli pertaining to long-term mating with an attractive male. Crocchiola (2014) found that the ratio of the second, or index, to the fourth, or ring finger was smaller among both male and female artists, which was predicted based on the finding that increased testosterone tends to result in smaller ratios. The fact that the same effect appears for both men and women contradicts the assumption that male bias measured in patterns of cultural demography (e.g. Miller, 1999) might be merely due to social, historical and cultural circumstances favouring artistic production among males (e.g. Mithen, 2005).

1.4.3. The ancestress hypothesis

Among the critiques uttered against the aesthetic fitness indicator hypothesis is the crossculturally recurring observation that much art is apparently not produced or aesthetically perceived and judged within a mating context (e.g. Coe, 2003). According to such comments, the emphasis on male engagement in the arts should perhaps be reconsidered in the light of the fact that art is also commonly created by women, and that the contexts where artmaking takes place are often of a collective, traditional or ritual nature, rather than individual, competitive, and aimed at courtship. Partly for this reason, Coe (2003) developed the ancestress hypothesis. As is evident from its name, the main point of departure will be the role of females in general, and maternal care in particular, in human evolution. Its disciplinary perspective is strongly ethological: visual art is seen as a behaviour, with social effects that can significantly influence the differential reproductive success of those engaged in it.

This hypothesis describes art as a crucial factor in establishing and maintaining large-scale cooperation. Cooperation and altruism towards conspecifics comprise one of the biggest riddles for evolutionary theorists of human behaviour.[19] If the basic unit of natural selection is the gene, it makes little sense that an individual would display behaviour that might disadvantage the transmission of its own genetic material due to the often significant costs associated with cooperative action, while at the same time benefitting the proliferation of the genes of a beneficiary, who is theoretically always a competitor in achieving reproductive success and overall fitness. Yet cooperation and altruism are widespread across and within human populations, so it is unlikely that such behavioural tendencies merely carry large costs for the individuals displaying them. Several theories have been proposed to solve this paradox (see West et al., 2007a, 2007b for reviews).

[19] The terms cooperation and altruistic action are used interchangeably here, although some would argue that cooperation is the term used for behaviours that are beneficial for the recipient and are evolutionarily maintained for this reason, whereas altruism should only be applied in the case of cooperative acts that entail costs, and no benefits for the donor. As is evident from the following examples of solutions to the paradox of cooperation, such distinctions between costs and benefits for donors and recipients are however not easily made.

One major evolutionary explanation of cooperation - aside from being an important addition to Darwinian evolutionary biology - is inclusive fitness theory. [20] Developed by the evolutionary biologist William D. Hamilton (1964), it proposes that reproductive fitness does not merely correspond to the number of viable and reproducing offspring - or the relative reproductive success of an organism in comparison with others - but rather to the transmission of an organism's genetic material in various ways beyond immediate reproduction by the organism itself. While the increase of one's own survival and reproductive success is referred to as direct fitness benefits, indirect fitness benefits apply when one's own genes are indirectly transmitted. This is particularly salient in the case of cooperation with genetic relatives, and has been quantified in Hamilton's rule. This rule proposes that a behaviour will be favoured by selection if $r * b - c > 0$, where c refers to the fitness cost for the donor in a cooperative interaction, b to the benefits for the recipient, and r to the coefficient of genetic relatedness.[21] In other words, a behaviour such as engaging in an altruist act will be maintained by selection if the benefits for the recipient, multiplied by the degree of genetic relatedness, minus the cost for the donor, still yield a net positive outcome for this donor in terms of the transmission of genetic material shared with the beneficiary. Evidently, the chances of this happening are higher when the costs for the donor are lower, and when the degree of genetic relatedness between the donor and recipient is higher, in turn making the benefits for the latter also higher. In order to allow for recognizing kin, humans, but other species as well, have evolved a variety of kin discriminatory mechanisms (West et al., 2007b).

While inclusive fitness theory investigates the ultimate reasons why individuals who share genes, notably kin, cooperate with each other, much cooperative and altruistic action takes place among non-related individuals. Here, the explanation cannot be that an organism helps a close relative in order to pass on shared genetic information.[22] Even more so, cooperation with unrelated individuals can bear significant costs to the altruist, which has led some researchers to describe

[20] Inclusive fitness theory is commonly linked to the concept of kin selection, or the "process by which traits are favoured because of their beneficial effects on the fitness of relatives." (West et al., 2007)
[21] The average percentage of genetic relatedness would be 50%, for example, between a parent and its offspring, 50% between two full siblings, and 25% between nephews or nieces.
[22] Except in instances where there is indeed a significant portion of genetic similarity between donor and beneficiary, in which case cooperation could persist despite the absence of actual relatedness.

cooperation among non-kin as paradoxical in evolutionary terms - it is implied then that natural selection would have selected against behaviour that comes with an advantage for others, but has disadvantages for one's own gene propagation. The main explanatory framework for such cases of cooperation is the theory of reciprocal altruism, developed by Trivers (1971). It explains how individuals can benefit from their own altruistic act if such acts are embedded in cooperative sequences, for example if cooperation takes place between members of the same social group. The principle of reciprocity implies that even if an individual incurs costs associated with a cooperative act directed at a non-related individual, these will theoretically be compensated by cooperative acts by the beneficiary, which should in return be aimed at the original donor. Clearly this type of cooperation involves risks, as one cannot always be sure that the original recipient will eventually reciprocate. As a consequence, reciprocal altruism is more likely to occur if the costs of the primary cooperative act are relatively inexpensive, if the cooperative return can be expected in a very short timespan, or if enforcement mechanisms are in place, such as punishment of defectors, or reputation building as a third-party monitoring system (Axelrod & Hamilton, 1981; Boyd & Richerson, 1992; Boyd et al., 2003; Fehr et al., 2002; Fehr & Gächter, 2002; Nowak & Sigmund, 2005). The maintenance of cooperation, often in large-scale societies where inclusive fitness theory does not suffice and where the regulatory mechanisms of reciprocal altruism would also suffer under large group size and increasing anonymity, has also been linked to the emergence of religion with its own apparatus of moral norms and supernatural punishment (Watts et al., 2015), or as Coe argues, to the origins of art.

A third major explanatory framework for the evolution of cooperation is cultural group selection. Developed by Boyd, Richerson and colleagues, it regards cooperation as developing at multiple levels. While individual and gene-based mechanisms such as inclusive fitness and reciprocal altruism do account for a lot of the cooperative acts observed among conspecifics, they might not be fully adequate to account for large-scale cooperation in groups that often consist of many non-related individuals. The level of groups had been invoked before to account for the emergence of altruism and cooperation. Wynne-Edwards (1962) originally proposed that group selection could occur when a group consisting of altruistic individuals outcompeted a group of selfish individuals. Because the first would be more inclined to cooperate in contexts such as hunting or warfare, the members would be more likely to survive, perpetuating the genes underlying altruistic behaviour. The main flaw in this proposal is that a group, even if predominantly altruistic, could be invaded by selfish cheaters who would display behaviour in their own genes' interest, eventually and after multiple generations eliminating the genetic basis for altruism (Maynard Smith, 1964; Williams, 1966). Recently, group selectionist ideas have been reinvigorated in variants such as multilevel selection theory (e.g. Sober & Wilson, 1999; Wilson, 1975) and cultural group selection theory (e.g. Richerson & Boyd, 1998; Soltis et al., 1995). The latter in particular is an interesting case for the evolution of both art and cooperation. Cultural group selection proposes that groups are defined in cultural or symbolic terms, also including a belief system that will promote empathy towards others, and ultimately altruistic acts aimed at ingroup members. Evidently, a major condition for this to occur is that the groups involved are clearly delineated - one needs to be able to identify ingroup members one should cooperate with, as well as outgroups members to be treated differently - and that they are stable - the composition of a group should not shift so often that its boundaries become unclear to the members. To remedy this, Richerson and Boyd propose that a variety of symbolic markers evolved or were co-opted, such as body decoration, speech dialects, rituals, and "elaborately rationalized ideologies." (Richerson & Boyd, 1998, p. 86) Such ideologies or belief systems might be the mechanism according to which cooperation is established and maintained. Among the symbolic markers that function as group boundaries may be a variety of art forms, such as body ornamentation or visual art, but also music and dance (1998).[23]

In her proposal for an ancestress hypothesis of visual art's origins, Coe discusses the above theories of the evolution of cooperation, and points out elements where these existing theories appear unsufficient (Aiken & Coe, 2004; Coe, 2003). For example, while Richerson and Boyd develop cultural group selection as a perspective that supposedly accounts for cooperation within large groups of non-related individuals, an important condition for this to occur would be that such groups are stable and clearly defined. Coe's analysis, on the contrary, suggests that the clan-type structure she describes as characteristic of ancestral societies would have been a lot more volatile in structure, with compositions often changing due to marriage transfers. As this conflicts with one of the basic premises of cultural group selection, it appears that other explanations would be necessary, at least in a complementary way. Coe offers the proposition that art may have played an important role in the establishment of human cooperative bonds. Specifically, she

[23] The ideas of Richerson and Boyd on aesthetic displays and symbolic markers are discussed within the framework of gene-culture co-evolution in the last hypothesis in this overview, which is the indirect bias hypothesis.

argues that art evolved to motivate cooperation among descendants from a common maternal ancestor. This idea is framed not only within cooperation research, but also within research on parental investment in offspring.

Human reproduction is generally characterized by having few offspring, and making large investments in each single offspring. By contrast, many animal species have larger numbers of offspring, and invest relatively little in each single one. Depending on environmental circumstances, both of these strategies can be successful. Larger investment in fewer young will increase the likelihood that most or all of them survive to reproductive age, whereas little investment, but a greater number of young, will likely ensure that despite losses due to limited care, a sufficient amount of young will still continue to live on and reproduce themselves, so as to perpetuate genetic material. The first is referred to as a k-strategy, and is typical for predictable, relatively stable environments where increased investment in a few offspring is likely to pay off in terms of the offspring's survival. The second is an r-strategy, and is usually practised in unstable environments where offspring is less likely to survive, which may select for increased reproductive quantity behaviour, rather than extensive investment (MacArthur & Wilson, 1967; Pianka, 1970). In the case of humans, the fact that infants and young children require extensive investment over several years has created selection pressures not only for maternal care and pairbonding, but also allomothering, understood as contributing to a child's care by women that are not the child's biological mother, but are often genetically related, such as grandmothers and aunts (Hrdy, 1999, 2009). According to Coe, the original emphasis on maternal and allomaternal care produced an "ancestress strategy." (2003, p. 3) She defines the concept of an ancestress as "a dynast; she is a woman who lived and reproduced and left a lineage of descendants influenced by her strategies." (2003, p. 3) Such a strategy is not only aimed at personal reproductive success, but is mostly focussed on the long term, as it should predominantly ensure the survival and reproductive opportunities of immediate offspring and their descendants over many generations. As time proceeds, genetic relatedness between these descendants may diminish, but this is not of crucial importance to the ancestress hypothesis, which assumes that a sense of relatedness to others should only be perceived as common descent of an ancestress, rather than being determined by close genetic relatedness. Individuals' sense of belonging to the same dynasty should then ensure the establishment and maintenance of altruistic acts and cooperative bonds among them.

Coe argues that visual art evolved as an adaptation to ensure these effects. Art's proximate aim "was to identify individuals who shared descent from a common ancestor and to encourage cooperative, unselfish behavior among all individuals so identified." (2003, p. 3) Its eventual evolutionary or ultimate function was to create "an environment in which large numbers of individuals who shared common ancestry, codescendants, identified themselves and cooperated as close kin (although many were *not* close kin) and thus were not threats to costly, vulnerable human offspring but were their protectors, providers, and teachers." (2003, p. 3-4, original italics) Even more generally, the ancestress hypothesis can be formulated as the proposal that "(...) in the ancestral past, art behaviors, such as making music, painting pictures, fashioning hairstyles, and decorating the body, evolved as a means of influencing behavior, more specifically as an important way of encouraging or promoting cooperative behavior. Art accomplished this by evoking emotions in order to attract attention to messages about social behavior regarded as appropriate and to bond individuals to work together toward a common goal (e.g. childcare)." (Aiken & Coe, 2004, p. 7) In other words, maternal kinship and descent strategies could create large networks of codescendants, which over the course of time could turn into tribes, clans, or other cohabitation systems. Cultural transmission of group identification mechanisms can in the long term result in the establishment of traditions, which is the context deemed crucial by Coe for understanding the evolution of art. Specifically, the most useful kinds of art are those that identify individuals and their group membership along a maternal lineage, such as body adornment with ochre, jewellery and hairstyles. Adding elements that make visible the resemblance of children to their father extends the original maternal kin network to include the network of fathers, thereby extending the overall cooperative system all individuals will eventually benefit from taking part in. If this is indeed the actual context of art's evolution, Coe proposes to regard it as a "parental strategy," persisting as a "dynastic strategy" (Aiken & Coe, 2004, p. 7), rather than the sexual strategy endorsed in the aesthetic fitness indicator hypothesis.

In addition, visual art can also be imbued with specific ancestral elements. Examples of this are funeral relics for ancestors, depictions of ancestral individuals, objects linked to ancestral traditions, religious art depicting metaphorical ancestors, and patriotic imagery (Coe, 2003). Such art can both be used to ascertain the boundaries of a codescendants network, and to delineate clearly who doesn't belong to it. As such, the ancestress hypothesis predicts both an ingroup and outgroup function of art. Aside from this primary function of recognizing codescendants, the hypothesis also predicts increased cooperation. One notable way of achieving this, is to integrate the arts into ritual practice, providing an medium for collective action where individual interest and competition are mediated in favour of altruistic and cooperative behaviour. Recently, Coe and colleagues argued that religious art might be particularly efficient in achieving such goals (Palmer et al., 2013). This is because some cultural variants of religious imagery, such as images of Christian saints, are often deeply saturated with concepts of suffering, sacrifice, kindness and compassion. The authors argue that witnessing such images creates a feeling of moral elevation, which they define as "the long observed human tendency to respond to witnessing acts, stories, or images of altruism and sacrifice with altruistic acts of their own." (2013, p. 108) They designate moral elevation as a psychological adaptation evolved through natural selection to enable ancestors to influence their descendants' altruistic and cooperative behaviour.

1.4.4. The simulation hypothesis

The simulation hypothesis theoretically applies to all kinds of art that can contain fictional components, but is extensively developed with regard to fictional storytelling (Boyd, 2009; Carroll, 1995, 2004, 2005, 2011; Dutton, 2009; Gottschall, 2012; Sugiyama, 2005), and only to a limited extent to visual art. Nevertheless, some general insights are relevant for understanding visual art. In this dissertation, the simulation hypothesis is used as an overarching term, meant to encompass a variety of approaches that regard art as an instructive device for the development of cognitive and social skills (see also e.g. Davies, 2012). None of the authors gathered under this thematic focus on art directly employ this term for their hypothesis, but simulation is the recurring feature in a variety of ideas. It generally implies that stories, or according to some (Boyd, 2009; Carroll, 2005; Tooby & Cosmides, 2001), artworks in general, provide a medium where ordinary experiences are temporarily suspended in favour of entering a simulated world, where actions and emotions can be compared, considered, practised and anticipated, with the eventual possible outcome of extending one's behavioural and cognitive repertoire. It is commonly argued that, either through artworks in general or fictional stories in particular, this outcome might be so relevant that simulating through art can be regarded as an adaptive behaviour (e.g. Boyd, 2009; Carroll, 2011; Gottschall, 2012; Sugiyama, 2005, Tooby & Cosmides, 2001).

Tooby and Cosmides have provided one of the most fundamental, computational perspectives on art as mental simulation. At the same time, their view is most compatible with considering visual art in addition to the medium of storytelling. This is because their concept of fiction is not almost exclusively limited to stories, as is commonly done by scholars based in literary studies (e.g. Gottschall, 2012), but instead refers to "any representation intended to be understood as nonveridical, whether story, drama, film, painting, sculpture, and so on." (2001, p. 7) These representations in themselves should not necessarily consists of elements that could not exist in the real world, i.e. fictional elements in the sense that they deviate from what could occur in reality. Rather, the hypothesis refers to representations where the standard belief system that applies to real-world representations is temporarily suspended. Fictional representations, according to Tooby and Cosmides's terminology, are therefore those representations that *do not* occur in the real world, rather than those who *could not* occur. As such, the phenomenon of fiction is closely linked to pretend play, which tends to develop reliably in toddlers (Leslie, 1987). The principle cognitive mechanism involved in pretend play is the ability of decoupling: primary mental representations about the outside world are temporarily quarantined in order to protect them from modifications that take place during engagement in pretend play, or fictional worlds in general. Should such quarantining not take place, the children or adults involved would jeopardize their normal understanding of the outside world, which could have disadvantageous outcomes (Leslie, 1987, Cosmides and Tooby, 2000b).[24] The proposition that decoupling occurs is also supported by the apparent fact that fiction engages some cognitive systems, such as those involved in emotional experiences, but not others such as action systems, which prevents that those who read stories would act upon, for example, feelings of fear or sadness (Tooby & Cosmides, 2001).

According to Tooby and Cosmides, the apparent fact that engaging in pretend play and fiction is a human universal and is actively sought for by many who thoroughly enjoy immersing in imagined worlds, in combination with the vast complexity of the cognitive machinery involved, suggests that fiction may have been an adaptive feature of our ancestors' mental world. More specifically, evolution is thought to have endowed with neural rewards those actions and behaviours that can produce fitness-enhancing changes to the mind. This means that fiction contains an important operational component, and answers to the major adaptive problem of

[24] For a more extensive discussion of the computational foundations of fiction and pretend play, as proposed by Tooby and Cosmides, see Cosmides and Tooby (2000b).

having to organize the mind "physically and informationally over the course of the lifespan." (2001, p. 14) As such, engaging in fictional art can be seen as a developmental behaviour, aimed at ever more elaborating the cognitive machinery that is at its basis, and that will be of use in a variety of other, non-fictional circumstances. While domain-specific modules, as proposed in standard evolutionary psychology, have an important genetic basis, they are also heavily dependent for their manifestation on environmental input: "what is genetically specified in adaptations is an economic kernel of elements that guides the construction and initialization of the machinery through targeted interactions with specific structures, situations, or stimuli in the world (...)." (2001, p. 15) If fiction achieves this, it plays an important role in the workings of what Tooby and Cosmides refer to as "the internal world of mind and brain" (2001, p. 16).

Fiction can accomplish its mental organizational function through its characteristic non-veridical nature, containing bundles of representations that are not constrained by the current context or location: "these are the new worlds of the might-be-true, the true-over-there, the once-was-true, the what-others-believe-is-true, the true-only-if-I-did-that, the not-true-here, the what-they-want-me-to-believe-is-true, the will-someday-be-true, the certainly-is-not-true, the what-he-told-me, the seems-true-on-the-basis-of-these claims, and on and on." (2001, p. 20) This allowed our ancestors to move away from information that was merely locally, temporally or contextually true, and instead to acquire a new reservoir of representations that translated into increased behavioural choices, in turn allowing for the vast complexity of human existence (2001). This way, the practice of actions or the experience of emotions did not have to take place in real situations that might involve significant risks or dangers, or that did not provide enough informational feedback within the timeframe that the organism needed such feedback to make the cognitive mechanisms involved function effectively (2001). As a secondary consequence, the "simulated or imagined experience" (2001, p. 23) of fiction also enables foresight, planning and mental time travel, as well as increasing empathy with others. Of the different arts, stories might be particularly suitable to achieve this, as their narrative structure is closely aligned with how actual events from an individual's point of view would be stored in memory, to be retrieved for future use. Elements such as a temporal sequence of events, an agent causing such events, and a one-person perspective experiencing a variety of emotions are very similar to how actions unfold and are perceived in the real world (Sugiyama, 2005; Tooby & Cosmides, 2001).

Boyd also provides an account of art's evolution that could be placed in the simulation hypothesis category (2005, 2009). His concept of art is a broad one, and is described in various ways. One of his definitions outlines art as "the attempt to engage attention *by transforming objects and/or actions in order to appeal to species-wide cognitive preferences for the sake of the response this evokes*." (Boyd, 2005, p. 148, original italics) Later, he refers to the same subject as "cognitive play with pattern" (2009, p. 15), and to a work of art as "a playground for the mind." (2009, p. 15) Similar to Dissanayake and Coe, Boyd emphasizes that it is important to look at art as a behaviour, rather than, for example, merely a set of objects (2009, p. 85). His hypothesis is built upon a wide variety of insights from the evolutionary study of human behaviour, such as the evolution of cooperation, advanced intelligence and cognitive skills, and the functions of play. Before outlining the multiple functions Boyd attributes to art, it is important to sketch his use of terms like 'play' and 'pattern', as they turn out to be crucial for understanding his evolutionary account of art in general, and fiction in particular.

Play, or exploratory behaviour in general, was likely of paramount importance for human ancestors in situations where natural selection did not provide clear blueprints of how to act in specific situations. This is particularly salient in situations where decisions concerning alternative actions had to be made at short notice, or where such decisions were dependent upon adequately and quickly processing contextual information:

> "This applies particularly to the volatile sphere of social relations, and especially to the most urgent situations, flight and fight. Such behaviors can be fine-tuned by experience and the range of options extended by exploratory action. Creatures with stronger motivations to practice such behaviors and to explore new options in advance, in situations of low danger and adequate resources, will fare better than those without. The more pleasure that creatures have in play in safe contexts, the more they will happily expend energy in mastering skills needed in urgent or volatile situations, in attack, defense, and social competition and cooperation. (...) The more often and the more exuberantly animals play, the more they hone skills, widen repertoires, and sharpen sensitivities. Play therefore has evolved to be highly self-rewarding. Through the compulsiveness of play, animals incrementally alter muscle tone and neural wiring, strengthen and increase the processing speed of synaptic pathways, and improve their capacity and potential for performance in later, less forgiving circumstances." (2009, p. 92)

Play involves many features that are either shared with the arts, or that will be co-opted by the arts if they evolve in later stages of evolution, an argument not unlike Dissanayake's hypothesis on the behavioural complex of art, ritual and play (e.g. 1974, 1982, 1995). Contrary to Dissanayake, who focusses on the similarities in behaviour and psychophysiological outcomes involved in art and play, Boyd emphasizes the potential applicability of play in the evolution of cognition. In this regard, art as cognitive play "stimulates our brains more than does routine processing of the environment," (2009, p. 94), which makes it a supernormal stimulus.

Boyd's account points out that play often involves the assessment of environmental and contextual information, such as the behaviour of conspecifics, or events happening in the surrounding world that can have significant implications for how an organism should act. Adequately perceiving and processing such information is greatly helped by the presence of pattern, and by corresponding cognitive abilities to detect, decode, and act upon such patterns. Patterns, according to Boyd, create order in material things such as artefacts, but also immaterial media such as actions or thoughts. The human penchant for patterns, shared with a variety of other species, is thought to be beneficial for humans because it brings along the potential to quickly process a large and constant inflow of environmental information. The mere presence of patterns additionally suggests regularities in the surrounding environment, which could signal, for instance, occupation by other humans. Researchers have previously pointed out that humans, and by extension higher primates, are especially prone to have a preference for sophisticated patterns such as symmetrical and rhythmic displays (Boyd, 2009; Gazzaniga, 2008; Humphrey, 1973a). Art answers to our thirst for patterns in a variety of ways, in the creation and perception of movement, shapes and surfaces, sounds, and words, which is again reminiscent of Dissanayake's artification hypothesis. The arts, according to Boyd, fulfill two major functions:

> "First, it serves as a stimulus and training for a flexible mind, as play does for the body and physical behavior. The high concentrations of pattern that art delivers repeatedly engage and activate individual brains and over time alter their wiring to modify key human perceptual, cognitive, and expressive systems, especially in terms of sight, hearing, movement, and social cognition. All of art's other functions lead *from* this. Second, art becomes a social and individual system for engendering creativity, for producing options not confined by the here and now or the

> immediate and given. All other functions lead up *to* this." (2009, p. 86-87, original italics)

While the first of these is art's basic function, and the second the way art can ultimately be put to use, Boyd proposes that yet other functions are attached to this behaviour. Depending on the type of art, different benefits apply. Time-based arts such as music making and dancing establish coordination through the element of synchronization and the practice of movement. Visual arts can help in outlining social norms, whereas play and fiction canalize emotions, strengthen social insight, and promote prosocial behaviour and values in what tends to be an emotionally salient medium. Art additionally raises the status of individual artists, and it also joins forces with religion in order to support within-group cooperation (Boyd, 2009).

Finally, Carroll (2005) formulated a similar simulationist account of the evolution of narrative in particular, and the arts in general. 'Literature', 'narrative' and 'the arts' are often used interchangeably, including when statements are being made about their common adaptive function. As such, phrases such as "(...) the adapted mind produces literature and (...) literature reflects the structure and character of the adapted mind," (2005, p. 931) can be taken to refer to both the more narrow medium of narrative fiction, as well as to the arts in general. The main adaptive function of the arts is "to produce an emotionally and aesthetically saturated cognitive order," (2005, p. 938) intended to help structure the complex social and mental world of our ancestors. More specifically, art provides "the mind with subjectively weighted models of reality in such a way as to help organize the complex human motivational system. Art does not simply provide examples of appropriate behavior or adaptive information. It provides an emotionally saturated simulation of experience." (2005, p. 940) Engaging in narrative is guided by the mechanism of aesthetic distance: the medium of art enables us to experience a wide range of emotions while at the same time maintaining cognitive detachment. As a consequence of this, "by vicariously participating in the simulated life provided by these models, people improve their ability to understand and regulate their own behavior and to assess the behavior of other people." (2005, p. 940)

1.5. Byproduct views on visual art

1.5.1. The cheesecake hypothesis

Pinker (1997, 2007) has argued that the prevalence of adaptationist hypotheses on the origins of art may stem from an overall positive value attribution to making and aesthetically appreciating art, resulting in a strong willingness to demonstrate its presumed quintessential place in human nature and evolutionary history. Contrary to this view, he explains visual art as a byproduct of other, adaptive cognitive mechanisms, a hypothesis that has become widely known by its use of the cheesecake metaphor: "we enjoy strawberry cheesecake, but not because we evolved a taste for it. We evolved circuits that gave us trickles of enjoyment from the sweet taste of ripe fruit, the creamy feel of fats and oils from nuts and meat, and the coolness of fresh water. Cheesecake packs a sensual wallop unlike anything in the natural world because it is a brew of megadoses of agreeable stimuli which we concocted for the express purpose of pressing our pleasure buttons." (1997, p. 525)

The basic implication of this metaphor is that the human mind did not evolve for artmaking as such, similar to the fact that it did not evolve for the purpose of enjoying cheesecake. Instead, components of art, like components of cheesecake, are appreciated because they home in on elements of ordinary perception and cognition, this way resonating sensory and psychological processes that are involved in perceiving the surrounding world. In the same way as Boyd (2009) argued with regard to patterns that ease information processing, Pinker notes how an environment with fitness valence will emit "patterns of sounds, sights, smells, tastes, and feels that the senses are designed to register." (1997, p. 525) Art can be seen as a hyperstimulus, or a supernormal rush of such patterns that evidently activates the corresponding cognitive structures in a much stronger way. Of particular interest are neural reward circuits (Berridge, 2003). Throughout evolutionary history, elements in the environment that were beneficial for survival and reproductive purposes were endowed with favourable neural rewards following sensory perception by an individual, whereas elements that were potentially harmful resulted in neural and thus emotional responses that motivated the individual concerned to remove itself from the threat (Pinker, 1997; Thornhil, 2003). The experience of pleasure when making or perceiving art stems from the heightened activation of these circuits.

But what features of art elicit this response? In the case of figurative representations, it is possible that those elements that are preferred are precisely the signals of "adaptively valuable objects," (1997, p. 526) such as habitats that do not only appear to be safe, but that also look like resources are abundant, in addition to the potential for exploration. In addition, Pinker says, we enjoy looking at "fertile, healthy dates, mates, and babies," all of which would help an organism in achieving greater survival and reproductive success (Pinker 1997, p. 526).[25] Abstract patterns can equally help in achieving these goals, and are therefore also endowed with pleasurable experience upon perceiving them. Elements such as "zigzags, plaids, tweeds, polka dots, parallels, circles, squares, stars, spirals, and splashes of color" primarily signal elements such as regularity and predictability, and help the visual system in quickly scanning and decoding new environments (Pinker, 1997, p. 526). Prevalent in decorative practices around the world, they may be commonly integrated in art because of the equally pleasurable experience they elicit, similar to salient figurative representations. Straight lines and clear edges indicate solid objects or surfaces, repetition of pattern usually signals the outlines of a single surface, hard boundaries suggest that part of an object is hidden behind another one, and bilateral symmetry is characteristic of humans, animals, and many artefacts and plants (1997). Visual clarity does not only ease environmental information processing, it also relieves anxiety and uncertainty, which could be experienced in instances where the environment is fuzzy, blurred, dark or otherwise not easily overseeable. Finally, our enjoyment of the arts is not limited to sensory matters. Thematically, art also provides insight into the human condition, and does so in an emotionally salient way: "these tap into the timeless tragedies of our biological predicament: our mortality, our finite knowledge and wisdom, the differences among us, and our conflicts of interest with friends, neighbors, relatives, and lovers. All are topics of the sciences of human nature." (Pinker, 2002, p. 418)

In order to understand why a presumably non-functional trait such as making visual art managed to persist through evolutionary history, is it necessary to add another interpretative layer. Aside from perception and cognition and its purified operation in art, we need to take into account the psychology of status. This refers to the apparent finding that activities that can be considered as leisure and non-essential occupations in contemporary society, such as the arts but also philosophy, religion and humour, are commonly imbued with strong societal and status value, with those engaging in the abovementioned practices often achieving increased social status. As Pinker tellingly notes:

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[25] Aesthetic judgement of the surrounding environment and conspecifics will be discussed in more detail in the paragraphs on evolutionary aesthetics.

> "In a gathering of today's elite, it is perfectly acceptable to laugh that you barely passed Physics for Poets and Rocks for Jocks and have remained ignorant of science ever since, despite the obvious importance of scientific literacy to informed choices about personal health and public policy. But saying that you have never heard of James Joyce or that you tried listening to Mozart once but prefer Andrew Lloyd Webber is as shocking as blowing your nose on your sleeve or announcing that you employ children in your sweatshop, despite the obvious unimportance of your tastes in leasure-time activity to just about anything." (1997, p. 522-523)

Acknowledging that the psychology of status comprises a big part of our perception of and engagement in the arts, both in prehistoric as well as in contemporary society, opens up an important perspective for understanding art in evolutionary terms. If we understand that categorization of art based on elitist considerations is an innate feature of our evolved psychology rather than reflecting inherent properties of the art we discuss - although the two are of course not mutually exclusive - we can reduce the riddle we are trying to explain to its very essence: "what is it about the mind that lets people take pleasure in shapes and colors and sounds and jokes and stories and myths?" (1997, p. 522) To this end, Pinker argues, we should refrain from immediately turning to what might be termed 'high art' by some, and instead look at items in Western folk or popular culture, as well as the cultural products of non-western cultures that are often detached from large-scale institutions. Without considering the dynamics of status, we will be inclined to take our own western elitist art as reference examples, and we will be left with an account unsuitable for understanding art's natural origins: "It can never explain why music pleases the ear, because 'music' will be defined to encompass atonal jazz, chromatic compositions, and other intellectual exercises. It will never understand the bawdy laughs and convivial banter that are so important in people's lives because it will define humor as the arch wit of an Oscar Wilde." (1997, p. 522)

The idea that evolutionary interpretations of culture should first and foremost look at folk art as opposed to elitist art, is not unique to Pinker's writing. Authors such as Miller (2001a) and Davies (2012) have similarly underlined the importance of the former. In addition, an increasing body of research looks at various products of popular culture, and searches for ways in which these may be understood better from an evolutionary perspective, despite their often very recent emergence in the human cultural repertoire. Subjects as far apart as celebrity gossip, video games, culinary traditions, fashion, toys and news headlines have, in addition to other topics, all been assessed within this framework (Alexander, 2003; Davis &

McLeod, 2003; De Backer, 2012; Heywood & Garcia, 2010; Mendenhall et al., 2010; Sherman & Billing, 1999; for an overview and discussion, see Saad, 2012). A broad survey of themes in Western paintings - though these would again be mostly in the realm of elite aesthetics - revealed the prevalence of five themes that can be linked to evolutionary concerns. These are people, given that humans are a social species, landscapes, major events that often involve scenes of conflict, and daily events and still life paintings. Both of these are less clearly linked to survival and reproduction themes, although flowers and fruit, for example, can equally be interpreted as having been of interest to our ancestors (Fisher & Meredith, 2012a). An analysis of themes used by modern women painters revealed a bias towards representations of female alliances, family and children, and private as opposed to public life (Chang et al., 2012). Similar thematic, evolutionary analyses have been performed with romance novels as the subject matter (Cox & Fisher, 2009; Fisher & Cox, 2010; Fisher & Meredith, 2012b), as well as concerning modern pop songs, and television series such as Dallas (Fisher, 2012; Fisher & Candea, 2012; Hobbs & Gallup, 2011).

In sum, Pinker describes visual art as a byproduct of several existing adaptations, which are the quest to achieve high social status, the pleasure drawn from perceiving environmental elements that may confer fitness benefits, and the ability to create and modify artefacts towards a desired end (Pinker, 2002). These three adaptations have functions in themselves, which are subsequently co-opted in the creation of visual art. The byproduct trajectory essentially operates on a psychological level, i.e. artmaking develops by virtue of existing cognitive machinery, and is in itself characterized by psychological effects. In contrast to this, the sensory exploitation hypothesis seeks a byproduct account in the interaction between biology and culture.

1.5.2. The sensory exploitation hypothesis

In his sexual selectionist account of art's origins, Miller pointed out that for a process such as runaway selection to occur, the origin of the female preference sparking the fast development of male display traits does not necessarily have to be functionally specified. It can, for example, be a coincidental preference caused by a random mutation, which is in turn strenghtened by the positive feedback process characteristic of Fisherian runaway selection. According to Verpooten and Nelissen (2010, 2012), a good candidate for the original nudge of such a runaway process is to be found in the concept of sensory exploitation. Variously termed sensory drive, pre-existing bias and sensory trap in the literature, sensory exploitation involves the co-opted use of pre-existing perceptual biases within new contexts such as mating. These biases can be adaptively structured – for example a particular colour preference resulting from selection pressures associated with foraging – or merely coincidental features of the perceptual system of an organism. The first set can be called "adaptive sensory biases," whereas the second set is referred to as "hidden preferences." (2012, p. 202; Arnqvist,2006).

Visual art in general is seen as a signaling trait: "Thus, here we view 'artistic behavior' as producing and experiencing 'signals' (or a perceivable object emitting signals) with captivating meaning and/or form (design) to group members." (2012, p. 202) Similar to the aforementioned sexual selectionist interpretation of art, the concept of reproductive success plays a role, only here it revolves around the signals themselves instead of the individuals who produce them. In non-human animals, sensory exploitation may be at least partly responsible for some cases where male ornamental traits evolve to attract females' attention, exploiting the latter's pre-existing sensory biases.[26] In humans, a similar process may be at work in the case of visual art, although the sensory exploitation application to artistic behaviour does not necessarily predict that we should still find a predominantly male representation among artists. As such, it differs from Miller (1999, 2001a), whose good genes selection perspective is closely intertwined with a strong gender bias in artistic production.

The sensory exploitation hypothesis of visual art proposes that processes such as selection for indirect benefits, as argued by Miller and others, are not necessary and that a more parsimonious explanation is to be found is the simple mechanism of sensory exploitation itself. Visual art may be little more than a non-functional cultural artefact, spontaneously arisen from the workings of the perceptual system. Hidden preferences – incidental consequences of the structure of this perceptual system – may have resulted in abstract art,[27] whereas adaptive sensory bias – those corresponding to survival and reproduction-relevant issues – may be responsible for the development of iconic art (Verpooten & Nelissen, 2010). In the case of iconic or figurative representations, some types of content are particularly clear examples of

[26] But see Borgia & Keagy, 2006, for an opposite view.
[27] This part of the argument is fairly similar to Pinker's hypothesis that abstract patterns in particular are hyperstimuli, eliciting neural rewards through a non-functional link between original fitness-relevant stimuli and their replication in the context of art (1997).

how this might work. The recurrence of facial patterns in world art for example, such as portraits and caricatures, may be due to the exploitation of adaptive sensory biases for facial recognition. Similarly, the cross-cultural and transhistorical prevalence of animals in art is potentially the result of equally adaptive biases for adequately perceiving and detecting animal presence in the surrounding environment (Verpooten & Nelissen, 2012).

Still, one is left wondering why iconic representations arose relatively late in human evolution. If sensory exploitation is a phylogenetically ancient mechanism that can spontaneously result in artistic outcomes, why would figurative representations be evolutionarily lagging behind on abstract patterns? The key to understanding this gap might lie in combining a sensory exploitation perspective with demographic factors characteristic of the timeframe of the Middle to Upper Palaeolithic transition. Demographic changes around the advent of the Upper Palaeolithic, in particular population increase, may have positively affected the sociocultural transmission of technical knowledge and cultural innovation, leading to both the development of skills that were highly adaptive in other contexts such as tool making, and skills that were specific to the production of visual art, such as drawing abilities. As such, the sensory exploitation hypothesis can perhaps provide an explanation for the late emergence of iconic art by regarding it as a side effect of other functional capacities, as well as of pre-existing psychosensory biases (Verpooten & Nelissen 2010).

This idea is reminiscent of Sperber's cultural attractors hypothesis, which proposes that the mind consists of domain-specific modules, evolved for functional purposes, that can later be co-opted in a cultural way (Sperber, 1994; Sperber & Hirschfeld, 2004). Specifically, the hypothesis proposes that cultural representations will be constrained by our evolved cognition: we are likely to see those representations appear in art that can be clearly linked to adaptive cognitive features, such as the ability for face recognition. While processing real faces is this module's 'proper domain' - the need for perceiving and decoding faces was a significant adaptive problem for our ancestors - the module additionally acquires an 'actual domain' through culture (Sperber & Hirschfeld, 2004). Cultural products linked to face recognition, such as portraits, caricatures and masks, are prevalent around the world and often exaggerate features that would be sought for if the module operated in its functional mode, such as striking eyes, which may in turn help explain the vast popularity of such representations.

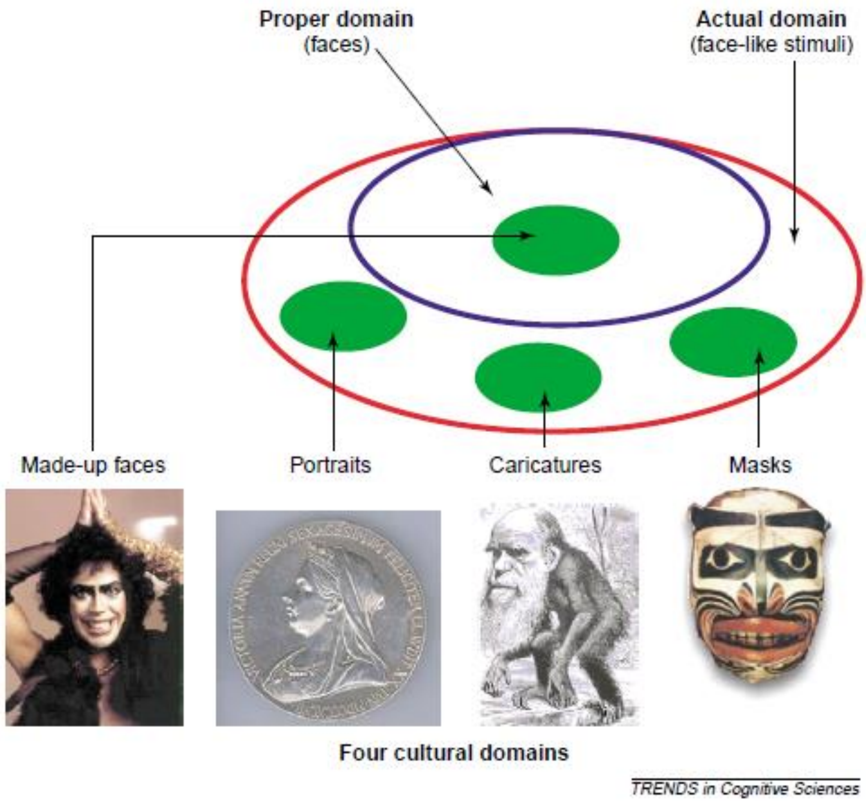

Fig. 30. The proper and actual domain of the face recognition module.

This byproduct account based on sensory exploitation is different in its outlook on the ultimate outcome of artmaking as a non-functional trait: "(...) it should be emphasized that referring to the arts by such terms as "sensory cheesecake" (...) somewhat trivializes their importance, as this implies the behavior simply diverged from, or existed alongside, more pressing evolutionary concerns." (Hodgson & Verpooten, 2015, p. 79) According to the sensory exploitation hypothesis, the arts are perhaps best regarded as a *necessary* outcome of how the brain functions, in combination with the forces of cultural transmission. The element of necessity then refers to the perceptual and cognitive biases arising from ordinary cognition, which give rise, influenced by cultural factors, to behaviours such as artmaking. Behaviours emerging via this route can be neutral or even maladaptive (Hodgson & Verpooten, 2015), although constraints by natural selection should evidently apply. The sensory exploitation hypothesis does not require, but does not exclude either, that secondary beneficial effects may have arisen throughout evolutionary history, which would qualify art as an exaptation.

1.6. Gene-culture co-evolution, cultural adaptation and exaptation

1.6.1. The indirect bias hypothesis

Several of the already mentioned hypotheses on art's origins contain elements of co-evolution. This concept refers to the presence of an interactive evolutionary process where different selective forces influence each other, to the extent that a positive feedback loop is created. For example, Miller's sexual selectionist hypothesis contains co-evolutionary elements through the assertion that the behaviour of making art and the relevant aesthetic preferences for its evaluation must have evolved jointly, so as to allow the establishment of artmaking as a mating signal. Similarly, the sensory exploitation hypothesis can be said to contain co-evolutionary elements in its joint treatment of sensory biases and their reflection in abstract and figurative features of art. In addition, co-evolutionary scenarios have been proposed for various behaviours that contributed to each other's persistence in human evolutionary history. Among those is Dissanayake's proposal of art and ritual emerging and developing in a mutually strengthening feedback loop, until the former's detachment into a separate behavioural trait (e.g. 1979, 2009). The increase of human brain size has also often been framed within co-evolutionary processes that emphasize the role of social intelligence and deception (Byrne & Whiten, 1988; Whiten & Byrne, 1997), social bonding (Dunbar, 1995, 2009; Humphrey, 1976), and complex culture (Lumsden & Wilson, 1981) in driving encephalization, or the evolution of brain size over time.[28]

Co-evolution can also occur at a more fundamental, explanatory level. In this sense, a particular hypothesis makes use of co-evolutionary thinking, not immediately to account for a co-evolution of art and the mind, for example, or ritual practice and cohesion within human groups, but rather with regard to evolutionary forces in themselves. Extensively developed and discussed by Boyd and Richerson, the approach of gene-culture co-evolution proposes that culture is not merely an outcome of genetically based behavioural evolution, but a driving force in itself, possessing the potential to alter the trajectories of biological evolution in ways that warrant its recognition as an independent evolutionary force. More specifically, such co-evolutionary pathways recognize the importance of cultural inheritance as an additional system to genetic inheritance, which has led to sometimes dubbing gene-culture co-evolution "dual inheritance theory." (Boyd & Richerson, 1985) The

[28] Alternatively, the term 'encephalization' can be used to refer to an animal's brain size in relation to its body mass.

differences between these inheritance systems and the role of cultural transmission in the establishment of phenotypic variation, are clarified by Boyd and Richerson through the use of schematic representations of evolution in acultural and cultural populations. The defining, distinguishing feature between both is evidently the presence or absence of culture, understood as "the transmission from one generation to the next, via teaching and imitation, of knowledge, values, and other factors that influence behavior." (1985, p. 2)

The basic tenets of natural selection are variation, inheritance and selection. Selection is traditionally stated to occur in individuals, and more specifically at the level of genes. This also applies to sexual selection. Whether it is regarded as a subtype of natural selection or as an independent evolutionary process (e.g. Miller, 2001a), it often operates in a similar way, although the traits at stake are notably located in the realm of reproductive competition and success, rather than immediately being linked to survival purposes. In either case, a particular phenotypic outcome is linked to an underlying genotype:

$$G_t \xrightarrow{Ontogeny} F_t$$

Fig. 31. Basic diagram of the relation between genotype and phenotype.

In the above diagram, G_t refers to the distribution of different genotypes within a population,[29] whereas F_t refers to the distribution of phenotypes within the same population. Ontogeny is here taken to mean the development of an individual until it reaches its mature form. As a consequence, different ontogenetic paths can result in the same genotype having different phenotypic outcomes. The present diagram thus involves the most simple rendition of evolution possible. Clearly, gene-environment interactions in ontogenetic development are not the sole influences on phenotypic outcome. The above diagram can thus be elaborated in the following way:

$$G_t \xrightarrow{Ontogeny} F_t \xrightarrow{Selection} F_t{}' \xrightarrow{Mating} G_{t+1}$$

Fig. 32. Diagram of evolution in a non-cultural population.

F_t' here refers to the distribution of phenotypes within the same population after the initial distribution F_t underwent selection based on competition over resources for

[29] "There could be, for example, 1 percent genotype 1, 4.3 percent genotype 2, 63 percent genotype 3, and so on, until the frequencies sum to 100 percent." (Boyd & Richerson, 1985, p. 5)

reproduction (Boyd & Richerson, 1985, p. 5). G_{t+1}, the genotypic distribution in the following generation, is achieved when the adult population engages in reproductive behaviour, or mating, which in turn brings along new evolutionary forces such as recombination of alleles.[30] While more advanced, the second diagram still applies to a population drawn from an acultural species, i.e. it still only takes into account the ways in which a genotype is modelled into a particular phenotype through an individual's ontogenetic development, the influence on the persistence of a particular phenotypic distribution through environmental selective pressures, and the reshuffling of genes through mating. In a cultural species, it is additionally important to recognize the element of cultural transmission. Transmission of cultural traits can happen through a variety of structures, which are seen as "patterns of socialization by which a given trait or a set of traits are transmitted in a given society." (1985, p. 2) Although such patterns can differ - cultural information can be transmitted by immediate biological parents, but also by other, biologically non-related models or 'cultural parents' within a population, or by generational peers - a constant feature is the fact that culturally acquired variation can be passed on from one generation to another. Because of the mechanism of social learning, cultural influences on behaviour do not die out with individual organisms, but can instead have population-level consequences (1985). The second diagram, which displayed a process of evolution in an acultural species, should therefore be adapted as follows:

$$
\begin{tikzcd}
{F_t}'_{-1} \arrow[rr, "\substack{Cultural\\ transmission}"] \arrow[dr, "Mating"'] & & F_t \arrow[r, "Selection"] & {F_t}' \arrow[rr, "\substack{Cultural\\ transmission}"] \arrow[dr, "Mating"'] & & {} \\
& G_t \arrow[ur, "Ontogeny"'] & & & G_{t+1} \arrow[ur] &
\end{tikzcd}
$$

Fig. 33. Diagram of evolution in a cultural species, including cultural transmission in addition to genetic inheritance.

[30] Evidently, the model of Boyd and Richerson involves theoretical diagrams that provide schematic representations of particular types of evolution, without implying that the different phases should be regarded as being neatly distinct. Ontogenetic development, for example, should not necessarily be regarded as 'finished' at a set point in an individual's life time - except in cases where the term is merely used to describe the developmental phase leading up to an organism's mature form - and nor should selection be limited to resource competition preceding mating alone.

This schematic view of evolution in a cultural species now includes the cultural transmission of phenotypic traits, in addition to genetic inheritance mechanisms at the basis of this same phenotype. This trajectory can of course repeat itself in an indefinite number of new generations. Cultural transmission that relies on social learning is thought to be one of the main features that make humans unique in comparison with other animals - even phylogenetically closely related species. The element of social learning enables an individual to quickly establish a behavioural repertoire that is not only based on the individual's own trial-and-error based learning, but also, and most importantly, on an ever increasing cultural pool shared by the entire population. This enables rapid cumulative cultural evolution, where the speed of innovation exponentially increases as the already available pool of cultural information becomes larger (e.g. Tomasello, 1999). Cumulative cultural evolution is probably a uniquely human phenomenon, contrary to cultural behaviour in itself, which is found among a limited number of other species. The most notable examples in this regard are certain non-human primates, and according to some, specific bird species (e.g. Aplin et al., 2015; Whiten et al., 1999). The ability to learn from others, i.e. social learning, rather than having to acquire knowledge and skills by means of trial and error learning, clearly entails a significant decrease in fitness costs, especially in stable environments where it is sensible to rely on the already available knowhow of cultural parents (Boyd & Richerson, 1985).

But how does cultural transmission occur? While analogies can be made between genetic and cultural inheritance - concepts such as transmission, adaptation, variation and inheritance can be equally applied to genes and culture - important differences are also present (Mesoudi, 2007; Mesoudi et al., 2004, 2006). Boyd and Richerson point out such differences as variable generation length in cultural transmission (the copying of variants is not automatically tied to the length of a biological generation involving genetic inheritance), multiple possible 'models' for copying such variants (as opposed to biological parents being the sole individuals to pass on genetic information), and the seemingly, but for culture not really Lamarckian phenomenon of inheriting acquired variants (at odds with the fact of biological evolution, in which a variant must have a genetic basis in order to be passed on) (1985).

In addition to these structural differences, cultural inheritance operates by its own set of evolutionary forces: "by 'forces' we mean causes of cultural change, the analogs of natural selection, mutation, drift, and so forth in the genetic system of inheritance." (1985, p. 2) Some of these forces of cultural evolution will indeed bear similarities to biological evolution. Both random variation and drift can be expressed genetically as well as culturally. *Random variation* in cultural transmission occurs, for example, when a particular variant is misremembered in a chain of communication, in which case it can also be termed an accidental variation. *Drift*, in turn, refers to the process where a chance variation can lead to significant frequency shifts in the maintenance or disappearance of a variant, analogous to genetic drift. In addition, the force of *guided variation* occurs when cultural variance is constrained, or guided, by relevant information extracted from the environment and the estimation of different behavioural responses, and how they may be suitable for meeting the challenges posed by this environment: "it is these guiding criteria that translate variation in the environment into a directional, often adaptive, change in phenotype, which then is culturally transmitted to subsequent generations." (Boyd & Richerson, 1985, p. 9).

Furthermore, cultural transmission very often occurs according to the force of *biased transmission*, which, in the most basic manner refers to the differential copying rate of some variations compared with others. Several bias types have been set out. If a variant is copied by means of *direct bias*, the decision to copy is made based on properties of the variant itself that are considered useful, pleasurable, or otherwise assessed positively. *Frequency-dependent bias* implies that a variant is adopted by cultural offspring because of its commonness or rarity among the different cultural parents the offspring witnesses, such as when a particular opinion shared by a majority in a population tends to be copied. Finally, *indirect bias* occurs when an individual takes on a cultural variant from another individual because of other, unrelated traits this individual possesses. For example, possessing wealth or prestige, traits that make a model particularly attractive, may result in other traits of such an individual being copied as well, even though they do not necessarily contribute to the original attractive traits (Boyd & Richerson, 1985). Recent research has mapped biases in cultural transmission according to a different and more specific structure (Henrich & McElreath, 2003).

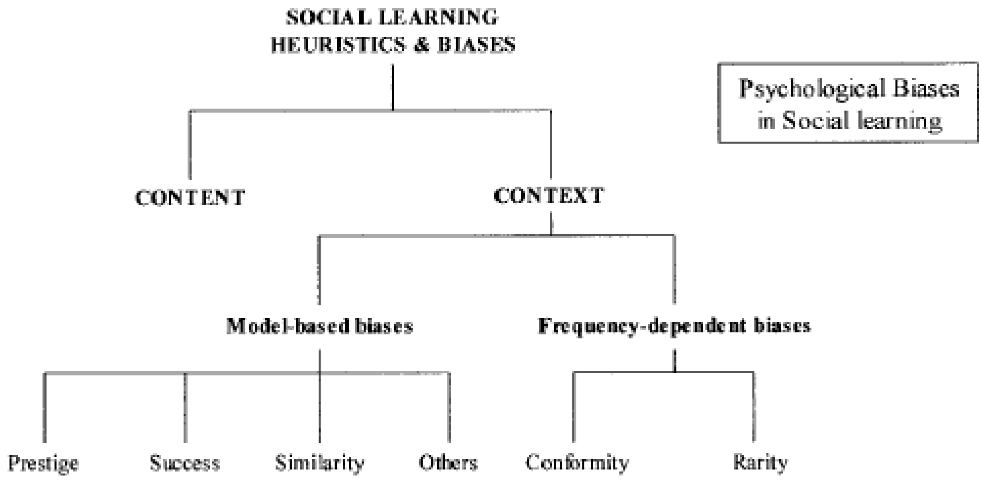

Fig. 34. Biases in social learning, primarily distinguishing content biases - based on information available in the variants to be copied - and context biases - based on the learning environment or context in which the variant is encountered.

In this schedule, direct biases corresponds to content biases, whereas indirect biases are rephrased as model-based biases. Addressing indirect biases as context biases clearly illustrates that in these cases, decisions to copy a trait, or a particular variant, are not immediately based on properties of the trait or variant in itself, but rather made in relation to contextual features such as the model possessing the trait or variant, its already steady presence, or instead its rarity in the imitator's population. Boyd and Richerson's frequency dependent biases are further specified as directed towards either the conformity or rarity of a trait or variant. Model-based biases, broadly corresponding to Boyd and Richerson's indirect bias, are further subdivided according to which property of a model determines an individual's choice to copy this model.

Within their proposal of the relevance of indirect bias in understanding the evolution of many behavioural and cultural phenomena, Boyd and Richerson elaborate this bias further by outlining three sets of traits. *Indicator traits* are those features of models that are perceived by imitators and assessed as being desirable to copy, such as number of children as an indicator of success - assuming that one wishes to emulate successful individuals within a population. *Indirectly biased traits* are those traits that are acquired as byproducts of indicator traits. If an imitator copies a model based on number of children as an indicator of success, and this model gains increasing popularity and is clearly established in the process of enculturation in a population, it becomes very likely that imitators will adopt a wide variety of other characteristics, even though such indirectly biased traits are very often unrelated to the originally imitated trait. Finally, *preference traits* refer to the preferred values of indicator traits, such as the precise number of children that is deemed desirable. While in some societies, built upon a particular set of cultural values and norms, large numbers of children can be preferred, the exact opposite can be seen as desirable in societies where such values and norms are structured differently.

Indirect bias, or model-based bias in Henrich and McElreath's model (2003), is particularly suitable for explaining the emergence, persistence and evolution of many cultural traits. The process Boyd and Richerson invoke for this, is a process of cultural runaway. Its basic structure is the same as the runaway process previously described for sexual selection. An arbitrary preference for a certain trait or variant can take off in the direction of either exaggeration or decrease, without the original preference having to be correlated with fitness benefits for the choosing organism. In cultural inheritance, the crucial components for runaway to occur are indicator traits, which affect how attractive an individual is considered to be as a model for copying, and preference traits, which determine the variant of the indicator trait that is found to be most attractive to an imitator. Starting from here, two different pathways can occur: the first is termed by Richerson et al. as the "stable fitness maximization, honest advertising" mode (1996, p. 252): "if the strength of indirect bias acting on the preference trait is weak compared to the combined adaptive forces of selection and direct bias on the indicator trait, then the preference trait will eventually reach a stable equilibrum at the value that maximizes genetic fitness." (1996, p. 252) This means that natural selection may create sufficient pressure for individuals to choose a certain variant - a preference trait - if it is closely correlated with genetic fitness. Alternatively, a runaway, or "costly exaggerated advertising" mode can happen (1996, p. 252): "if the strength of indirect bias acting on the preference character is strong compared to the combined adaptive forces of selection and direct bias acting on the indicator character, then according to the model, the values of both the indicator trait and the preference trait will run away, becoming indefinitely larger or smaller depending on the initial condition." (1996, p. 252) In sum, if natural selection does not act strongly upon a certain preference, i.e. if direct bias in copying does not appear to be significant because of clear beneficial properties of the trait being copied, a cultural runaway process can occur. This does not mean that natural selection does not act at all, or that the evolution of a cultural trait or variant and an associated preference will be entirely unconstrained. Rather, it is implied that the runaway process is considerably unstable and can work towards outcomes that do not coincide with optimal levels of genetic fitness. In other words, a cultural runaway process can explain why certain traits or variants are copied even if they are maladaptive. Like sexual selection, though, a cultural runaway process can have a functional characteristic at its core, in which case the process may include elements of Zahavi's handicap principle: ever more exaggeration of cultural traits and variants is then equally an indicator of the model's overall fitness (Richerson et al., 1996).

Boyd and Richerson's indirect bias hypothesis is not specifically aimed at explaining the origins of art. Instead, it focuses on the emergence of symbolic traits and their use as ethnic markers. Some markers are "arbitrary symbolic," such as dress style, rituals, cuisine, dialects and accents, etc., whereas others are "more directly functional," such as moral values (Boyd & Richerson, 1987). Ethnic markers entail two major benefits: if they are characteristic of a certain group, an individual that is part of this group can use markers to identify those models that would be best to copy, as they will likely possess behavioural traits and variants that the imitator will benefit from because of the shared environment. Second, those recognizable as ingroup members by their markers should also be chosen for cooperative and otherwise social interactions, as they will likely share the imitator's value system (Richerson & Boyd, 2005). That art can function as an ethnic markers has been demonstrated empirically, independent of a gene-culture co-evolutionary approach. In a classic experiment, Tajfel et al. (1971) found that merely expressing a preference for paintings of Klee or Kandinsky was sufficient to establish an ingroup-outgroup effect among the participants of the experiment, with increased cooperation observed towards those thought to share the same artistic preference.

Although not explicitely focussed on art but rather on stylistic and symbolic traits of group membership, this framework can shed light on the apparent phenomenon of an Upper Palaeolithic symbolic explosion around 40.000 BP (e.g. Mithen, 1996a). The marked increase in population densities over the course of the early Upper Palaeolithic may have produced the conditions under which ethnic markers arose and proliferated (Richerson et al., 1996). De Smedt and De Cruz (2012) have applied very similar lines of thinking in a discussion of the geographical spread and regional variation - yet categorical resemblance - of Venus figurines during the Magdalenian cultural complex. According to them, this practice and its variance might have evolved in the wake of environmental changes that created pressure towards the establishment of larger-scale cooperative networks. Venus figurines, especially if they were worn as pendants, might then fulfill the exact function proposed for symbolic traits by Boyd and Richerson.

It is important to note that Boyd and Richerson do not explicitely make use of the concept of exaptation, although their model basically argues for the same principle: a trait or variant that is already in existence can acquire a new effect that might confer fitness benefits on an individual or a group. As symbolic traits could have originally arisen as mere non-functional outcomes of a cultural runaway process, this hypothesis can also be regarded as including byproduct elements. In the terminology of standard evolutionary analyses of human behaviour - undertaken by evolutionary psychologists and those in closely related paradigms - Boyd and Richerson's account then appears to correspond to an explanation as an exapted cultural byproduct. However, as gene-culture co-evolution explicitely distances itself from the standard evolutionary explanatory framework with its heavy emphasis on genetic inheritance, it might be more suitable to frame the hypothesis as such, rather than by means of the terminology of genetic inheritance-based approaches.

1.7. Archaeology's contribution to evolutionary thinking

Palaeolithic archaeologists attempt to clarify past human behaviour by studying its material traces, which are gathered in the presently available archaeological record (Barnard, 2012). An increasing number of researchers has therefore proposed to enrich archaeology with a variety of biologically based perspectives, such as neuroscience, cognitive science and evolutionary psychology. This has produced subfields such as neuroarchaeology, evolutionary or Darwinian archaeology, and cognitive archaeology. The present brief overview largely leaves aside findings from neuroarchaeology, in accordance with the general intended limitation of this dissertation not to include brain research as a main analytic perspective.[31] Instead, in order to sketch naturalistic approaches within archaeology with regard to art's origin, two notable authors should be mentioned. Mithen has comprehensively argued for the integration of evolutionary psychology in archaeology, developing a hypothesis of the evolution of modern cognition and complex culture that adopts insights from both of these perspectives. Hodgson, in turn, mainly draws from cognitive neuroscience in order to substantiate elaborate analyses of Middle and Upper Palaeolithic engravings and figurative representations. Neither of these

[31] But see, for example, Malafouris (2010, 2013) for a neuroarchaeological perspective.

authors makes claims as to any evolutionary functionality of art, i.e. they do not endorse arguments in favour of artmaking being an adaptive, exaptive or byproduct behaviour practised by human ancestors. As such, their work should perhaps not be regarded along the same lines as the abovementioned explanatory hypotheses, but the archaeological perspective is nonetheless a necessary addition to the debate, as it bridges evolutionary theory and the material culture it ultimately has as its subject matter.

1.7.1. Cognitive fluidity

According to Mithen, we stand the best chance at understanding the mind by joining forces from archaeology and psychology. Without a material record, evolutionary thinking about human cognition and behaviour is at risk of becoming a speculative endeavour. Without evolutionary psychology, in turn, material culture cannot be fully appropriated as to its relevance in the history of our species (Mithen, 1996a). Mithen has extended concepts such as modularity and functional specialization to a cognitive archaeological view of the mind, which is centered around the concept of cognitive fluidity. This concept proposes a model of cognitive evolution that outlines four major cognitive domains.[32] In addition to general intelligence, the modular thought to have been characteristic of the earliest human minds, these are social intelligence - responsible for understanding conspecifics' emotions, intents and actions - technological intelligence - at the basis of behaviours such as toolmaking - and natural intelligence - enabling the reliable processing of environmental elements such as animal tracks and migratory movements, or seasonal plant distribution. Around the time of the Upper Palaeolithic transition, a breakthrough between the domains took place, described as cognitive fluidity (1994, 1995, 1996a, 2000, 2001). This process probably did not take place in one brief episode, but is instead made up of several stages where the different modules became first partially, and then fully integrated. The precise reason and mechanism behind increasing levels of fluidity are unclear. Being primarily derived from patterns uncovered in the archaeological record, notably the apparent symbolic explosion attributed to the European Upper Palaeolithic, the cognitive fluidity hypothesis is predominantly inferred from this record, rather than being mainly empirically based in itself.

[32] Mindviews in terms of cognitive domains are not unique to Mithen, and have been endorsed by previously by, among others, Chomsky (1972) and Gardner (1983).

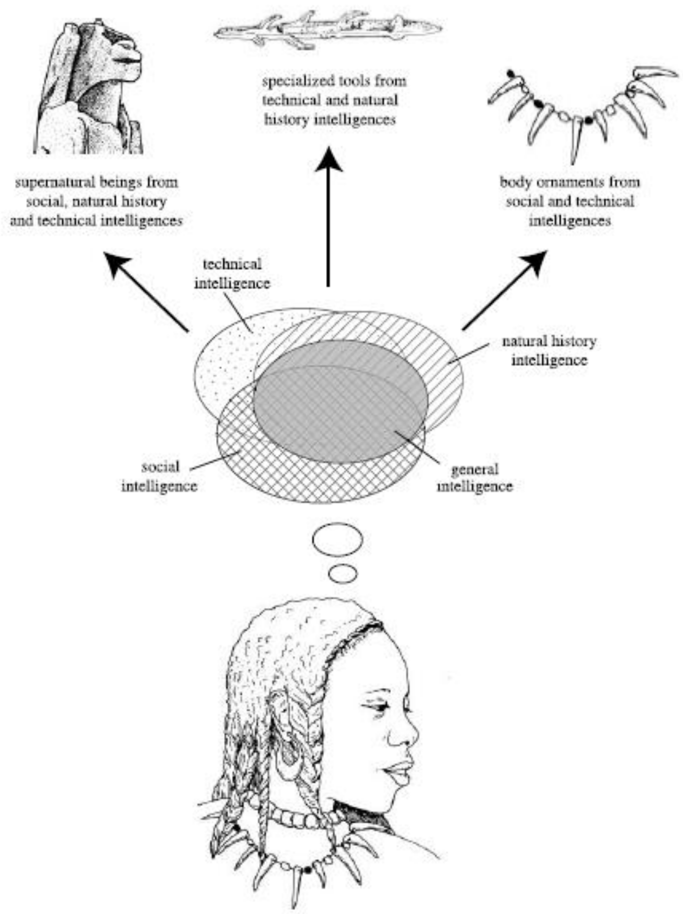

Fig. 35. Cognitive fluidity - the convergence of different intelligences by means of a mental breakthrough in the evolution of the human mind - resulting in new combinatory outcomes such as artistic representations, supernatural thinking, advanced tool use and personal ornamentation.

Symbolic thinking is key to the last phase of Mithen's model of cognitive fluidity, i.e. the proposed cultural explosion around 45.000 BP. It is not immediately clear, however, how symbols might have originated. As they are essentially characterized by shared meaning, their appearance seems difficult to fit in a group of previously unsymbolic individuals: "just as an individual within a modern human society is severely disadvantaged in social interaction if she/he cannot attribute meaning to visual image, so too would one be with this ability in an otherwise symbolically illiterate society." (Mithen, 1996b, p. 201) Although symbols are crucial in the social realm, their primary origin perhaps lies outside of this. According to Mithen, this origin might be the world of hunting and gathering within a natural environment. Natural signs are those visual properties of the environment that can potentially hold informational relevance, such as animal tracks being indicative of particular species, the age of the animals and their migratory patterns. Animal tracks might also be useful for acquiring additional information, for example, as to where vegetational or other resources, such as water, can be found (Mithen, 1988a, 1988b; 1996b). Because evolution normally operates on individual characteristics, such as a gene if genecentrism is endorsed, or a particular trait or variant, it is possible that the ability to recognize and decode natural signs originally evolved as a beneficial property of one individual, which would have increased his or her foraging or hunting success, which in turn could lead to more reproductive success (Mithen, 1996b). This might have happened already during the Middle Palaeolithic or the corresponding Middle Stone Age, and the elementary capacity of understanding natural signs was, according to Mithen, later co-opted in symbolic cognition.

While attributing meaning to these signs already implies a protosymbolic component,[33] full visual symbolism is achieved by integrating the capacity with three others. These are the making of visual marks or images, identifying a mark or image as belonging in a particular conceptual class or as the first member of a new class, and intentional communication as to the reference relationship between a symbol and a meaning displaced in time or space (Mithen, 1996a, 1996b). These three components might have evolved relatively early, with some being shared with non-human primates. Each component in itself can be connected to a specific cognitive domain that, according to Mithen, operated in relative isolation before the breakthrough at the dawn of the Upper Palaeolithic.

Making marks is closely correlated with technological intelligence. Tool manufacture has been reported to exist from as early as 2.6 million years ago as part of the Oldowan industrial complex, and is found in a variety of forms among species that often far precede the emergence of anatomically modern humans. The Neanderthal Mousterian industry was characterized by, among other things, the Levallois technique which requires sequential knapping and advanced planning by means of mental templates. According to Mithen, the levels of technical intelligence established close to Homo sapiens' emergence must have been of a sufficient level to produce art: "(...) the failure to make three-dimensional objects of art cannot reflect difficulties in conceiving of objects 'within' a block of stone or

[33] They are defined by Mithen as "visual images and objects which are not directly associated with their referent. (..) they could be referred to as 'indexes' - signs which do not visually resemble their referent but have a direct causal association (...)." (1996b, p. 203) As such, they are not full symbols in the sense that they are endowed with shared meaning.

ivory, or the mental planning and manual dexterity to 'extract' them. The cognitive processes located in the domain of technical intelligence used for making stone artifacts appear to have been sufficient to produce a figurine from an ivory tusk. But they were not used for such ends." (1996a, p. 182-183) Intentional communication concerning the reference relationships is characteristic of the domain of social intelligence. Not only were earlier species of humans capable of basic communication - perhaps not in a fully verbal but rather in a vocalizing way - other species, such as non-human primates, have also been frequently observed to communicate (Mithen, 1996a). Finally, attributing basic meaning by classifying a mark in a certain conceptual class is built upon the domain of natural intelligence. Decoding animal prints probably dates back to the earliest times during which ancestral species hunted or scavenged animals, or otherwise interpreted the variety of signals present in the natural environment (Mithen, 1988a, 1988b; 1996a). In sum, the three basic components at the basis of visual symbolism, which were subsequently integrated with the capacity to attribute entirely arbitrary reference relationships, were already characteristic of species ancestral to our own. While understanding animal marks should be interpreted as a type of proto-symbolic cognition, its full integration with other domains through the process of cognitive fluidity eventually enabled the development and mediation of arbitrary conventional relationships, in turn making way for meaning attribution to human-made marks (1996a).

Religious art constitutes a special case within Mithen's framework. Religion is probably as difficult to define as art, but Mithen addresses this issue pragmatically by outlining four characteristic features that appear to reoccur cross-culturally. They are the belief in non-physical beings such as gods, the belief that after death, a non-physical part of an otherwise physical person will remain - i.e. a soul - the belief that certain people within a society are in close contact with supernatural beings, and the belief that performing rituals can influence the surrounding world (Mithen, 1999). According to Mithen, concepts such as supernatural beings are formed by combining elements from different domains of intelligence. They draw from social and natural intelligence in their treatment of the social behaviour and physical properties of essentially non-physical beings, which is subsequently lifted into the symbolic realm, as full cognitive fluidity implies the presence of symbolic thinking. Finally, the merging of different domains with technical intelligence allows for anchoring religious ideas in material artefacts:

> "The material symbols involved in religious behaviour, especially those that represent supernatural beings, appear to capture the epitome of the human symbolic

> capacity. Not only does an image of a deity represent something that is not present in time and space; it represents something that *could not* be present. Hard, tangible objects, such as carvings in stone, are used to symbolize intangible ideas and concepts: people appear to have no difficulty in understanding such symbolic links." (Mithen, 1999, p. 147)

Material artefacts, according to Mithen, are "anchors for these ideas in the mind," (1999, p. 148) and they may have played an important role in the ultimate establishment of religious institutions. This is because religious ideas in themselves are fairly counterintuitive, i.e. they do not immediately fit within 'normal' cognitive ranges, which are typically evolved to process real-world information (Baumard & Boyer, 2013; Boyer, 1993, 1994). In order to memorize such counterintuitive concepts, and by extension, wider religious traditions, Mithen thinks that material artefacts are necessary. Without these, it is proposed, persistent and institutionalized religion could not have evolved. Religion, then, can be seen as a product of cognitive fluidity (Mithen 1999).

1.7.2. Neurovisual resonance theory

Hodgson similarly draws from cognitive science insights in order to clarify the origins of art, but supports his argument by making references to cognitive neuroscience rather than evolutionary psychology. As the basis of his theory, he addresses a pattern in the archaeological record that may turn out to yield great insight into the workings of the brain in relation to the origins of art. Leaving aside the limited number of isolated and heavily debated proposals for an early origin of figurative artmaking - of which the Berekhat Ram Venus and the Tan Tan Venus are often mentioned as examples - it seems that the appearance of figurative art around 40.000 BP in several areas of the world is predated by a phase where geometric mark-making occurs. According to Hodgson, "logically, one would expect representational depiction to predate geometric motifs as the former would, to archaic humans, have had more of an obvious relevance and appeal than the latter." (2006a, p. 54) While objects are indeed prevalent in the surrounding environment, geometric elements are an "almost non-existent commodity," (2006a, p. 54) which seems to imply that if they appear as markings on objects, they must to a certain extent arise from abstract thought. In other words, Hodgson argues that while geometric elements are indeed also present in the environment, they are not as readily perceivable as figurative elements, which suggests that the markings may warrant an explanation that is based on non-external origins. In his view, the answer lies in the structural properties of the visual brain.

The visual cortex, located at the back of the human brain, consists of several discrete areas that are functionally specialized, i.e. that contain neurons that are particularly responsive to certain classes of stimuli. Area V1, sometimes described as a catalogue input area for all incoming visual stimuli, or as the primary visual cortex (Zeki, 1998, 1999), has as its main function to receive such stimuli and engage in basic processing of properties such as colour, form, and motion. The information is then transferred to other, more specialized areas such as area V5 for motion, and area V8 for colour. Area V2, where stimuli first arrive after V1, is thought to be responsible for assembling basic formal properties such as lines into more coherent representations, whereas V4 contributes to distinguishing a figure from any background information (Hodgson, 2006a). In later stages, the information exiting the main areas of the visual cortex is additionally processed by secondary visual areas in the parietal cortex, which, among other things, arranges spatial insight concerning the incoming visual stimuli, and in the temporal cortex, which is responsible for the recognition of features such as objects and faces (Hodgson, 2006a). The visual cortex is thus characterized by a hierarchical organization: not only do the different areas process different types of stimuli, they also gradually build up an image based on these properties, which is the eventual perception of the surrounding world we consciously experience (Hodgson, 2006a; Zeki, 1998, 1999).

The initial stages of visual processing are concerned with what Hodgson calls "graphic primitives." (Hodgson, 2005, p. 55) These are simple formal features such as straight, oblique and curved lines, dots, and other basic geometric elements. Graphic primitives are not only found as early instances of mark-making in the Middle Stone Age and Middle Palaeolithic before becoming prevalent in the last ca. 40.000 years. They are also among the earliest developments in normally developing children's drawings, which suggests their primacy in visual perception and in their eventual reproduction in a material record (Hodgson, 2000). The basic premise of neurovisual resonance theory is that "the chronology by which geometric primitives turn up in the archaeological record - from simple lines to more complex forms and, ultimately, in the Upper Palaeolithic, geometrics and representation of animals - may be analogous to how the brain constructs form." (Hodgson, 2006a, p. 56) Visual or graphic primitives are key to decoding and understanding the surrounding environment, a point already extensively recognized and explored as part of different evolutionary hypotheses, such as Boyd's simulation account based on patterning (2009), and Pinker's byproduct explanation invoking pleasurable aesthetic response towards visual stimuli that appear regular or patterned (1997). Neurovisual resonance theory works in much the same way: "an organism is, at any given moment, tuned to resonate to incoming patterns of the optical array corresponding to the invariants that are significant to it." (Hodgson, 2006a, p. 56)

Simple geometry in the environment helps the visual cortex in quickly analyzing incoming stimuli in order to construct mental images of the surrounding world, through minimizing distraction and chaos. As such, the appearance of geometric mark-making in the archaeological record and their appeal to human observers is not so much an evolutionary novelty necessarily requiring entirely new explanations, but they are instead already "an integral feature of the brain. (…) they provided a measure of certainty and predictability in the face of unpredictability." (Hodgson, 2006a, p. 61; see also Davis, 1986; Harrod, 2003). Perceiving geometric elements draws attention and increases arousal, as well as being accompanied by pleasurable experiences, explained through neural rewards (e.g. Pinker, 1997). Importantly, neurons' sensitivity to graphic primitives has also been shown to increase by means of practice, e.g. through the creation and repeated perception of geometric mark-making on objects (Li et al., 2004; Schoups et al., 2001). This means that, through the mere workings of the visual cortex, a feedback loop can be established between the latter's structure and the appearance and continuation of mark-making in the archaeological record. The original motivation that gave rise to more extensive mark-making may have been accidental. According to Hodgson, it is possible that unintentional cutmarks on animal bones activated the basic functioning of the visual cortex in a way that was pleasing to an observer (2006a). Starting from here, the resonating feedback loop might have taken off on a journey towards more elaborate depictions.

As included in the basic premise of neurovisual resonance theory, the workings of the visual brain also yield insight into the appearance of figurative art. The record of figurative art has repeatedly been endowed with explanations that propose considerable symbolic significance, yet Hodgson's theory extends to figurative imagery if the co-evolutionary feedback loop with the brain is taken to include those areas that are responsible for the recognition of particular images such as objects and faces. Hodgson has in particular addressed shamanist explanations of figurative cave art, notably the views of Lewis-Williams (e.g. 2002). According to insights from neurovisual resonance theory, and from the cognitive neuroscience of vision more generally, it appears that elements such as animal depictions are not in need of symbolic interpretations, but can instead be straightforwardly explained by reference to the visual brain, and additional components such as memory (Hodgson, 2003, 2006b, 2008; Hodgson & Helvenston, 2006).

1.8. Evolutionary aesthetics

1.8.1. Aesthetics in evolutionary hypotheses of art

In addition to employing evolutionary approaches for explaining the apparently universal human behavioural propensity to create art, the same theoretical framework can be used to study why we appreciate the artistic outcomes of this propensity, a field that be summarized as evolutionary aesthetics. It can broadly be described as the body of research that studies the human perception and qualitative judgement of natural and artificial stimuli within an evolutionary framework. Methodologically, it is firmly rooted in both historical explorations in experimental aesthetics, as well as the discipline of evolutionary psychology. Generally, evolutionary aesthetics researchers propose that the human aesthetic sense - our ability to express negative or positive evaluative judgement of the surrounding environment - reflects such innate cognitive machinery that evolved for a functional purpose (Thornhill, 2003). This function is best understood by referring to evolutionary psychology's general explanation for the evolution of emotions. Emotions are thought to have evolved as motivational systems for directing behaviour. A particular emotional experience by an individual is the eventual outcome of an evolved system of neural rewards and punishments (Orians, 2001; Pinker, 1997; Thornhill, 2003). One of the most fundamental emotional responses is the experience of beauty - where favourable conditions are present - and ugliness as its reverse - when environmental stimuli are perceived as harmful or threatening. Thornhill has concisely summarized this point as follows: "Beauty experiences are unconsciously realized avenues to high fitness in human evolutionary history. Ugliness defines just the reverse." (2003, p. 9) Wilson similarly stated that human aesthetic propensities "play upon the circuitry of the brain's limbic system in a way that ultimately promotes survival and reproduction." (1984, p. 61)

The element of functionality with regard to environmental perception and affective experience is a recurring feature. Ruso et al. write that "human evolutionary aesthetics is in many ways the study of humble everyday life-preferences and feelings evoked by a stimulus without self-conscious thought, and yet prevalent on an almost daily basis." (2003, p. 279) Kaplan similarly states that "aesthetics in this perspective is a functionally based way of responding to the environment." (1992, p. 585) Such definitions make abundantly clear that research in evolutionary aesthetics inevitably involves a joint examination of cognition and emotion. Gazzaniga concisely summarized this as follows: "Aesthetics is a special class of experience, neither a type of response nor an emotion, but a modus operandi of "knowing about" the world. It is a sensation with an attached positive or negative evaluation." (2009, p. 208)

Evolutionary aesthetics can be concerned with investigating our aesthetic judgement of artworks, but this does not necessarily have to be the case. As the theoretical foundation of this field pertains to an assessment of the evolution of favourable or less favourable emotional judgement, aesthetic judgement can in principle apply to any category of stimuli (Brown & Dissanayake, 2009; Dissanayake, 2015). It is therefore important to recognize that the fields of evolutionary aesthetics and the evolutionary study of art partly coincide, but differ to a greater extent. This means that, while evolutionary aesthetics sometimes deals with non-artistic stimuli, evolutionary approaches to art are sometimes almost entirely unconcerned with explaining its aesthetic properties. This tends to be true for cognition-based hypotheses such as Tooby and Cosmides' interpretation of the simulation hypothesis (2001). Here, the benefits of art operate in the elaboration of an individual's cognitive repertoire. While aesthetic judgement may play a role to some extent - as it usually does - the aesthetic judgement of artistic stimuli does not have an actual part in supporting the proposed simulation function. In other instances, such as Miller's aesthetic fitness indicator hypothesis (1999, 2001a, 2001b), artistic ability and aesthetic judgement evolve in a co-evolutionary feedback loop. Aesthetic judgement, associated with female choice, is a necessary feature in order to sustain the possibility that artistic ability evolved among males as a sexually selected fitness indicator. It is also likely that the cognitive and neural architecture involved in both, at least partly coincides. In yet other instances, such as Dissanayake's artification hypothesis, the distinction between art and aesthetics virtually disappears (Verpooten, 2015). Here, the process of making special in itself incorporates aesthetic considerations to such a significant extent, and aesthetic experience is so closely intertwined with the joint creation of, and engagement in the arts, that teasing the two apart takes down the entire hypothesis. Pragmatically, it appears to be best to reserve the term 'evolutionary aesthetics' for inquiries into the qualitative judgement of stimuli, translated into emotions such as the experience of beauty and ugliness. Elements of aesthetics in evolutionary accounts of the arts may be approached in this way, but should always be framed within the particular conjunction of art and aesthetics, if any, in a single hypothesis.

1.8.2. Themes in evolutionary aesthetics

Within evolutionary aesthetics, interest has focussed on two main subjects: aesthetic considerations made during mate choice, and evaluating habitats in terms of their suitability for prolonged occupation, often summarized under the subfield of environmental aesthetics. In both cases, immediately perceivable characteristics of an environment - including conspecifics present in it - can be indicators of more fundamental properties that may or may not be fitness-enhancing. Researchers in evolutionary aesthetics have tended to focus almost exclusively on the importance of visual perception, which explains why the vast majority of available theoretical and empirical studies also investigates this sensory modality.[34]

Researchers in environmental aesthetics are interested in uncovering which environments as a whole, or which particular features elicit favourable responses in observers, assuming that such positive appraisals are the product of evolved cognition, indicative of selection pressures during the Pleistocene. Three main hypotheses have dominated this field of research. In the savanna hypothesis, Orians and Heerwagen (1992; Heerwagen & Orians, 1993) propose that the significant part of human Prehistory that was spent in the savanna environment of Eastern Africa is still reflected in current aesthetic preferences for landscape features. They describe the most essential human needs, at least during the Pleistocene, as having "to find adequate food and water and to protect themselves from the physical environment, predators, and hostile conspecifics." (1993, p. 140-141) Savanna environments are well suited for fulfilling these needs, as they often contain features like large trees, plant growth, water, focal points in semi-open spaces with changes in elevation and relatively unobstructed views of the horizon, which would have enabled a clear view of risks and opportunities in the immediate surroundings, as well as providing a degree of protection against possible harm (Orians, 1980). Another notable hypothesis in the field is the prospect-refuge theory (Appleton, 1975). It predicts that humans should seek out environments that provide a maximal balance of prospect - environmental features that enable, for example, spotting resources from a distance

[34] But see Milinski (2003) for an olfactory perspective.

- and refuge - shelter opportunities in view of potential danger. Finally, Kaplan (1989, 1992) developed an information gathering model of environmental aesthetics, addressing the basic need to be able to extract relevant information from the surrounding environment while at the same time avoiding the risks that accompany threading in unknown territories. Based on a matrix of structural properties of an environment, such as coherence, complexity, legibility and mystery, it is argued that by assessing these properties, one should be able to understand an environment, as well as determine its exploratory potential.

Several features of these hypotheses have been tested empirically. In an analysis of recurrent features in western landscape painting and garden architecture, Heerwagen and Orians (1993) found preferences that are strongly consistent with the predictions made by the savanna hypothesis. In addition, they found that prospect-refuge imagery is related to the time of day depicted in a particular painting, with a stronger emphasis on refuge elements present when the scene was set during dusk or nightfall. Additionally, recent research has assessed the abovementioned and other findings from environmental aesthetics in contemporary contexts and in an applied manner, such as the role of nature imagery in advertising (Hartmann & Apaolaza-Ibáñez, 2010), and psychophysiological and behavioural effects of exposure to natural stimuli (e.g. Bringslimark et al., 2011; Donovan & Prestemon, 2010; Nielsen & Hansen, 2007).

The second main interest in evolutionary aesthetics is the process of sexual selection, and in particular the role of aesthetic considerations during courtship display and mate choice. Along the lines of evolutionary psychological thinking on emotions as motivational agents for behavioural choices (e.g. Orians, 2001), evolutionary aesthetics research on mating generally proposes that aesthetic preferences for features such as symmetry and averageness of facial and bodily traits are in fact unconscious choices for health, developmental stability and good genes, as choices for these features result in higher-quality offspring, and thus would have gradually become endowed with neural rewards over the course of evolution. Two general frameworks have been proposed to account for the evolution of signalling traits as well as discriminatory abilities for assessing these traits (Barber, 1995; Miller, 2001a). They are good genes sexual selection and runway evolution, both of which have been outlined above. With regard to art's evolution, runaway evolution was extended into the cultural realm and applied to the evolution of aesthetic features by Boyd and Richerson (e.g. 1985, 2005). Interpretations of good genes sexual selection with regard to art and aesthetics have been made by Miller (e.g. 1999, 2001a, 2001b), and Voland (2003), in an application of costly signalling theory to the world of artefacts, rather than natural stimuli alone. Handaxes, too, have at various occasions been taken to reflect sexual selectionist considerations (Kohn & Mithen, 1999; Mithen, 2003)

1.9. Visual art and the brain

1.9.1. Neuroarthistory and neuroaesthetics

Although in effect exceeding the limitations of this dissertation, this introductory chapter on evolutionary hypotheses on visual art concludes with a number of brief references to neuroscientifically inspired research on art. Brain research can be used in a variety of ways in the study of art: neuroscience is sometimes adopted to account for particular features of works of art, a field of study referred to as neuroarthistory, and our knowledge of the brain is also often employed to clarify the perception and aesthetic appreciation of artworks, termed neuroaesthetics.[35] In addition, cognitive neuroscientific research into art can be very informative if it addresses and clarifies how certain brain or cognitive abnormalities, such as specific diseases, affect particular elements of artmaking.

Neuroarthistory can be used as a general term for a variety of views that converge on the idea that knowledge of the brain can also translate into knowledge of art. Different authors have endorsed different approaches along this general line of thinking. Among the foundational figures of neuroarthistory is Zeki, whose work spans both neuroarthistory and neuroaesthetics, although he commonly summarizes it under the second term. Zeki has extensively explored the neural foundations of the perception of formal properties of art, which has led the way for more applied neurocognitive approaches such as Hodgon's neurovisual resonance theory (e.g. 2006a). Zeki notes how the workings of the brain may in fact be very similar to the way art is perceived and processed (e.g. 1998, 1999). As such, "artists are neurologists, studying the brain with techniques that are unique to them and reaching interesting but unspecified conclusions about the organization of the brain." (1998, p. 4) The connections between visual properties and art are fairly

[35] In practice, 'neuroarthistory' and 'neuroaesthetics' are sometimes used interchangeably, which should be avoided so as to minimize confusion about the precise contributions of neuroscientific research for either addressing the nature of art or its aesthetic appreciation.

straightforward if these properties echo the basic building blocks of the visual cortex, such as those areas aimed at the processing of straight and oblique lines, or colour. The theory also holds for more complex types of perception, such as movement, which is reflected in the practice of kinetic art (Zeki & Lamb, 1994). Moreover, understanding processes such as concept formation and abstraction in the brain might prove key to understanding many great artists and artistic realizations (Zeki, 2002). Onians (2007a, 2008) has also strongly advocated the development of the field of neuroarthistory, along with the parallel field of neuroarchaeology (2007b). His work commonly centers around the role of neuroplasticity, or the apparent fact that the brain strengthens its synaptic connections in response to certain sensory input. According to Onians, this can partially explain matters such as the particular influence of the environment an artist grew up in on the nature of his work, or why certain representations are repeated over time - their appearance may have become hard-wired into the brain, partially explaning why the same representations are sought for again at a later time (2008). Rolls (2012, 2014) advocates a theory of neurological perception of art that is based on emotions and on the role these play in the brain's processes of reasoning and problem-solving: "it is argued that combinations of multiple such factors provide part of the basis for aesthetics. To this is added the operation of the reasoning, syntactic, brain system which evolved to help solve difficult, multistep, problems, and the use of which is encouraged by pleasant feelings when elegant, simple, and hence aesthetic solutions are found that are advantageous because they are parsimonious and follow Occam's razor." (2014, p. 291)

Neuroaesthetics refers to the study of aesthetic perception and judgement, based within a neurocognitive framework. This is not necessarily limited to stimuli coming from artworks: like evolutionary aesthetics, it can equally apply to non-artistic, ordinary environmental stimuli. Interest has centered around the all important question of how the brain creates aesthetic experiences of beauty. In addition to his work on the neural perception of formal properties in art, Zeki has also addressed this question (Kawabata & Zeki, 2004). This research yielded not only insight into particular patterns of brain activation that are involved in judgements of beauty and ugliness, but also differential activation for aesthetic as opposed to normal perceptual judgement (e.g. the brightness of stimuli) (Ishizu & Zeki, 2013). Studies in neuroaesthetics are not limited to this overall interest in beauty judgement (for others, see e.g. Cela-Conde et al., 2004; Jacobsen et al, 2006). Others have looked at neural effects of aesthetic expertise (Kirk et al., 2009a), the influence of semantic context on the aesthetic perception and judgement of objects (Kirk, 2008; Kirk et al., 2009b), and the role of authenticity in the aesthetic perception of artworks (Huang et al., 2011; see also Bloom, 2010).[36]

Neurocognitive research also yields insight into the nature of art in ways that go beyond the findings stemming from neuroarthistory and neuroaesthetics. By means of a comprehensive review, Chatterjee (2004b) outlined how many neurocognitive medical conditions, such as hemineglect, aphasia, epilepsy, migraine, autism and dementia, can have significant consequences for the affected person's artmaking. Cognitive impairment studies can highlight modular aspects of art, for instance in those cases where a particular disease is known to affect a certain brain region or function. Comparing the elements of this disease with changes measured in figurative or abstract representations, can indicate where in the brain these representational aspects are located. It is important to note that such conditions do not merely have as a consequence that paintings, drawings or other artistic products always become of lesser quality. Instead, striking stylistic changes are often observed (Chatterjee et al., 2011). The onset of Alzheimer's disease and frontotemporal dementia, for example, seems to result in diminished accuracy and realism in depiction, in favour of more abstraction (van Buren et al., 2013).

1.9.2. The relevance of neuroscience for evolutionary hypotheses

The cognitive neuroscientific literature on art is extensive and continuously expanding, and the great variety of insights arising from this literature also suggests that brain research can illuminate very specific questions in evolutionary studies of art. Starting from a very basic level, neuroscience evidently provides insight into how visual features of artworks are perceived and processed, as has been elaborately described by Zeki (e.g. 1998, 1998). This in turn makes way for applying such insights to support particular views such as the hyperstimulus account of art endorsed by Ramachadran and Hirstein (1999). The concept of hyperstimulus implies that the brain enjoys the perception of art because it provides an exaggeration rendition of reality, with the authors even referring to this as art's purpose: "the purpose of art, surely, is not merely to depict or represent reality - for that can be accomplished very easily with a camera - but to enhance, transcend, or indeed even to *distort* reality...

[36] For general overviews of the use of cognitive neuroscience in the study of art, see Chatterjee, (2004a, 2010) and Zaidel (2010, 2013).

What the artist tries to do (either consciously or unconsciously) is not only capture the essence of something but also to amplify it in order to more powerfully activate the same neural mechanisms that would be activated by the original object." (1999, p. 16) Ideas such as these can be connected back to Pinker's cheesecake hypothesis, which proposes that our enjoyment while engaging in visual art comes from the heightened activation of pre-existing, functional neurocognitive networks through art (1997, 2006, 2007).

In terms of interpreting specific sections of the archaeological record, the ever increasing knowledge of the visual brain is also of use. Neurovisual resonance theory already addressed this matter (e.g. Hodgson, 2006a). According to De Smedt and De Cruz, "the perceptual tendencies of the human brain can be seen as cognitive attractors that have channeled abstract art in preordained directions, in particular, a tendency toward more clear-cut, simplified and geometric shapes, brighter colors and higher color contrasts, arguably because these features elicit stronger responses in the artist's and viewer's early perceptual systems." (2010, p. 702) Specific examples seen from a cognitive neuroscientific point of view, such as geometrically marked artefacts in relation to the anatomy of the visual cortex, illustrate how it may not be necessary to invoke art-specific neural circuits or functions to explain the neurocognitive workings of art, but that its manufacture instead relies on ordinary cognition.

Neuroscientific research also aids in addressing questions at a conceptual level. One of these questions concerns the extent to which cognitive neuroscientific studies assist in attempts to answer the adaptationist-byproduct debate mentioned earlier. According to some, the apparent absence of a neural network unique to art, indicates that a byproduct account is preferable to an adaptationist explanation: "the byproduct account of art is preferable to the adaptationist view, because the former is more in line with cognitive neuroscience. The cognitive neuroscientific evidence reviewed here provides strong empirical support for the claim that various forms of art, including visual art and music, are attention-grabbing because of their correspondence with evolved propensities of the human neural system." (De Smedt & De Cruz 2010, p. 710) Others have expressed doubt as to such immediate implications of cognitive neuroscience for what is essentially a theoretical, evolutionary discussion (e.g. Davies, 2012). Even in the absence of an art-specific neural network - an assumption that must currently be taken as default given the lack of any empirical evidence to the opposite - a byproduct interpretation of art is not necessarily the automatic conclusion to be drawn. Even if a number of different perceptual, emotional and social neural networks are demonstrated to be involved in the cognitive processing of artistic products and behaviours, it is theoretically possible that these have all become co-opted at a certain point in evolutionary history, because of a potential beneficial effect that was not, or could not have been exploited by the separate areas, but that is enabled by their joint operation in the context of art. Similarly, research such as the neuroaesthetics approach to the role of intentionality (Huang et al., 2011) can be enlightening for determining whether certain cognitive abilities and predispositions are perhaps crucial to the phenomenon of artmaking as a trait of human nature.

1.10. Concluding remarks

This chapter provided, in a non-evaluative way, an overview of both the archaeological record for visual art and the main theoretical foundations of its evolutionary study. This second element is embodied by the seven major explanatory hypotheses that were discussed, covering the most prevalent evolutionary perspectives for studying human behaviour in general, i.e. evolutionary psychology, ethology, biology and anthropology. In addition, these hypotheses touch upon many elements from this general literature, such as the evolution of cooperation, group identification and bonding, mate choice, and signalling and advertisement for both mating purposes and social status increase.

Other sources of information available in the evolutionary-related literature on art were also included, such as historical predecessors of present-day research, philosophical considerations as to the use of an evolutionary framework for art, theoretical perspectives in archaeology that draw from evolutionary ideas, and related views in evolutionary aesthetics and cognitive neuroscience. The review-structure of this chapter is also intended for further reference throughout this dissertation. Starting from the following chapter, evolutionary ideas will be scrutinized as to the soundness of their methodological foundations. The first of these chapters will be concerned with the primary question of how, and if, to define art.

2

Defining art in evolutionary research: conceptual and methodological considerations

2.1. Introduction[37]

The matter of defining art is among the most challenging subjects in western philosophy of art. Numerous definitions have been proposed, and ideas pertaining to any central properties of art that should gain a steady place in corresponding definitions, vary widely. Humanities scholars typically adopt a relatively speculative approach, and are often heavily influenced by the sociocultural characteristics of their particular time and place. In recent decades, there has been an upsurge in discussions on the boundaries of art from a biological perspective. This chapter looks more closely at the subject of art's definition from an evolutionary point of view. It does so by first reviewing three evolutionary-based attempts at defining art. These are the use of an operational distinction between different kinds of art, a cluster concept approach with a non-definitional view of art, and a cognitive cluster account that focusses on the cognitive foundations of the making and enjoyment of art.

[37] This chapter was adapted from Seghers (under review). Defining art in evolutionary research: conceptual and methodological considerations.

Each of these approaches contains methodologically problematic elements that interfere with their usefulness as a basis for evolutionary theorizing about the origins of art. Importantly, the difficulty of defining art within an evolutionary framework is closely intertwined with the conceptual structure of explanatory hypotheses, which theoretically require a trait-wise subject. In order to remedy this, existing philosophical suggestions will be integrated with aspects of the biologically-based attempts at defining art, in order to arrive at a pragmatic suggestion for approaching this concept. It is proposed that it may not be a prerequisite, and might even be undesirable, to have a stable concept of art in mind before proceeding to its evolutionary analysis. The ultimate goal of this chapter is therefore not to provide an additional evolutionary definition or delineation of art, but to assess instead present attempts at delineating art within this evolutionary framework, and to provide, where possible, suggestions for conceptual clarification.

2.2. The matter of defining art

Aside from numerous attempts at providing sound definitions for art, Weitz has argued that art cannot be defined at all in an essentialist way, which would entail “a quest for a nontrivial specification of the jointly necessary and sufficient condition for ‘artworkness,’ where the realization of this condition is essentially and not merely contingently related to artworks’ being artworks.” (Davies, 1991, p. 5; see also Weitz, 1956) Others have tried to circumscribe an essence of art, well-known attempts to which are the formalist approach of Bell (2003), proposing that form is the quintessential feature determining artistic value, and the institutionalist account of Dickie (1974), who argues that an artwork’s status depends mainly on its relation to an institutional art world. Levinson (1979, 1989, 1993, 2002), on the other hand, defends a historical view that regards artistic value as being determined by the relation between a potential work of art and preceding, recognized artworks.[38]

The recent upsurge in biologically-based approaches to human behaviour, such as evolutionary theory, offers a unique opportunity to tackle a centuries old issue by providing a corresponding perspective on the matter of defining art. The rise of these approaches in the humanities and social sciences is often referred to as ‘vertical integration’ or ‘consilience’, described by Wilson (1998) as a means for

[38] For discussions and additional examples of philosophical theories of art, see for example Davies, 2006a; Monseré, 2010.

gaining greater insight into human behaviour by integrating various strands of knowlegde from different disciplines. Specifically, evolutionary approaches can add an explanatory layer for understanding subjects that are traditionally studied from historical, philosophical and sociological points of view. While often regarded as reductionist endeavours in the negative sense - biologically-based approaches to humanities subjects are often thought to consist of attempts to unjustly rephrase complex individual experiences, emotions and meanings in simpler, biological terms. In his discussion of consilience, Wilson counterargues that "while it is true that science advances by reducing phenomena to their working elements - by dissecting brains into neurons, for example, and neurons into molecules - it does not aim to diminish the integrity of the whole. On the contrary, synthesis of the elements to re-create their original assembly is the other half of scientific procedure. In fact, it is the ultimate goal of science." (Wilson, 1998, p. 230)

Along with numerous other behavioural and cultural phenomena, the arts are increasingly studied through an evolutionary lens. Over the past decades, insights from cognitive science have acquired a steady presence in the study of art and aesthetics, often informed by neuroscientific research (see, for example, Currie et al., 2014; Schellekens & Goldie, 2011). In this chapter, interest will focus on the approach of evolutionary theory and its relevance for understanding art. An evolutionary approach tends to regard art as an evolved behavioural and mental trait. It has been variously described as an adaptation, i.e. a functional practice, for purposes such as establishing social cohesion, enabling kin identification, signalling mate quality, and developing one's cognitive apparatus so as to achieve better environmental and social navigation skills in the surrounding world (Aiken & Coe, 2004; Boyd, 2009; Carroll, 2005; Coe, 2003; Dissanayake, 1995, 2008; Miller, 2001a, 2001b; Tooby & Cosmides, 2001). In addition, art might be a byproduct, i.e. a non-functional spin-off of adaptive behavioural and psychological traits, that could have acquired - though not necessarily - a new function in later stages of evolution (Pinker, 1997, 2007; Richerson & Boyd, 2005).

An evolutionary approach to art, although explanatory in nature, raises the additional question whether, from a bottom-up perspective, evolutionary theory can also assist in the more fundamental matter of defining art, or at least of delineating the subject matter. This is not only relevant with regard to other, philosophical definitions – adding a biological perspective may provide a counterweight for the speculative nature characteristic of traditional humanities attempts at defining art – but also within evolutionary psychology and anthropology itself, where a clearer view of a concept of art will aid its study as an ancestral practice. But why should it be important to ponder any biological boundaries of art before embarking upon evolutionary research? In general, clearly establishing the subject matter of a particular hypothesis will help to make the evolutionary explanation provided more specific, i.e. the explanation itself can be finetuned to the subject it tries to explain. This in turn provides a point of departure for empirical testing. If a hypothesis is put to the test, the concept of art employed should ideally be operationalized as closely as possible to any theory-based predictions made, which only becomes possible when the theoretical concept of art in itself is clearly outlined. In addition, mapping the subject more elaborately than is commonly done, allows for testing hypotheses against the archaeological record, as well as for establishing evolutionary associations with other pieces of information available in this record, such as fossil evidence of biological traits (Coe, 1992).[39]

2.3. Evolutionary attempts at defining art

2.3.1. Analytic confusion

One significant issue with research on the evolution of art is that the concept of 'art' itself is a very broad one and can include a wide variety of art forms. In addition, the level of analysis often differs greatly according to the specific evolutionary perspective taken. As Coe notes, "(...) it is not always clear if we are trying to define objects (e.g., sculptures, paintings, decorated objects), performances (e.g. dance, storytelling), psychological underpinnings, evolved proximate or ultimate functions, the behavior of making and/or viewing art, or the emotional response aroused by art, or all or some of these." (2013, p. 155) As is evident from this remark, using too general a concept of art may result in both clustering of different art forms into one category, as well as in mixing up different levels of explanation concerning the phenomenon of art as a whole. Both of these issues are discussed below.

Some authors argue that various kinds of art as we presently distinguish them, such as visual art, music making, dance, and verbal recitation, may have evolved in a

[39] Depending on which properties are deemed essential for a definition or delineation of art, Coe argues that addressing this methodological issue can also aid in cross-cultural comparison and analysis. This becomes possible when a proposed definition is stripped from features that are typically imbued with a lot of cultural meaning and influence, such as concepts of skill and aesthetic emotions.

shared context where they might not have been separated phenomena. For example, one could imagine religious ritual as a possible behavioural framework for artmaking, which would provide opportunities for both music, dance and performative elements such as recitation, as well as visual elements such as the use of devotional objects, or the application of body decoration of special significance. Dissanayake's artification hypothesis involves such a mixed concept of art, where different kinds of art are not seen as detached practices, but rather as exponents of the underlying behavioural propensity of artifying ordinary reality (Dissanayake, 1995).

The question whether different arts evolved in conjunction with one another is difficult to answer in the absence of clear, empirically supported contextual information about ancestral behaviour. As a consequence, we cannot ascertain whether the arts were originally a cluster that later diversified into more separate art forms, or whether they evolved independently in different contexts. Even if various kinds of art have current functions linked to the same or a similar purpose, such as group cohesion for example, it would be almost impossible to determine whether this is the outcome of an evolutionary process that involved all the arts jointly, or rather the result of convergent evolution, where different arts would stem from different evolutionary trajectories that nonetheless share the same outcome. While it cannot be disproven that the arts evolved as a cluster - sharing the same or a very similar ultimate function - several strands of evidence suggest that they may have evolved along different, at least partly separate pathways. Empirical studies often find support for functions that are specific for one kind of art. While music and dance, for example, are commonly said to have been involved in establishing group cohesion and social bonding within ancestral communities, the art of storytelling has been repeatedly demonstrated to be instrumental in improving psychological features such as theory of mind and empathy (Anshel & Kipper, 1988; Hagen & Bryant, 2003; Kirschner & Tomasello, 2010; Goldstein & Winner, 2012; Mar et al., 2006, 2009).

The archaeological record additionally provides insight into the question whether the arts evolved jointly or separately - taking into account that the evolution of storytelling is virtually impossible to assess from this perspective. Even when taphonomic limitations are considered, the first traces of visual art appear to have much older dates than similar evidence for music, which would suggest that the former predates the latter in the evolution of human behaviour, thus requesting different explanatory hypotheses (e.g. d'Errico et al., 2003).[40] In sum, parsimony appears to demand that the different arts are hypothesized to have evolved along different cultural phylogenetic trajectories, which would require different explanatory hypotheses for each. Of course, this does not exclude that the arts may have joined forces in fulfilling a particular function, such as social cohesion, at various points in the evolution of artmaking among our ancestors. For conceptualizing art in evolutionary research, however, this means that broad, general views of 'the arts' appear unsuitable.

In addition to this, more confusion arises from the fact that the various evolutionary hypotheses tend to approach their subject matter at different levels of analysis, resulting in definition attempts that cannot be thoroughly assessed in a comparative manner as they refer to different aspects of the phenomenon of art. Some evolutionary hypotheses have stressed the *behavioural* aspect of art, or the practice of artmaking in itself, instead of its outcome. The artification hypothesis, for example, "conceptualizes art differently from most other schemes – as a behavior ('artifying'), not as the results (paintings, carvings, dances, songs, or poems) or their putative defining qualities (beauty, harmony, complexity, skill)." (Dissanayake, 2009, p. 156) Others look at the *computational and modular foundations* of art. Miller refers to "(...) our artistic instincts for producing and appreciating aesthetic ornamentation," (2001a, p. 258) whereas the literary scholar Brian Boyd, adopts a joint view of art as a behaviour with important psychological operations, in stating that "we can define art as cognitive play with pattern." (2009, p. 15)

This issue is difficult to accommodate, as choosing a particular analytic focus, for example objects over behaviour and psychological machinery, is likely to create an immediate bias towards visual art as opposed to practices such as music and storytelling, which evidently leave fewer, if any traces in the archaeological record. Yet even if a hypothesis merely intends to capture the realm of visual art - following

[40] One method to try and limit the influence of taphonomic processes on our perception of the earliest traces of art, is to perform a thorough integration of archaeological and palaeontological data. This way, it might become possible to assess when practices such as singing were enabled by the anatomical evolution of human ancestors, which could then be mapped along with archaeological evidence of musical instruments in order to construct a fuller view of music's evolution. This would also partially remedy the issue that the archaeological record can only inform us about the evolution of music if ancestral musical practice involved the use of instruments. Possible earlier stages such as joint singing or humming will not surface according to this method, which could distort our perception of music's evolution (for these and other issues, see Mithen, 2005).

the above outlined option of studying various kinds of art in themselves - an object-based view still does not qualify as a comprehensive term. While portable art clearly fits such a view, practices such as parietal painting and drawing, or pigment body decoration, appear to require a different categorization. Bednarik therefore proposes to call art more generally "the medium conveying awareness of a perceived reality to the sensory perception of other humans." (s.d.) Yet such a broad, inclusive view again complicates the development of any testable explanatory hypothesis because of the difficulties involved in operationalizing concepts such as 'medium'. As Davies notes: "just as many scientists cheapen the notion of the aesthetic to the point where all sense-based reactions would qualify, some of them do the same for art, with the result that claims for connections between art and humans' evolved behavior become trivially true." (2012, p. 28) Apart from the analytic categories variously used by the abovementioned authors, an additional issue consists of the fact that several definitions appear to be infused by the western post-Enlightenment view of *l'art pour l'art*, which presupposes that artmaking is a non-functional behaviour, detached from the practical concerns of everyday life, and devoid of any crucial function in human existence. Such a view is not likely to reflect the crosscultural and transhistorical occurrence of art that warrants us to consider "western fine art as one species within a wider genus that also includes religious art, domestic art, and so on (...)." (Davies, 2006b, p. 224) Some evolutionary definitions explicitely endorse a non-functional outlook on art. Guthrie describes art as "(...) a certain class of actions that are not overtly necessary for the operational demands immediately linked to reproductive *fitness*." (2005, p. 374, original italics) As evolutionary research on art commonly discusses the option whether art evolved for a particular function, and if so, which one, it is not productive to exclude such a function in the initial definition.

2.3.2. Evolutionary approaches

The matter of defining art is sometimes approached by making *operational distinctions* between different kinds of art. This means that, instead of trying to delineate a concept of art or provide a sound definition, the arts are broken down into broad, intuitive categories that can, but do not necessarily have to receive a different evolutionary explanation. Pinker (1997, 2007) distinguishes between visual arts and music, two kinds of art that are explained by means of a byproduct account, and fiction, a third kind of art that is of a combined adaptive and byproduct nature.

He does not specify the width of a term such as ‘visual art’ any further, but merely mentions composite features such as patterns and geometric elements when using examples such as abstract art, in order to connect the subject matter to the evolution of cognitive abilities and processes.

A considerable issue with this approach is that it does not provide a clear conceptual foundation for evolutionary interpretations of an entire category. Many subdivisions can be made within any of the proposed types of art, such as visual art or storytelling. When looking at visual art, for example, the archaeological record provides a wide range of practices that have all been described either as instances of art, precursors of full-blown art, or indications of aesthetic consciousness. Archaeologists almost unequivocally accept parietal cave paintings and portable objects from the Aurignacian period as art (but see Davis, 1986, for a critical perspective), but aside from this, similar claims have been made - although more debated - for geometrically engraved artefacts dated to the Middle Stone Age and the corresponding Middle Palaeolithic, shell beads thought to have been worn as jewellery, symmetrically shaped handaxes from the Acheulean period, and ochre use which, in the form of applications to the human body, may be seen as an early form of body art - if not the earliest form of all art.[41] The different timeframes and uses of these objects and practices are at least suggestive of different functions for our ancestors. While they may all be seen as utterances of visual art, gathering them within the same concept of ‘visual art’ can potentially diversify this term to such a significant extent that its value as an analytic category is severely weakened. Conversely, not all instances of a particular category are necessarily art. As for music, Davies writes that "‘Happy Birthday’ and the catchy jingle that advertises the phone number of the local pizza parlor are music, but I’d be reluctant to count them as art, even assuming a humble view of what art is." (2012, p. 27) Equally telling examples can be found for other kinds of art, leading Davies to conclude that "we cannot define art as the sum of the art forms." (2012, p. 27) This also makes it evident that adopting generic categories such as ‘visual art’ or ‘music’ can limit the strength of any evolutionary hypothesis, putting it at risk of becoming, as mentioned before, "trivially true." (2012, p. 28)

[41] Artistic claims for Middle Stone Age and Middle Palaeolithic geometrically engraved artefacts: see e.g. Henshilwood et al. (2009) and Marshack (1996); for shell beads, e.g. Barham (2004) and Zilhão (2007); for Acheulean handaxes, e.g. Currie (2011), Miller (2001a) and Mithen (2003); for ochre use, e.g. Coe (1992) and Power (1999), but see Corbey et al. (2004) and Mithen (1999) for a different view.

A second possibility consists of using *cluster concepts*, which try to specify the nature of art to a greater extent than the operational distinctions mentioned above. Authors in favour of this approach make use of a set of characteristics that together make up a continuum of 'artness'. The cluster account of art does not try to phrase a definition, but instead searches for properties, "the possession of which conceptually *counts towards* an object's falling under a concept (...)." (Gaut, 2005, p. 273) A cluster thus contains criteria that are "disjunctively sufficient, but not necessary, for 'arthood'." (Monseré, 2012, p. 150) The cluster concept that is most closely linked to an evolutionary attempt at understanding art was developed by Dutton. It is composed of 'direct pleasure', 'skill or virtuosity', 'style', 'novelty and creativity', 'criticism', 'representation', '"special" focus', 'expressive individuality', 'emotional saturation', 'intellectual challenge', 'art traditions and institutions', and 'imaginative experience' (2006, 2009). With this cluster, Dutton attempts to capture a wide range of artistic products and activities, avoiding historical and local cultural biases often present in philosophical definitions. Instead, he opts for a universal outlook that "depends on persistent and cross-culturally identified patterns of behavior and discourse: the making, experiencing, and assessing of works of art." (2006, p. 368)[42] The cluster is thought to apply to his broad, descriptive view of the arts, which are "artifacts (sculptures, paintings, and decorated objects, such as tools or the human body, and scores and texts considered as objects) and performances (dances, music, and the composition and recitation of stories)." (2009, p. 51-52)

The cluster account has as a benefit that its lack of formal structure makes it well suited for addressing art from non-western cultures – utterances of art which tend to fall outside more narrow western-biased definitions.[43] On a similar note, it appears that such a cluster can also apply to prehistoric art, which shows interesting parallels with non-western art in terms of its often unfamiliar cultural setting. This broad and inclusive approach is, however, also one of the pitfalls of the cluster concept. In the absence of clear insight into the social circumstances of both non-western and prehistoric art, it is difficult to determine to what extent concepts such

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[42] According to Dutton, his cluster concept also underlines the importance of reconsidering the *centre* of art, rather than exhaustively attempting to account for liminal or questionable cases, a practice more common to philosophical thinking on art: "the world of art, it is supposed, will at last be understood once we are able to explain art's most marginal or difficult instances. (...) The obsession with accounting for art's most problematic outliers (...) has left aesthetics ignoring the center of art and its values." (Dutton, 2006, p. 368)
[43] For a detailed discussion of cluster concepts and their potential applicability to non-Western art, see Monseré, 2012.

as criticism, art traditions and institutions, expressive individuality and intellectual challenge apply to the presumed artworks under consideration, as well as the extent to which the proclaimed relevance of such criteria might be biased by western art history and philosophy (Davies, 2012).[44]

Similar to its breadth, the flexible nature of the cluster concept also constitutes one of its weaknesses. In an effort to lessen the demands of absolute, essentialist definitions in order to recognize the overall complexity and cross-cultural occurrence of art, a cluster concept provides recognition criteria, but does not specify, for example, whether a minimum set of properties must be present, or whether some of these properties are perhaps more important than others and thus more enlightening to determine if something should be regarded as art (Monseré, 2012). According to Dutton (2009), an object, performance or practice can even possess several features on the list, but can still come out of the analysis as non-art, indicating the difficulty of applying a continuum to potential artworks. Cluster accounts can thus leave us with a similar issue as operational distinctions. If the concept of art is stretched to the extent that it virtually has no boundaries, we are again without a solid point of departure for evolutionary research.

The third approach mentioned here is related to the cluster account, but shifts the subject of analysis to the cognitive abilities that are thought to be at the basis of art. This approach, the *cognitive cluster account*, attempts to determine which capacities are necessary for being able to produce and recognize art, and then browses the archaeological record for objects that appear to correspond to these capacities, and that can thus be seen as the earliest currently known art. In other words, objects can qualify as art if, based on the formal properties archaeologists have at their disposal for their interpretation, the object shows presumed evidence of the presence of the proposed capacities. A cognitive cluster account does not propose a definition of art based on such formal properties, but argues instead that humans possess a cognitive blueprint of art that allows for intuitively recognizing certain objects as artworks. According to De Smedt and De Cruz (2011a), art can be broken down at a cognitive level into intentionality and the design stance – referring to the ability to assess foreknowledge about artist's intent when recognizing a work of art - symbolic thinking - decoupling a representation into an image and what this image represents - and an aesthetic sense.[45] As such, the cognitive cluster account and its

[44] For a thorough discussion of Dutton's cluster concept, see Coe, 2013.

[45] These cognitive capacities are evidently also frequently employed outside the context of art, but this is not a problem to the cognitive cluster account. As "there is no a priori reason why

intuitive applicability may be seen as a folk concept of art, analogous with similar evolved systems such as folk biology and folk psychology (2011).

This cognitive cluster account of art is applied to several instances of visual art, but is theoretically suitable to other forms of art. A cognitive feature such as the recognition of intentionality in creation is not necessarily limited to objects and could be extended to practices such as storytelling and music making, for example (e.g. Steinbeis & Koelsch, 2009). Yet intuitively, this account and its archaeological framework make it more suitable for utterances of visual art, and within this category, for object-based art as opposed to, for instance, pigment body decoration. Its more narrow application differs from the previously described general cluster account by Dutton, fitting a wide variety of art forms. They also differ in terms of their argumentative structure: while Dutton's more general cluster concept, along with others, does not clearly specify whether any, and if so, which and how many criteria are necessary to classify something as art, the three components of the cognitive cluster account are described as "required for art production and appreciation." (De Smedt & De Cruz, 2011a, p. 381)

Proposing that features such as intentionalist thinking, symbol-mindedness and aesthetic sensitivity are necessary features - i.e. they are required for the production, recognition and appreciation of artworks - does, however, bring along a priori statements about the origin of art. Stating, for example, that symbol-mindedness is a prerequisite for art, implies that the first art objects must have been of a symbolic nature. If symbolism were not a quintessential characteristic, art could have arisen equally well in the absence of symbol-mindedness in the cognitive repertoire of human ancestors. The burden of evidence is thus taken too lighty: it does not suffice to cite empirical evidence from developmental psychology in order to demonstrate the role of symbolic thinking in *some* kinds of art. Rooting this capacity in the cognitive cluster account warrants demonstrating that it is necessary for, in this case, the creation of the hypothetical first art object, albeit allowing the development of later art that is not symbolic. In addition, the proposed necessity of the aforementioned cognitive capacities implicitely assumes that new archaeological objects that are unearthed, are unable to modify the cognitive cluster, as this would mean that the structure of the cluster is in itself dependent upon the objects it

humans would not draw on cognitive capacities that are used in other domains," the capacities need not be specific to the creation, perception and appreciation of art. As a consequence, the objects we categorize as artworks also do not need to be regarded, and defined in themselves, as a separate kind, different from all non-artistic objects (De Smedt & De Cruz, 2011, p. 381) intends to classify by means of its predefined list of capacities. The recognition of these capacities is, however, often primarily based on archaeological discourse about particular objects, in turn used to support claims that the capacities are essential features of art. As a consequence, the cognitive cluster account is highly susceptible to circular reasoning on evolutionary concepts of art.

2.4. Whither art in evolutionary research?

2.4.1. First art and an evolutionary concept of art

In an elaborate discussion of the concept of first art, Davies indicates how many Western philosophical definitions of art are of a recursive nature: they make references to earlier artworks in the same tradition so as to establish the status of a candidate for art under consideration. Such references are made on different grounds. While some authors find concepts such as style to be crucial for mapping a historical and conceptual sequence of artworks, others point towards function, or artist's intent (Davies, 1997). Regardless of which particular feature is endorsed as a key for establishing such recursive definitions, they all encounter the same basic problem, which is to identify the 'first art': if subsequent artworks can be defined in reference to previous ones, it seems that such a chain of association must eventually have an unequivocal beginning. Despite several proposals, such a beginning seems difficult to pinpoint, leaving us guessing as to whether any of the recursive definitions proposed might capture the essence of art's origins.

Whereas philosophical approaches such as those mentioned above tend to focus on the concept of *first art*, evolutionary perspectives such as the cluster account attempt to formulate an *evolutionary concept of art*, which can then provide a conceptual starting point for evolutionary hypotheses. Within an evolutionary context - momentarily leaving aside philosophical approaches - first art can be regarded more specifically as the actual first utterance of artmaking, for example the first object of art in the archaeological record, however difficult or even impossible it might be to identify such an object. An evolutionary concept, in turn, is the more theoretical construct that can in principle be derived from any first art that is identified. This is, however, not necessary - such a concept can also be developed from theoretically based and empirically tested predictions about artistic behaviour and psychology.

The methodological tension between the archeological record and theory-based evolutionary concepts of art becomes clearer by looking more closely at the cognitive cluster account of art, which can also be seen as an attempt to address the problem of first art, this time by means of a bottom-up, abilities approach rather than a philosophical determining feature (De Smedt & De Cruz, 2011a). The cognitive cluster account is particularly interesting as it incorporates, contrary to philosophical approaches, the archaeological record that should contain the hypothetical first instance of art. This record contains the only material data available to inform present-day researchers about the roots of art. In addition, the historical perspective of evolutionary research would greatly benefit from anchoring in a material record what would otherwise be mostly speculative thinking on the behavioural and cultural repertoire of our ancestors (Mithen, 1996a). As such, leaving the archaeological record aside because of its interpretative difficulties, implies that we neglect an important source of information.

Yet even merely considering different possible candidates for the hypothetical 'first art' in the archaeological record is immediately complicated by our inability to determine whether this first art would have been an object or rather a performative practice such as joint singing or dancing, or a visual feature such as body decoration with ochre - none of which would leave clear traces in the archaeological record. In addition, even in the case of a focus on visual art, taphonomic processes can distort our archaeological window to the past. This appears to make it unadvisable to focus any attempt to identify a candidate for first art on an object-based record, and it would suggest that an evolutionary concept should be predominantly developed based on theoretical, evolutionary thinking on art. In the absence of a substantial, comprehensive and largely undisputed archaeological record, this seems to be the most solid framework to depart form. However, this quickly increases the chance that the matter of defining or delineating art will become circular: while there should ideally be an evolutionary concept of art before proceeding to an explanation of its origin, such a concept, if predominantly derived from explanatory hypotheses, is likely to be biased from the beginning by the particular hypothesis proposed.

2.4.2. The matter of traits

Developing an evolutionary hypothesis, whether it proposes a process of adaptation or not, needs to delineate its subject matter as clearly as possible in order to be able to address it as a replicable unit, i.e. as a trait or a characteristic, the variants of which can potentially become subject to selection if they differentially affect the survival and reproductive opportunities of the organisms involved. As a consequence, intuitive or very broad notions of art, such as the existing attempts outlined above, are generally at odds with the methodological requirements of evolutionary thinking on aspects of human behaviour. The need to identify replicable units that may or may not have a function therefore underlines the importance of giving extensive consideration to the matter of defining or delineating art within evolutionary research.

However, considering art as a biological trait - rather than approaching it from a philosophical perspective - does not make the argumentative burden for any particular concept or definition easier. The concept of 'trait' is difficult to define in itself, but can pragmatically be outlined as "(...) any aspect of the phenotype that can be discriminated on the basis of any criterion - its causes, its effects, its appearance, and so on (...)." (Andrews et al., 2002, p. 490) An adaptation can be regarded as a subtype of traits, or more specifically an inherited trait that evolved either through natural or sexual selection, enhancing the differential reproductive success of the organism that possesses the trait. In order to be functional, the trait must increase survival chances, in turn resulting in heightened reproductive success compared to others not possessing the trait. In order to be heritable, the trait must have a genetic basis (Andrews et al., 2002; Buss et al., 1998). Traits are not always adaptive, i.e. they do not always encompass a functional effect. They can instead be byproducts - non-functional spin-offs of adaptive traits - or exaptations - traits that acquired new effects, but that were not selected for this purpose (Andrews et al., 2002; Buss et al., 1998). The most well known evolutionary hypotheses of art propose that it evolved as an adaptation (Aiken & Coe, 2004; Boyd, 2009; Carroll, 2005; Coe, 2003; Dissanayake, 1995; Miller, 2001a; Tooby & Cosmides, 2001). Evidently, a behaviour such as artmaking cannot be reduced to one 'art gene' or a combination of several of such genes, nor should we underestimate the importance of looking at the different analytic levels involved, such as behavioural outcomes, cognitive processes and neural substrates.

But how should we think of art as an evolved trait? If its vast complexity does not allow us to arrive at universally agreed upon philosophical definitions, then it surely also doesn't enable us to clearly map it as a trait? Within the framework of an adaptive explanation describing art as a functional practice for identifying kin and establishing cooperative bonds, Coe (1992) attempted to provide a definition of art as a replicable unit, describing it as "color and/or form used by humans in order to modify an object, body, or message, solely to attract attention to that object, body, or message. The proximate or immediate effect of art is to make objects more noticeable." (1992, p. 219) This definition attempts to provide a basic account of art that does not involve highly interpretative features such as emotional effects and the involvement of creativity, as such features are often so heavily imbued with cultural meaning that they do not always translate across cultures. Its limitations are, however, immediately evident. Even if all visual art involves colour and/or form, we have no way of knowing whether such formal modification was *solely* meant to attract attention to a particular medium. This definition equally does not recognize the vast complexity of artmaking in human evolutionary history - even when merely considering visual art - which warrants us to take a different approach.

The issue of art as an evolved trait is not unlike the case of religion. This concept too is a highly intricate cluster of different behaviours, psychological processes and cultural practices, which makes it equally difficult to provide a succinct definition that can subsequently be used to develop evolutionary hypotheses (Sosis, 2009). Approaching it in a cluster-like manner (Boyer, 2003; Whitehouse, 2008), similar to the aforementioned cluster account of art, has many benefits, such as the ability to recognize that some constituent features of what we call 'religion' probably evolved independently at different times in evolutionary history. In addition to looking at composite features such as, in the case of religion, ritual, belief in an afterlife and supernatural agents, and sacred taboos, Sosis has suggested that we look at religion as an adaptive complex containing cognitive, affective, behavioural and developmental elements which can be studied as traits in themselves, and which may be the true replicable units, rather than religion as a whole (Alcorta & Sosis, 2005). A very similar line of reasoning applies to art. Regarding art as a complex allows us to acknowledge its vast complexity, to a greater extent then Dutton's earlier described cluster approach does. This view also recognizes intrinsic features of art itself such as style, social aspects such as art traditions and institutions, as well as the psychological experience of artworks, for example through imagination and emotional saturation (Dutton, 2006, 2009). If the same broad division is used as in the case of religion, art too can be understood as containing behavioural, cognitive, affective and developmental aspects, such as its practice in individual and social circumstances, its psychological foundations - expressed in both the creation and perception of art - emotional experiences by makers and viewers, which include aesthetic experiences, and its ontogenetic development among young children, sometimes followed by less or more formal modes of apprenticeship during adolescence or adulthood.

2.4.3. Towards a pluralist view of art in evolutionary research

But why should a composite account of art be more suitable than, for instance, a cluster account such as Dutton's that also takes the approach of identifying constituent features? To answer this question, it is useful to look more closely at an as yet unmentioned proposal in the debate on art's definition, which is art concept pluralism (Mag Uidhir & Magnus, 2011). Art concept pluralism implies that the most prevalent approaches for defining art, such as philosophical definitions or more naturalistic cluster concepts, are seen as monist approaches, or instances of concept monism. While, for example, Dutton's cluster account clearly tries to incorporate the pluralist nature of art - i.e. it tries to acknowledge the complexity of the universal phenomenon of artmaking, and the great difficulties in grasping this within a singular, essentialist definition - the eventual outcome is still a monist concept: the intent is still to map, though more flexibly than in the case of philosophical definitions, what 'art' is. As an alternative to this, art concept pluralism involves integrating the pluralist aspect in the concept itself, in addition to recognizing pluralism in art. It proposes that it is perhaps not necessary to pinpoint one definition, often containing an essentialist feature that is thought to truly define art. Instead, different concepts of art can be adopted and used for various analytic purposes, depending on which concept suits the particular research subject and goal the most. Mag Uidhir proposes that we can employ four different concepts, which are historical art (artworks as being part of historical traditions), conventional art (artworks as they are recognized by conventions and institutions), aesthetic art (artworks as enabling aesthetic experiences), and communicative art (artworks as media for communicating particular contents) (2011).[46] A very similar approach has been endorsed by Davies, who argues that the great difficulties involved in defining art appear to necessitate a more pragmatic, multistranded account that: "acknowledges the different ways in which something can qualify as art: something is art (a) if it falls under an established, publicly recognized category of art or within an established art tradition, or (b) if it is intended by its

[46] These concepts are useful for particular research paradigms, such as the historical concept for art historical research, and the aesthetic concept for cognitive studies about art perception and experience.

maker/presenter to be art and its maker/presenter does what is necessary and appropriate to realizing that intention, or (c) if it shows excellence of skill and achievement in realizing significant aesthetic or artistic goals." (2012, p. 28-29)

According to Davies, this characterization allows for considering cases of non-western art, as it doesn't exclude that different cultures may possess different artistic traditions, or different ideas about an artist's intent. The last condition is particularly relevant for including those cases of art where there are no clear historical precedents, such as 'first art' objects. In such instances, "skill and achievement take the place of intentions, traditions, and categories." (2012, p. 29) Davies acknowledges that these conditions are probably not able to capture all artworks, and to exclude all non-artworks reliably, but they may provide an initial outlook for understanding the subject matter of evolutionary theories (2012).

Both of these pluralist or multistranded proposals do not explicitely take an evolutionary perspective, but rather a more general, philosophical one. The account of art as a complex of different features provides an opportunity for extending art concept pluralism into the evolutionary realm. Depending on the precise research aim, the concept of art being used can shift from, for example, a set of behavioural practices when investigating its social functions within a group, to its psychological foundations when looking at the ways in which we cognitively perceive, process, and understand art. This pluralist approach brings to mind the often diverging focuses employed by authors taking different disciplinary perspectives. Whereas some, such as ethologists, think of art as a behaviour, others - notably evolutionary psychologists - award more attention to its cognitive components. This can cause confusion when attempting to compare different explanatory accounts, but should not necessarily be an issue when both of these features are seen as constituent elements of the overall complex of art, as well as both being central elements of different art concepts that can be chosen to be applied depending on the particular research question or focus.

Approaching art in a pluralist manner can also accommodate the archaeological record in ways that do not merely involve searching for objects or other kinds of art that might be the first artworks in human evolutionary history. If art is seen as a complex of different constituent features, some of these features may be empirically tested, for example, through experimentally investigating whether a particular cognitive process or function is involved in the creation of figurative representation, which can then be linked to corresponding patterns in the archaeological record. In addition, the pluralist nature of art itself can be studied by closely analyzing artefact patterns that persist over longer periods of time. Handaxes, for instance, originated as functional tools, but several strands of evidence appear to suggest that they might have acquired a new function within sexual selection, and became aesthetically elaborated objects in later phases (Miller, 2001a; Mithen, 2003; Wynn, 2002). If, however, a fixed concept of art is not a prerequisite, it is possible to regard these objects as developing from the purely utilitarian tools they once were into artworks in the later stages of their development, containing aesthetic, and perhaps even symbolic properties.

2.5. Concluding remarks

This paper reviewed current evolutionary attempts at defining or delineating art, and addressed methodological issues concerning the relationship between evolutionary concepts and the archaeological record, the matter of first art, and the contribution of concept pluralism. The existing evolutionary approaches discussed - operational distinctions, cluster concepts and cognitive cluster accounts - all contain difficulties that interfere with their overall applicability within evolutionary research. Adopting art concept pluralism, as well as recognizing the plurality of art itself by conceptualizing it as a complex of constituent features, rather than a singular unit, may provide a pragmatic alternative to these approaches. It was argued that the use of different concepts might be fruitful if considered in relation to particular research aims and the structure of evolutionary thinking in itself. Given the fact that evolution very often involves an intricate interplay of processes such as selection, adaptation and phenotypic modification, it seems counterintuitive at least, and counterproductive at worst, to try and pinpoint a steady definition of art, be it of an essentialist or a cluster-type nature. As a consequence, the concept of 'first art' might be less relevant within evolutionary research than it is commonly assumed to be in the philosophy of art. Maintaining 'first art' within an evolutionary and archaeological context implies that art rather suddenly came into existence around a time that we should, theoretically, be able to determine with more insight into the evolution of human cognition and culture, after a time when art was supposedly non-existent. Not only does this sound too simple in order to accommodate art's complex nature, it also presupposes and implies that there *is* indeed a clear definition of art that allows us to determine when it emerged - an option that was described in this paper as problematic. A pluralist account on the other hand, that draws from views of art as containing several constituent features, might provide a pragmatic alternative, and a new foundation for evolutionary research on art.

3

Cross-species comparison in the evolutionary study of art: a cognitive approach to the ape art debate

3.1. Introduction[47]

The 20th century has witnessed the development of a scientific debate that questions some of the most fundamental aspects of the presumed uniqueness of being human. The evolutionary origins of art have preoccupied numerous researchers, some of whom have argued that the key to explaining the emergence of our artistic behaviour lies in cross-species comparison, and in particular the study of nonhuman primates (Morris, 1962, 2013). The ape art debate does not only spark vivid aesthetic discussions, it also touches upon a number of philosophical issues. Its remarkable history and content are the result of decades of arguments going back and forth between primatologists, psychologists, philosophers and art critics. In general, this matter is broadly covered by two diametrically opposed perspectives. One constitutes a positive artistic appraisal, by what Lenain (1997) terms zoologists, of what nonhuman primates do when given painting or drawing material, as well as an aesthetic appreciation of their products. These researchers try to clarify the origins of art by pushing back in time its emergence, and by relating it to an aesthetic sense common among several species. The other perspective is that of the historians, and

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[47] This chapter was previously published under the same title in *Review of General Psychology, 18*, 263-272 (Seghers, 2014).

proclaims that ape art is a concept that originated in the mind of humans. In other words, the so-called artistic capacities of nonhuman primates are seen as a human construct.

In this article, I use a cognitive approach to shed a new light on the most notable empirical studies performed with chimpanzees during the 20th century. This approach will consist of outlining the main cognitive building blocks of the behavioural outcome of making art, and the aesthetic propensity to appreciate the result. These psychological features will be confronted with existing empirical studies on 'ape art' that describe nonhuman primate painting and drawing behaviour, so as to assess to what extent they correspond. The emphasis will be on visual art of an abstract nature. I argue that to categorize nonhuman primate painting and drawing as art, evidence must emerge that these animals possess a significant part of what is considered human artistic cognition. A cognitive perspective is likely to make a more objective contribution to the speculative nature of earlier research in the ape art debate. This analysis can also address the question whether painting and drawing among our closest living relatives is important for clarifying the origins of art in human evolution.

3.2. A history of the ape art debate

Most historical research on drawing and painting in great apes has been conducted with chimpanzees, in this case referring to the common chimpanzee species rather than the overarching genus also encompassing bonobos (Boysen et al., 1987; Iversen & Matsuzawa, 1996, 1997; Morris, 1962; Schiller, 1951; Smith, 1973; Tanaka, 2007; Tanaka et al., 2003). Other great ape species appear only seldom if ever in this debate, the most notable example being a gorilla named Sophie, who was studied during the 1950s. A few orangutans are also known to have been examined during the same decade. In addition, an early study documented coloured chalk drawing by a capuchin monkey, whereas a more recent examination of tufted capuchins revealed a variety of art-like behaviours (Klüver, 1933; Westergaard & Suomi, 1997). This article focusses on chimpanzees, as these make up the study population of almost all empirical research. In addition, their close phylogenetic relationship to humans makes them the most relevant species for assessing the ape art debate in relation to the evolution of art among humans.[48]

The art-like technique most commonly used in empirical studies is drawing, as this method, and especially the use of preexisting stimulus patterns, is most suitable for assessing whether chimpanzees possess any notions of balance, symmetry, and completion. In addition, other techniques such as finger painting, brush painting, and in later experimental work, electronic finger painting have been practised.

Researchers have used a variety of different methods for analyzing nonhuman primate paintings and drawings. Early studies, performed at the beginning of the 20th century, often employed observation and semiguidance of the behaviour of the animals (see, e.g., Morris, 1962; Schiller, 1951). Others sought a comparative psychological approach, looking for developmental patterns and cross-species differences and similarities in young chimpanzees and human infants (Kellogg & Kellogg, 1933; Kohts, 1935). In these studies, the aim was often not to explore the ability of art-making as such, but rather to investigate perceptual and learning abilities, which later yielded relevant information on the ontogenetic development of drawing in both species. More recent research consists of highly controlled experiments aimed at specific aspects of cognition, perception, and motor skills relevant in the context of painting and drawing (Tanaka et al., 2003; Tanaka, 2007). All of these methods provide little overall clarity concerning the phenomenon of ape art as a whole, and often raise a considerable amount of speculation as to how various behaviours should be interpreted. A cognitive approach might provide both an overarching framework and a solid scientific basis for reassessing painting and drawing in great apes.

Already in the 19th century, reports surfaced of nonhuman primates performing what seemed to be human-like drawing. Far from the results of deliberate teaching attempts by humans, these were actions undertaken by the animals themselves, and coincidentally observed by humans. Around 1875, the director of the Zoological Institute in Berlin noticed the attempts of a chimpanzee

[48] Taxonomically, the word 'ape', as used in the ape art debate, should include common chimpanzees, bonobos, gorillas, orangutans, gibbons, and humans, and should not incorporate capuchin monkeys. However, as nonhuman primate painting and drawing almost exclusively focuses on common chimpanzees, the word 'ape' is here taken to refer to this species. For a full overview of non-human primates engaged in painting and drawing studies up until 1959, see Morris (1962, p. 43–44).

to draw lines on paper with a pen, imitating the director's son (Lenain, 1997). Several decades later, actual scientific research emerged on what would later become known as 'ape art.' In Russia, Kohts (1935) conducted a lengthy investigation of the psychological and perceptual aspects of shape and colour with a chimpanzee named Joni. Not only did she compare the drawings of Joni with the artistic development of her own child, she also conducted similar studies with capuchin monkeys. She concluded that chimpanzees are considerably better than capuchins at developing their drawing skills and showing a certain progress, but that they seem to lack the capacity for progressing to the stage of representation, as occurs in human children. This was regarded as the point at which chimpanzee and child drawing abilities diverge (De Waal, 2001). The study done by Kohts is highly relevant as it demonstrated that chimpanzees too can make significant progress in their drawing abilities. Rather than remaining in the stage of boundless scribbling, Joni acquired greater visual and motor control, evident from the production of intersecting lines.

Kellogg and Kellogg (1933), known for their comparative psychological study The Ape and the Child, applied a range of standardized experiments to both their own infant son Donald and a young chimpanzee named Gua. When looking at the development of drawing abilities, they found that the child would spontaneously start to scribble when offered a pencil and paper, whereas the chimpanzee had to be shown what to do. Although Gua did eventually proceed to spontaneous scribbling, his drawings did not become imitative, contrary to Donald's, who mastered the copying of straight lines exemplified by the experimenters.

Perception research was also the starting point of Schiller, when he pursued the first systematic scientific study into ape art in the 1940s. A large amount of his work took place with a female chimpanzee named Alpha. By means of a range of blank and marked sheets, Schiller examined the ways in which Alpha responded to preexisting shapes. For example, he writes that "if the figure is near the middle of the sheet, it becomes a starting point or focal point for broad scribbling . . .. If it is off center, she tends to focus her scribbling in the largest open space . . ., producing a sort of balance between her markings and the presented figure. There is some reason to believe that this is a genuine tendency to balance masses in the total configuration" (1951, p. 104). In other cases, Alpha tended to fill out lighter shades more than darker areas. It is important to note that Schiller took the paper away after a maximum of 180 seconds. After this time, "her concentration on the figure diminishes and the whole sheet is eventually covered in scribblings" (1951, p. 109).

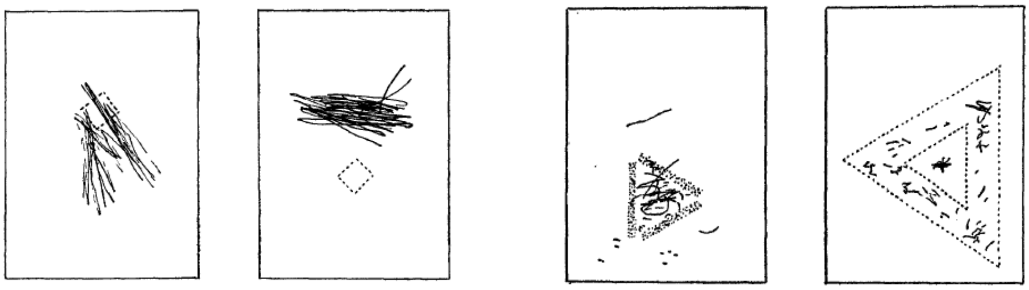


Fig. 36. Schiller: scribbling starting at a figure in the centre (left) and off centre (right), both of which took 10 seconds.

Fig. 37. Schiller: scribbling based on outline figures. Scribbling is contained within the outline (left). When the space between the inner triangle and the outline is widened (right), the two are treated as separate shapes, both filled with scribbling. (90s - 2 min.)

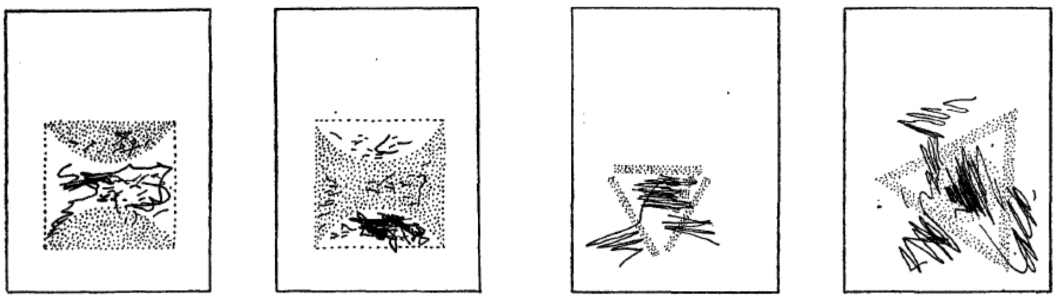


Fig. 38. Schiller: scribbling tends to take place on lighter areas. (90s - 2 min.)

Fig. 39. Schiller: symmetrical scribbling on a triangle. (15s - 30s.)

Morris's encounter with the chimpanzee Congo at London Zoo meant the offset of a long-term and comprehensive study on ape art, as well as one of the most vivid pleas for a true artistic status. His landmark book *The Biology of Art* documents a history of the ape art debate, as well as matters of composition, different methods such as pencil scribbling, finger painting, and brush painting, while also advocating the importance of apes in clarifying the emergence of art in human evolution (Morris, 1962). In addition, he arranged the first exhibition of ape art, which took place in 1957. Several of his findings elaborate on earlier studies such as the Alpha experiments done by Schiller, whose results are thoroughly compared with Morris's own experiments with Congo. He also teased apart the various formal features of ape painting and drawing, by distinguishing between composition - referring to, for example, concepts of balance, symmetry, and completion - and calligraphy—the creation of more general displays such as spirals or fan patterns.

In the following decades, several other systematic studies were conducted. Smith (1973) presented three young chimpanzees with a variety of stimulus patterns on paper to reassess the claims made earlier by Morris, for example with regard to balancing preexisting patterns and scribbles, and the closure of open figures. Boysen et al. (1987) undertook a similar study, largely confirming Smith's findings. Both of these analyses were conducted with the help of statistical methods, in contrast to the earlier intuitive assessment characteristic of Morris's work. Interestingly, one study specifically investigated the potential influence of subjective judgement versus quantitative methods by ordering two independent judges to consider all drawings as deliberately marked, balanced or closed. A comparison between their assessment and the experimenter's statistical analysis found that subjective judgement resulted in a much higher attribution of deliberate intent when scribbling (Smith, 1973).

In recent decades, primatologists have undertaken several experimental studies according to strict methodological guidelines, focusing on specific aspects of cognition and perception that are relevant for painting and drawing. Several of these studies have employed the method of electronic finger painting, which involves scribbling on a monitor. Iversen and Matsuzawa (1996, 1997) used this technique to test chimpanzee drawing ability in response to a line model provided by the experimenters, which resulted in copying behaviour by the chimpanzees without the verbal or manual instruction that was employed in earlier studies. In addition, the method of electronic finger painting proved to be particularly useful for infant chimpanzees, whose motor skills did not allow for handling drawing tools yet. A similar study by Tanaka et al. (2003) confirmed that electronic finger painting appears to be easier for younger animals, and suggested that the perceptual–motor control necessary for this kind of drawing is to be added to more advanced skills such as combinatory object manipulation, to enable instrumental drawing or painting on paper.

Tanaka (2007) also investigated whether chimpanzees are able to recognize novel photographic and nonphotographic images of flowers, such as sketches and cartoon-like figures, based on earlier seen photographs of flowers. The results showed that a period of learning is necessary for chimpanzees to recognize representational images, while juvenile chimpanzees appeared to be considerably better at the task of identifying different kinds of flower images compared to adults, suggesting the particular importance of an early learning period. One adult chimpanzee, who had previously acquired visual symbolic skills during earlier research also performed well, indicating a link between pictorial competence in recognition and the understanding of symbols.

3.3. Artistic cognition in the human species

Chimpanzees' phylogenetic proximity to Homo sapiens, along with a variety of striking behavioural observations of both wild and captive animals, has sparked a vivid and extensive body of research that investigates to what extent the evolutionary divide of around six million years truly makes for fundamental differences between humans and their closest primate cousins. Although purely anatomical traits can be investigated in a relatively objective manner, psychology and behaviour tend to require an important element of interpretation. Researchers have looked at a wide variety of topics, notable subjects being nonhuman primate tool use and elements of social learning and cultural differences (e.g., Whiten et al., 1999; Whiten, 2000), prosociality and altruism (e.g., de Waal, 2008), and the debated presence or absence in these animals of higher-order reasoning, comparable with the ability of theory of mind (ToM) (e.g., Tomasello, 1999). A recurrent question often refers to the matter of presumed human uniqueness: to what extent can we derive from any observed chimpanzee behaviour whether nonhuman primates rival humans in their cognitive and behavioural repertoire?

Among all possible traits to be investigated with regard to human and nonhuman primate similarities and differences, the creation and appreciation of art is probably among the most salient topics, as it is often widely regarded as the epitome of human culture. Even Morris, by far the most notable advocate of ape art, refers to art as "one of the most exciting ways in which we have manifested ourselves as a unique animal - … the complex activity we refer to as art … more than any other activity it has set us apart from other species" (2013, p. 10). Defining art has been and continues to be one of the most challenging topics in art historical and philosophical writings. Attempts to cover all artistic products of humans differ greatly according to disciplinary perspectives, philosophical propositions, and a range of intuitive or folk-based ideas. A cross-species comparative approach would naturally benefit from departing from a narrow Western perspective, and in this sense, attempts to define art cross-culturally may be relevant. For example, one might consider art to refer to a wide range of cultural products such as music, song, dance, stories, painting, sculpture, and so forth, compared with which Western fine art is merely "one species within a wider genus that also includes religious art, domestic art, and so on," as Davies notes (2006b, p. 224).

Folk concepts approach what we intuitively consider to be art, and have been captured by some authors in cluster concepts, which are groups of characteristics that are all related, but not necessarily limited, to art (Dutton, 2006, 2009; Gaut, 2005). According to Dutton for example, the cluster of art contains the following properties: direct pleasure, skill and virtuosity, style, novelty and creativity, criticism, representation, special focus, expressive individuality, emotional saturation, intellectual challenge, art traditions and institutions, and imaginative experience (2009). According to Gaut, "there are multiple criteria for the application of the concept, none of which is a necessary condition for something's being art. A criterion is a property, possession of which conceptually *counts toward* an object's falling under the concept" (2005, p. 273–274, original italics). In sum, cluster concepts allow for a common sense understanding of art as a crosscultural and transhistorical category, and it is this view, rather than an elitist Western perspective on art, that should be the starting point for a comparative psychological analysis.

Evidently, cross-cultural attempts at defining art do not equal a tool for cross-species comparison. The vast complexity of the subject already necessitates limiting the concept of art under consideration to one particular kind, such as visual art. This is the avenue taken in the present article. Second, it is precisely the interpretative nature of studying chimpanzee behaviour that severely impedes the use of an approach such as cluster concepts. Even among humans, determining the presence or absence of the abovementioned properties can be challenging, an issue that is even more apparent when attempting to observe the art-like behavior of other species.

The method in this chapter therefore consists of adopting a cluster approach, but one that is aimed at the cognitive capacities at the basis of art and its aesthetic appreciation, rather than looking at the characteristics of these behavioural traits in themselves. De Smedt and De Cruz (2011a) have developed such a cognitive cluster, looking at three abilities thought to be crucial for both producing and recognizing art: the concept of intentionality or the design stance, symbolism, and aesthetic sensitivity. Below, these components are briefly explained before proceeding to an analysis of existing empirical studies of ape art.

The relevance of a cognitive approach is suggested by the apparent fact that art is a universal human behaviour. When encountering art from other eras or cultures, humans worldwide often experience a remarkable kind of recognition, enabling them to appreciate different artistic forms, or a different aesthetics much the same way as they appreciate their own. Despite a common lack of contextual knowledge, they have little trouble realizing that they are dealing with art. It has been argued that our evolved cognitive structures and mechanisms transcend temporal and cultural boundaries, enabling us to acknowledge art on a fundamental level. Carroll refers to this as “an inbred capacity to detect the expressive behavior of our conspecifics as it is inscribed in the sensuous media of the traditional arts” (Carroll, 2004, p. 96). Here, this line of reasoning is extended to the question whether this inbred capacity may also transcend the boundaries of our species. The focus will be on the production of art-like results, rather than their appreciation or recognition as such.

3.3.1. Recognition of intentionality

Levinson has suggested that something is to be recognized as a work of art if its maker intended it to be related to earlier recognized art: “the agent in question intends the object for regard (treatment, assessment, reception, doing with) in some way or ways that what are acknowledged as already artworks, are or were correctly regarded or done with” (1993, p. 411). Bloom (1996) has extended Levinson’s intentional-historical concept of art to the domain of artifacts in general, and has provided support drawn from cognitive and developmental psychology. In his view, humans categorize artefacts based on the original intent of their maker. This kind of thinking about artefacts is governed by the ‘design stance,’ a term originally coined by Dennett (1987). The design stance refers to the tendency of looking at an object from the point of view of its maker, rather than focussing on the physical properties of the object in itself (Bloom, 1996). Gelman and Bloom (2000) have shown experimentally that study participants only tend to regard objects as works of art when they are told the objects in question were deliberately created as such, while this response is not present when the same objects are described as the result of unintentional processes. Similarly, neural activation patterns in response to music differ greatly according to the presumed origin of the sounds. Only when described as the deliberate product of a composer, in comparison with being computer generated, does the same piece of music activate brain areas associated with the attribution of mental states and intentions (Steinbeis & Koelsch, 2009).

3.3.2. Symbolism

The evolutionary origins of art are often associated with the emergence of symbolic cognition (e.g., Henshilwood & Marean, 2003; McBrearty & Brooks, 2000 for archaeological overviews). A considerable amount of discussion has been generated as to what we should understand by a symbol. DeLoache has offered a broad psychological and empirically supported definition, arguing that "a symbol is something that someone intends to represent something other than itself" (2004, p. 66). A more refined, archaeologically based definition comes from Peirce (1932/1960), who distinguishes between icons, indexes, and symbols, the latter being defined by an arbitrary relationship between a feature and what it refers to, compared with the other concepts which are based on formal resemblance and association respectively. Whereas Peirce's typology of signs would regard figurative depictions as primarily an example of icons, evolutionary research on art typically links symbolism to the emergence of representational art. In this sense, Upper Palaeolithic cave paintings and mobiliary art are often said to be the first unequivocal proof for the presence of symbolic cognition (e.g., Davies, 2012; Deacon, 1997).

3.3.3. Aesthetic sensitivity

An important distinction is to be made between art-making in itself and an aesthetic sense, or the ability to enjoy works of art, other objects, natural environments, and so forth. Darwinian or evolutionary aesthetics investigates the nature of animal—including human—decision-making with regard to the qualitative properties of what is judged. The mental experience of beauty evolved as a mechanism to help an individual choose fitness enhancing environments or conspecifics for successful reproduction (Thornhill, 2003). The aesthetic sense therefore spreads out far beyond the human species, as countless species are confronted with the same basic survival issues. Assuming that nonhuman primates and other animals possess a sense of beauty, does not however automatically imply that artmaking in itself is a cross-species phenomenon. With regard to artistic cognition as a whole, aesthetic sensitivity is to be regarded as a central feature: it captures our attention and enables our persistent attraction to works of art. This is neurobiologically explained by an evolved system of neural reward mechanisms in the brain, which cause us to feel good whenever we perceive something which may enhance our fitness level (Berridge, 2003; Lacey et al., 2011).

3.4. But is it art?

3.4.1. Recognition of intentionality

As was stated earlier, the design stance refers to regarding an object from the perspective of its maker, and the intentionalist theories of Levinson and Bloom suggest that we presume intentionality to be a fundamental criterion in the creation of artifacts in general, and works of art in particular (Bloom, 1996; Levinson, 1993). This implies that the artist must possess a mental representation of the work of art intended to be the final result. Empirical evidence supporting a similar cognitive process among chimpanzees is scarce to nonexistent. Findings such as those of Schiller (1951) do point out that chimpanzees like Alpha have a notion of completion to some degree, as she was observed to be filling gaps in accordance with preexisting shapes. This could be interpreted as an attempt to continue the original markings to achieve a completed shape, which would mean that Alpha had a concept in mind of what the finished figure should look like. However, different authors report behaviour that seems to indicate a lack of concern with the final result, or with creating an enduring work of art. Although chimpanzees apparently enjoy the act of drawing and painting, they often stop showing interest, and have been observed to destroy their work by tearing up the paper (De Waal, 2001; Schiller, 1951). In addition, they have been known to eat their chalk and crayons, rather than drawing with them (Lenain, 1997; Schiller, 1951).

The intentionality and design element of human art-making implies not only ideas about embarking upon creation, but also where to finish. Even though an artist often does not have an exact idea about what the final work of art should look like, the intent to eventually arrive at a finished result is generally present at different stages of creation. No convincing evidence of this has emerged from empirical studies with nonhuman primates. In many cases, human researchers and caretakers have been known to take a drawing or painting away, often to avoid eventual destruction by the ape. As a result, ape paintings might look like abstract art, while in reality an experimenter has taken the work in progress away as soon as the ape has done enough to mimic human abstract art (De Waal, 2001). A large part of the ape art debate therefore appears to be governed by human, rather than ape, concepts of completion, and the more or less delineated act of creating a work of art.

Some counterevidence for this has been put forward by Morris, who reports on Congo resisting to his paintings in progress being taken away, or refusing to continue a painting once he had put down his brush (Morris, 1962). However, one should be cautious with interpreting this as protest because the paintings supposedly weren't finished. These rare observations do not account with much more frequent findings that attest to an overall lack of interest in the final result, varying from abandonment to destruction. A fundamental difference between humans and apes is therefore that, in the latter case, "it does not appear to be a means to an end" (De Waal, 2001, p. 174).

3.4.2. Symbolism

None of the empirical studies that have been performed with nonhuman primates have produced any representational painting or drawing. For example, Kohts (1935) remarked that the onset of representation in the drawings of her child was the eventual point of divergence between the child and the chimpanzee. Although she did note that the chimpanzee appeared to be making improvements in abstract drawing—Joni gained an understanding of line intersection— a transition into representational drawing did not occur. If actual figurative representation is taken to be clear proof of symbolism, the aforementioned empirical studies suggest that chimpanzees possess no such capacity. Here, the issue naturally arises that a symbol does not necessarily have to bear physical resemblance to what it refers to (DeLoache, 2004). Therefore the absence of representation in nonhuman primate painting and drawing does not fully exclude the possibility that these animals might possess symbolic cognition, albeit in a less elaborate way than human beings.

Arguments in this direction have been developed from the perspective of language research (Savage-Rumbaugh et al., 1978; Savage-Rumbaugh, 1986). Other studies, for example on the representation of number concepts, are less forthcoming in the attribution of symbolic cognition (Matsuzawa, 2009). The aforementioned study by Tanaka (2007), which showed that some chimpanzees can be taught to recognize both novel photographic and nonphotographic pictorial representations, is also relevant in this regard. The case of Ai, an adult chimpanzee who had previously been taught visual symbolic skills and who performed well on the recognition tasks, supports the possibility that chimpanzees do appear to be able to acquire symbolic concepts. Although Tanaka's study did not involve the actual production of flower images by the animals, the fact that already present symbolic skills ease the recognition of representations does indicate that an understanding of representations and symbols are developmentally linked.[49]

In sum, the absence of representation does not prove the absence of symbolism, but the nature of ape painting and drawing also doesn't raise any other arguments in favour of symbolic content. This limit to what can be inferred from these works also causes several important questions to remain unanswered. For example, the drawings and paintings produced do not allow for deductions concerning imagination as a cognitive process that might be present during their creation. One could argue that the presence of representation would be suggestive of the presence of imagination as well, but the absence of the former doesn't automatically imply a lack of imaginative ability, as both are not necessarily linked. However, if imagination were absent during the art-like behaviour of chimpanzees and other great apes, this would imply less cognitive involvement compared to humans, indicating a major difference between painting and drawing among the members of these species and our own.

3.4.3. Aesthetic sensitivity

Several authors have reported observations that seem to support a sense of aesthetics among chimpanzees. According to Schiller (1951), Alpha showed a concept of symmetry and balance when she drew on all three sides of a triangle, opposite the lines as well as in the empty middle of the shape. In other instances, she scribbled across the whole surface of the paper when it was left completely blank by the experimenters, but kept away from the margins and corners when a small figure was presented in the middle, closer to either the top or bottom of the paper. In this case, she filled the blank space opposite the shape, suggesting that she might have tried to balance out the figure already present. As for completion, mixed results emerged from Alpha's drawing behaviour. Several different stimulus patterns were presented with the aim of testing whether the chimpanzee would fill a missing part of a shape or complete an outline, but only missing dots in the contour of a shape appeared to elicit a completion response.

[49] For a thorough discussion of pictorial competence in great apes, see Persson (2008).

Morris (1962) performed an equally wide range of composition tests, and found that some of Schiller's findings were confirmed, whereas others were not, or seemed to reoccur only in a few cases. In addition, he debated some of the outstanding issues concerning balance and completion. For example, when investigating the matter of true balance versus space filling, he found that space filling appears to be the mechanism at work when a stimulus figure is clearly positioned off centre, creating a large open space. However, if a stimulus was only slightly offset, the empty space didn't dominate the paper, and Congo appeared to produce genuine balanced scribbles that were equally offset, in the other direction than the original stimulus figure.

The extent to which chimpanzees truly choose where to mark based on an aesthetic understanding of balancing out preexisting shapes remains unclear. Although the findings by Schiller and Morris appear to demonstrate so, critical questions have been raised as to their interpretation. For example, Smith (1973) only found inconclusive evidence of balancing—true symmetrical balance seemed to be present in only a few instances—and no evidence that the chimpanzees in his study tended to complete preexisting shapes. Boysen et al. (1987) reached the same conclusion about closure and balance not being consistent features of ape drawing. A bimodal distribution of markings, interpreted by Morris (1962) as rough balancing, might merely be attributable to the chimpanzees filling the empty space without a particular concern with balance or symmetry.

The matter of colour preference is also undetermined. Schiller (1951) noted no significant differentiation of crayon colours by Alpha, except for a slight preference for brighter colours such as red, orange, and yellow. She merely kept scribbling in the same location when handed another crayon, and didn't distinguish between different colours on various parts of the paper. Recent experimental work by Tanaka et al. (2003) made use of a touch-screen monitor, whereby infant and adult chimpanzees were allowed to make finger-drawings with six colours of electronic ink, including a control condition with white ink against the white background of the screen. Chimpanzees could not choose between various colours as only one colour was used during each experimental session, but a colour preference, if present, could be deduced from a tendency to draw more strokes during sessions with a particularly appealing colour. No such a preference emerged, except for a not surprising, significantly higher interest in all five colours compared with the white, invisible ink. Morris reported a slight preference by Congo for red and orange, similar to what Schiller found, but recognized its relatively weak role. In addition, he pointed out the methodological difficulties in assessing colour preference, which became evident when Congo was offered six colours of paint a the same time. "On those occasions where it was attempted, Congo was given the six colors in a tray of six dishes... Upon being given a brush he proceeded, each time, to mix the colors together until all the dishes contained a uniform muddy brown. Only then would he show any interest in painting" (1962, p. 54).

In sum, the evidence in support of an aesthetic sense in chimpanzees is mixed. Neither colour preference nor formal concepts such as symmetry, balance and completion are to be regarded as constant properties of ape painting and drawing. The pieces of evidence in favor of chimpanzee aesthetics have been interpreted as displaying the seeds of the human aesthetic sense (De Waal, 2001; Morris, 1962), but others have stated that a more parsimonious explanation applies: nonhuman primates are perhaps merely engaging in exploration and play rather than actual artistic behaviour, and although they do respond to the visible effects of their markings, the resulting drawings and paintings are very likely based on elementary phenomena of visual perception, such as figure-background distinction, without having to invoke the presence of an aesthetic sense (Boysen et al., 1987; Smith, 1973).

3.5. Discussion: the relevance of ape art for the evolution of art and an aesthetic sense among humans

The above analysis confronted empirical studies on nonhuman primate painting and drawing with cognitive views on human art-making, assuming that ape art does not truly qualify as art unless considerable parallels between human and nonhuman primate cognition can be drawn. Having reviewed the evidence for intentionality, symbolism, and aesthetics in chimpanzee painting and drawing, the former appears to be absent, whereas the latter two are debatable. The presence of symbolic cognition seems to be only circumstantially supported, almost exclusively by referring to other research such as studies in the field of language acquisition, where a seemingly innate basic symbolic potential is extensively trained, strengthened, and expanded (Savage-Rumbaugh, 1986). As was already pointed out, the absence of representation does not unequivocally demonstrate the absence of symbolism as well, but neither do any clear indications of symbolic cognition arise.

This leaves aesthetics as the most fruitful avenue for further research into the nature of the ape art debate. De Waal has argued that the empirical studies on ape art demonstrate that humans are not the only species that enjoys "self-created visual effects," which suggests that a sense of aesthetics probably has relatively old roots (2001, p. 175). If this capacity were to date back to the common ancestor of humans and chimpanzees, this would mean that it is at least five to six million years old. However, elaborate research has been done with regard to behaviors in several bird species, equally suggesting an aesthetic consciousness, or the ability to discriminate between different degrees of beauty. The most famous example in this regard are bowerbirds, native to Australia and New Guinea. As part of their mating strategies, males construct large and complex bowers consisting of natural elements as well as a range of artificial colored objects found in their environment. These bowers are often symmetrical and impressive in size relative to the size of the birds. They are made solely for the purpose of attracting mates, and the effort taken in making them visually distinctive suggests that the female birds must possess a basic capacity of aesthetic discrimination, to be able to decide which male produces the most beautiful bower, and is likely to be the best suitable mate (Miller, 2001). An example such as this one indicates that an aesthetic sense is not limited to the human species, leaving the possibility open that nonhuman primates possess this capacity as well.

Neurobiologically, the apparent presence of a basic aesthetic sense can be explained by referring to neural rewards, associated with pattern recognition. Formal features that ease sensory information intake and cognitive processing should logically be preferred during perception to make sense of the constant input of stimuli in the brain. Humphrey has proposed the following link between aesthetics and information processing: "considered as a biological phenomenon, aesthetic preferences stem from a predisposition among animals and men to seek out experiences through which they may learn to classify the objects in the world about them. Beautiful 'structures' in nature or in art are those which facilitate the task of classification by presenting evidence of the 'taxonomic' relations between things in a way which is informative and easy to grasp." (Humphrey, 1973a, p. 432)

Morris cites a study by Rensch, who compared two monkey species and two bird species in their reaction to regular versus irregular markings, and found that all four tended to respond more to the regular markings, which could be interpreted as an aesthetic preference for regularity. According to Morris, such a preference shouldn't be limited to perception: "The vital words here are: steadiness - symmetry - repetition - rhythm. These are the basic factors that appeal to the eye and that also appear when, instead of merely selecting ready-made patterns, they are actually being created. There is, so to speak, a positive reaction to order rather than chaos, to organization rather than confusion" (1962, p. 161). Gazzaniga (2008) has argued that higher primates, among which humans, are especially prone to more sophisticated patterns such as symmetrical or rhythmical displays. The close phylogenetic relationship between humans and chimpanzees might be one of the main reasons why similarities between both species become readily apparent, despite the abovementioned issues when interpreting what is observed.

In sum, it is likely that chimpanzees, and possibly other nonhuman primates, possess a basic sense of aesthetics. This capacity, along with the fact that chimpanzee and human visual cognition largely coincide, can adequately explain the results emerging from the empirical studies, without having to invoke the category of art.

Given the consideration that several elements of nonhuman primate painting and drawing remain questionable matters, yielding both arguments in favor of and against an equation with humans, the subject matter might benefit from more advanced comparative cognitive psychological analysis. The capacity for symbolic thinking in particular appears to be a matter of debate. A possible avenue for further research would be to explore symbolic cognition in relation to metarepresentational thinking and the ability of decoupling, both of which are closely linked to theory of mind (Leslie, 1987). According to Leslie, metarepresentations are second-order representations of primary, reality-based representations. The human mental capacity to decouple primary and secondary representations avoids the risk of so-called "metarepresentational abuse," where representations at both of these levels become mixed-up. If present and successful, metarepresentational ability enables theory of mind, which is the cognitive ability to understand other people's mental states, intentions, goals, desires, and emotions. It is thought to be one of the cornerstones of empathy and social cognition (Baron-Cohen, 1999). This capacity also appears to be particularly relevant for the production and understanding of fictional art, such as stories or nonveridical representations, as this kind of art requires frequent mental shifts between characters, as well as an abstract understanding of events that do not, or only in part, correspond to real life.

The empirical studies discussed in this article provide no reasons to assume that paintings and drawings by nonhuman primates contain fictional representations, which seems to obviate the need to consider metarepresentational and decoupling ability, or theory of mind in relation to ape art. But apart from fictional art, these abilities are thought to be at the basis of symbolic play. Investigating their presence, for example through testing the theory of mind abilities of chimpanzees (e.g., Tomasello, 1999), might therefore substantiate the present preliminary conclusion about the likely absence of symbolic cognition, or on the contrary, provide new insights into the presence of symbolism in ape art.

An interesting case study would be to make a comparison between the art-like products of chimpanzees and those of savant artists, who often have severely impaired theory of mind abilities (Humphrey, 1998). Previous research has found that in the case of individuals with an autism spectrum disorder, drawing abilities in themselves are often fully in place, with some notable cases of exceptional talent (Scott & Baron-Cohen, 1996; Selfe, 1977). Developmental issues with theory of mind therefore do not automatically result in difficulties in producing representations, but in developing metarepresentations, which are necessary to create imaginary or fictional drawings or paintings. This can also be traced back to a lack of conceptualization, or the production of images based on a mental concept of what is depicted, rather than its visual resemblance to the external world (Humphrey, 1998). In the case of chimpanzees, not only secondary metapresentations are absent, but primary ones too. However, both savant and chimpanzee drawings and paintings are considered by some to be art, which raises new questions as to the central place of even primary, figurative representations in a definition of art.

Apart from through an elaboration of the cognitive apparatus examined in relation to visual art—of a human or nonhuman nature—yet other insights might be gained through extending the subject matter from purely visual expressions to other art forms such as music. Previous research has indicated that nonhuman primates such as chimpanzees may possess an inclination to produce rhythms (Hattori et al., 2013), whereas variety in some primate species' vocalizations can be traced back to different emotional states (Hauser, 2001). Both of these could be regarded as basic components of music, at least in an evolutionary sense as they can be likened to earlier, premusical stages described for human history (see, e.g., Mithen, 2005). Evolutionarily, music may have followed trajectories that were significantly different from the emergence of visual arts. Coinciding with this, the cognitive and perceptual foundations and mechanisms at the heart of music are likely very different from those involved in visual representations, or visual art. A thorough assessment of music-like practices among nonhuman primates, potentially also focussing on chimpanzees so as to achieve a delineated subject sample for comparative, cross-species analysis, may well lead to a different conclusion in terms of the applicability of the term 'music' outside the human lineage.

The artificial nature of ape art studies also yields an interesting avenue for assessing the naturalness of art-like behaviour. All empirical studies have been performed with apes kept in captivity, many of which have taken part in other research as well. Similar behaviour has not been reported for wild chimpanzees. Although this is evidently also explained by the absence of drawing and painting materials in nonexperimental conditions, one might expect to observe a basic kind of art-like behaviour as registered in captive chimpanzees, perhaps using natural tools, if such behaviour belonged to the instinctive repertoire of nonhuman primates.

Several authors do report that their experimental subjects tended to engage in painting and drawing without receiving any food rewards, and the willingness to do so demonstrated by the chimpanzees does suggest an intrinsic interest in these activities (Boysen et al., 1987; Schiller, 1951). However, caution is necessary in interpreting these observations. Morris has stated that "the aesthetic aspect of picture-making" is shared between humans and chimpanzees, which might be true considering the apparent presence of a basic sense of aesthetics in chimpanzees, but this doesn't equal the statement that both species also have in common "an inherent need to express themselves aesthetically." (1962, pp. 148, 151) If this were true, one should indeed expect to observe similar art-like behaviour in wild chimpanzees. Spontaneous emergence of a behaviour in an individual's lifetime seems particularly relevant given the fact that this has been described as a criterion in favor of the adaptiveness—and therefore functional importance—of art for humans (Carroll, 2005). The interest witnessed in chimpanzees is most likely to be explained by what was already described by Boysen et al. as an "intrinsic interest in exploratory and manipulative play." (1987, p. 82)

On a final, philosophical anthropological note, the ape art debate is especially relevant for considering the relationship between human and nonhuman primates. The fact that nonhuman animals reach into the ultimate realm of human culture—the world of art—is sufficient to elicit fierce responses by those displaying adverse reactions, as well as by proponents. Several of Congo's paintings have been auctioned for large sums of money, which means that chimpanzees are regarded, by at least a small group of admirers, as actual artists withstanding the competition with many human artists.

The responses in favour of ape art might be significantly influenced by a tendency to anthropomorphize our closest living relatives. For example, the energy that is evident from some works of ape art, especially paintings, has been taken by some to express an innate aesthetic drive, although this apparent forcefulness is probably merely attributable to the greater physical strength typical of chimpanzees. The recurring 'fan pattern' for example - a set of lines that widen starting from the bottom center of the paper - has been subject to extensive analysis. Describing Congo's actions, Morris writes that the "original, simple fan pattern had now become a complex one. Every line was carefully positioned in relation to every other line, and the whole composition was designed to fit into the space available for it, and also to fill that space ... Each time he would explore some new variation. He created a lop-sided fan, a subsidiary fan, a fan with a curved base, a split fan with a central yellow spot, a split fan with a central back spot and a split fan with a central blue mark. He was enjoying that most human of aesthetic games—thematic variation" (2013, p. 36, 37). According to De Waal (2001), these fan patterns can easily be explained by the relatively limited motor control of chimpanzees compared with humans, rather than being a formal, intended pattern in itself. In this view, thematic variation is presumably absent.

In yet other instances, the art-like behaviour under consideration is judged and described in a language that is more suitable for philosophical approaches to human art. For example, Lenain (1997) describes the products of nonhuman primates as visual disruption, through repeated probing and eventual destruction of the empty space present on the paper. He observes one of the crucial distinctions between primate and human art-like behavior to lie in the difference between "formal conscience" and "creative conscience" (1995, p. 210). Whereas the former refers to responding to given elements in a field, the latter corresponds to creating, modifying, and adapting a pictorial field with a specific aesthetic purpose in mind. The second of these is the kind of conscience typically associated with human art-making, and according to Lenain, this is one of the points where chimpanzees and other nonhuman primates fall short. In addition, he discusses that ape painting never appears to result in the combination of different individual elements in a second- or third-order formal set-up, such as sequencing elements of a pattern, or alternating different patterns to create a motif, but remains at a one-level operation of, for example, marking a preexisting shape (Lenain, 1995).

Proponents of the art status of nonhuman primate painting and drawing might argue that departing from human art and artistic cognition a priori eliminates the chimpanzee's chance of being recognized as a peer. Based on this consideration, we should refrain from using ourselves as the point of reference.

However, human art is the only possible beginning for attempting to assess a possible parallel in other species, and the ape art debate as a whole is built on human concepts of art and aesthetics. Trying to avoid human influences during the analysis of paintings and drawings would therefore undermine its very existence.

3.6. Concluding remarks

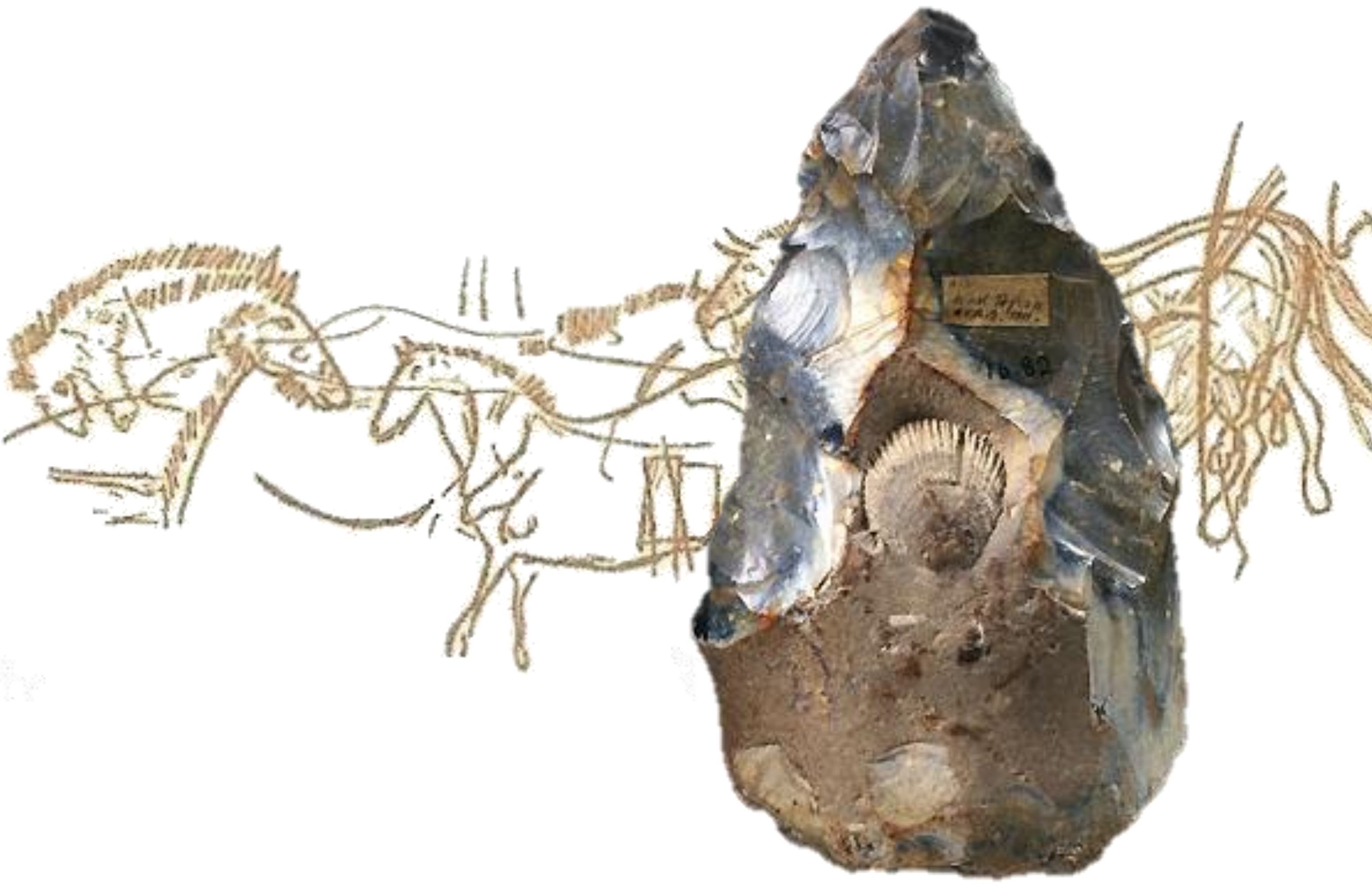
This chapter has aimed to investigate the question of the extent to which paintings and drawings made by other great apes, and chimpanzees in particular, should be considered to be works of art, based on a cognitive outlook on human artistic practice. Depending on the result of such an analysis, one can determine whether nonhuman primate behaviour may shed light on the origin and functions of human art-making. Authors in favour of the idea that chimpanzee paintings and drawings enlighten us as to art's origins, such as Morris (1962), have stated that the art-like behaviour observed among nonhuman primates is a clear indication that the roots of artistic behaviour and aesthetic consciousness predate the split between humans and our closest primate cousins, chimpanzees. For this claim to be true, the painting and drawing behaviour observed among nonhuman primates should correspond at least in part to the cognitive machinery at work when humans create, perceive, and enjoy art. The method in this article therefore has consisted of breaking down artistic behaviour into several cognitive capacities responsible for various parts of the process of creating and understanding art. These were the recognition of intentionality, symbolism, and an aesthetic sense. No convincing evidence emerges from the aforementioned empirical studies that the former two capacities, typical of human artistic cognition, are also present in the chimpanzee mind. The aesthetic sense, however, appears to be, at least in a basic version, at work during painting and drawing. De Waal is therefore probably right in concluding that "the evidence, then, is that painting apes have a sense of both balance and completeness, enjoy the visual effect of what they do, and create regularities and patterns, but are not out to produce a lasting product" (2001, p. 173).

If human and chimpanzee artistic cognition coincide only slightly, it is unlikely that the latter's products should be labeled as art. Because art is not a characteristic shared among both primate species, this also almost certainly means that it wasn't a part of the behavioural repertoire of the last common ancestor of humans and chimpanzees, as Morris (1962) suggests. In addition, if no significant arguments, such as relevant selection pressures, exist in favour of the idea that chimpanzees could have developed artistic skills after their split from the human lineage, the only conclusion is that art is indeed uniquely human.

However, this does not mean that studies on ape art should be dismissed. In addition to discussing the question of artistic skill and an aesthetic sense, they also contain rich sources of information on a variety of topics such as learning and imitation behaviour— as this has been reported for chimpanzees in response to both humans and their own conspecifics—the ontogenetic development of motor skills and object manipulation in infant chimpanzees, and their visual perception mechanisms. In addition, as the aesthetic sense appears to be common to both species, it is important to explore this part of the ape art debate further. If an aesthetic sense does indeed belong to the chimpanzee mind, it is likely, and desirable, that our primate cousins will help us uncover our early human past.

PART II

Cognitive archaeology



Introduction to Part II
Cognitive archaeology

Wynn, one of the foundational figures in cognitive archaeology, describes archaeology as "a set of methods for reconstructing past action from traces that exist in the present." (2002, p. 389) Performing such reconstruction entails a vast range of methodological challenges, especially because of the often very fragmented and biased archaeological record that comprises most of the available information pertaining to our ancestors' behaviour. This behaviour, of course, includes the practice of artmaking. The perspective of cognitive archaeology attempts to partly remedy this predicament by making use of the analytical level of cognition. It inquires whether, in addition to attempting to reconstruct past behaviour, archaeology may also prove to be an informative source about the evolution of human cognition. This can be achieved in two ways (Wynn, 2002). The archaeological record can help us to find material indications of the development of particular cognitive capacities, and it can provide at least a partial, hypothetical evolutionary framework. The latter is especially relevant when archaeology is thought of as not only encompassing a record of behaviour, but also a palaeoanthropological record of the human evolutionary lineage. Cognitive archaeology is a symbiotic undertaking, which means that archaeology and cognitive science exert a mutual influence on one another. While archaeology can contribute greatly in assessing the evolution of cognitive traits, as was described above, insights from cognitive science can in turn assist us in interpreting particular objects, or entire sequences and patterns in the archaeological record (Renfrew, 1982).

De Beaune endorses a similar methodological outlook for cognitive archaeology. Starting from objects, “we can query about the emergence conditions of these material and ‘symbolic’ productions and ask why only the human species could develop it. If we admit that they reflect a modification of cognitive skills, then it is advisable to wonder of what these capacities consist.” (2009, p. 1) Additionally, we can “seek to understand the conditions that led to the installation of a variety of cognitive processes during evolution.” (2009, p. 1) This can include, for example, assessing whether such cognitive change can be brought about by internal reorganization within the brain or by performing new functional behaviours with existing cognitive machinery. This question can also be framed within evolutionary perspectives, such as when certain new climatological or socioecological circumstances bring about new selection pressures that eventually result in cultural and artistic innovation. As such, the methodology of cognitive archaeology might be particularly useful for determining the timing and relevance of cognitive elements within evolutionary explanations.

Clearly, cognitive inferences from the archaeological record are heavily dependent upon its state and completeness. Preservation issues, and resulting biases in the archaeological record, are particularly salient when it comes to the earliest traces of art. These date back to some 100.000 years BP, in the form of geometric mark-making on different materials, such as ochre, stone, bone, and eggshells. While it is not entirely clear whether these artefacts qualify as the first currently known instances of art, they are almost unequivocally endowed with the appearance of symbolic thought in the human cognitive repertoire. Chapter 4 examines claims as to the potential symbolic meaning of these artefacts. While the interpretation of these early instances of mark-making as evidence of symbolism is fairly debated, the same cannot be said for the figurative imagery of the Upper Palaeolithic. Here, intepretations in terms of fully modern cognition are almost unequivocally accepted, and the paintings of sites such as Chauvet and Lascaux are heralded as the first undisputed evidence of art in human history. Chapter 5 critically approaches these assumptions by exploring an alternative explanation. Following up on earlier, yet isolated ideas in archaeological scholarship in prehistoric art, this chapter assesses Upper Palaeolithic figurative imagery in terms of the information it yields about the capacity of metarepresentational thought. For both of these chapters, the conclusion converges on the finding that inferences as to the breakthrough of fully modern cognition are perhaps too easily made. Finally, the last chapter in this section addresses recent but controversial findings as to the manufacture of art by other, non-sapiens species such as Homo neanderthalensis and Homo erectus. It explores the complex interrelationship between cognition and behaviour within a wider framework of recent theoretical developments in palaeoarchaeology, assessing whether the link between cognition and culture is as sound as it is often presented.

4

Symbolism and the nature of art: the case of geometrically engraved artefacts

4.1. Introduction[50]

Figurative art from the European Upper Palaeolithic, the earliest findings of which are dated to around 35.000 BP (Conard, 2009), is traditionally regarded as the first unequivocal example of art in human evolution (e.g. Davies, 2012). It is not only commonly seen as the hallmark and defining outcome of the emergence of symbolic thinking among human ancestors, but also as the beginning of the history of art. Recent archaeological surveys of sites across the world, in particular from the African Middle Stone Age and the Near Eastern Middle Palaeolithic, have yielded a range of artefacts that display geometric mark-making, determined to have been intentionally added to the object, and dated to between 100.000 and 50.000 BP. These findings have been interpreted by some palaeoarchaeologists as encompassing the true roots of symbolic cognition, thus far preceding the until now greatly emphasized record of figurative art. They are said to be the carriers of as yet

[50] Parts of this research were previously presented at the European Human Behaviour and Evolution Association (EHBEA) annual conference at the VU University Amsterdam in March 2013, the 1st International Conference: Cognitive Futures of the Humanities at Bangor University, Wales, in April 2013, and the Summer School on Neuroarthistory at the the University of East Anglia, Norwich, in July 2013.

undetermined, but meaningful symbolic content, which in turn is sometimes taken as an argument that they might constitute the first currently known objects of art.

Others have pointed out that this presumed symbolic nature mainly relies on assumptions and conjectural lines of reasoning, rather than on solid interpretative or empirical foundations (e.g. Hodgson, 2014; Mellars, 2005). This chapter investigates the arguments provided in favour of endorsing symbolic explanations for a number of notable cases, framed within the classical account of the behavioural modernity debate in Palaeolithic archaeology. Secondly, it explores alternative, non-symbolic interprations based on evolutionary and neurocognitive insights, before ultimately returning to the behavioural modernity debate in itself. Reconsidering its premises and the relative role of the explanatory variable of cognition, appears to suggest that so far, the interpretation of the artefacts as both symbolic objects and artworks has been strongly dependent upon cognitivist views within this debate.

4.2. The behavioural modernity debate in Palaeolithic archaeology

4.2.1. The nature of behavioural and cognitive modernity

Before examining the geometrically marked artefacts this chapter is concerned with, the larger-scale theoretical debate on the advent of behavioural modernity warrants closer attention. This debate broadly centers around the archaeological record of the last 200.000 years in human evolutionary history. These temporal boundaries are relevant for several reasons. Current palaeoarchaeological research converges on the finding that anatomically modern humans first appeared around 195.000 years ago in Eastern Africa (McDougall et al., 2005). By around 40.000 BP, they had replaced Neanderthals in Europe while Homo erectus perished in Asia around 70.000 BP, making them the only extant species of the genus Homo. The same timeframe also yields a remarkable and seemingly exponential growth in culture and technology, evident from corresponding patterns in the archaeological record of Africa and Europe. The link between both is often seen as a clear indication that Homo sapiens was in possession of cognitive abilities that significantly differed from the members of preceding species, and that were the basis of the present-day human cognitive realm. Traditional views on the emergence of cognitive modernity thus clearly established a connection between the level of cognition, which has to be estimated considering the fact that fossil evidence provides very little insight into internal brain organization, a biological or genetic substrate that appeared along with our species, and behavioural patterns observed in the archaeological record.

Within this debate, attention is often focussed on the question whether the increase in technological and cultural innovation has an explosion-type character (Klein, 1995, 2000, 2009; Mellars, 2005; Mithen, 1996a), or instead follows a more gradual pattern (Henshilwood & Marean, 2003; McBrearty & Brooks, 2003). Middle Stone Age geometrically engraved artefacts are a particularly interesting case study in this regard, and have proven to be among the key archaeological findings in defense of gradualist patterns of behavioural evolution. They have been uncovered far more recently than well-known, fullblown figurative cave art from Upper Palaeolithic Europe, and tend to be found in Africa and the Middle East, regions where anatomically modern humans roamed in evolutionary times long preceding the Upper Palaeolithic transition around 40.000 BP. Notably, they have been described as potential evidence that the origin of artmaking - an important hallmark of behavioural modernity - is to be found in a more distant past than until recently unequivocally accepted. Yet their relevance in this debate is heavily dependent upon adequate interpretations, which will be the central matter discussed in this chapter. First, the behavioural modernity debate is sketched more at length in the following paragraphs.

Despite diverging views on the sudden or instead gradual character of behavioural evolution, archaeologists tend to agree on which markers are indications of behavioural - and implicitely assumed cognitive - modernity. Most overviews tend to cite a very similar list of elements present in the archaeological record, that can subsequently be linked to presumed cognitive and behavioural advances in the human repertoire (e.g. Ambrose, 1998; Bar-Yosef, 1998, 2002; Chase & Dibble, 1987; Deacon 1989, 2001; d'Errico, 2003; Gargett, 1999; Henshilwood & Marean, 2003; Klein, 1995; 2000; Knight et al., 1995; McBrearty & Brooks, 2000; Mellars, 1989a, 1989b, 1991, 2005; Nowell, 2010). The characteristics in question tend to converge on the formation of several larger domains of innovation, such as innovations in utilitarian behaviour and subsistence, technological advances, and the appearance of apparently non-utilitarian behaviour.

(1) Utilitarian behaviour and subsistence

Complex hearth construction and greater control of fire, often as part of an increased organization of domestic space and site reoccupation.

Extensive exchange networks, resulting in the transmission of, for example, raw materials not available at an original occupation site, such as marine resources.

Seasonal migration for hunting and more general foraging, showing enhanced temporal awareness and insight into animal behavioural patterns and nature.

Occupation of harsh environments and exploration of new, challenging environments such as islands and territories in the far north of Europe and Asia.

Increased diet breadth, for example through the diversification of prey, e.g. fishing and the overall more extensive exploitation of aquatic resources.

Effective large-mammal exploitation, with specialization in exploitation patterns and tool innovation for different kinds of prey.

Increased population densities, possibly as a consequence of better environmental control, allowing existing populations to achieve and sustain greater numbers.

(2) Technological innovation

Artefact standardization and diversification of artefact types, showing awareness of imposed form, and of the practice of complex sequential stages of artefact creation.

Shift from predominant core-based flake technology (e.g. Levallois) to blade technology, with advances within blade technology such as microblades.

New scraper and burin forms, as well as improved missile technology.

Hafting and composite tools, equally showing an intended outcome based on multiple stages of production.

Use of bone, antler and ivory as novel materials for tools.

Mode	Characteristics	Time period	Representative industries from Western Europe
1	Pebble cores and flake tools	Lower Paleolithic (early)	Chellean Tayacian Clactonian
2	Large bifacial cutting tools made from flakes and cores	Lower Paleolithic (later)	Abbevillian Acheulian
3	Flake tools struck from prepared cores	Middle Paleolithic	Levalloisian Mousterian
4	Punch-struck prismatic blades retouched into various specialized forms	Upper Paleolithic	Aurignacian Gravettian Solutrean
5	Retouched microliths and other retouched components of composite tools	Later Upper Paleolithic and Mesolithic	Magdalenian Azilian Maglemosian Sauveterrian Tardenoisian

Fig. 40. Clark's modes of lithic technology with corresponding archaeological phases and representative industries or cultural complexes

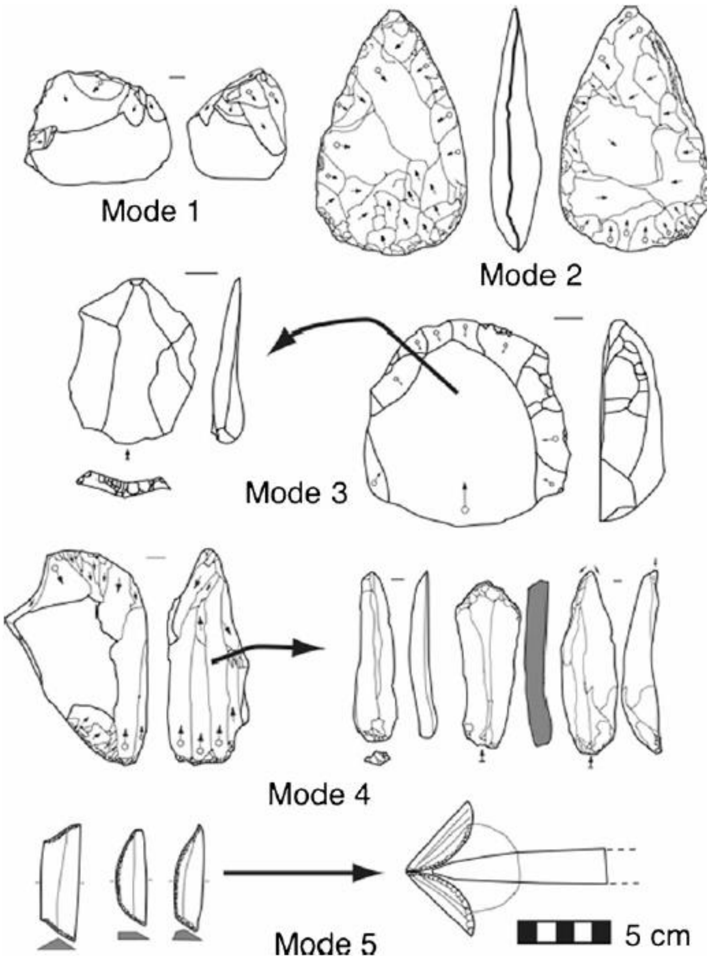


Fig. 41. Exemplary artefacts of the five modes of technology

(3) Non-utilitarian behaviour and utterances of symbolic cognition

Intentional burial, sometimes with ochre and/or grave goods, which has been interpreted as indicating ritual practice, and by extension religious cognition in the form of afterlife belief.

Symbolic use of ochre pigment, sometimes found in association with burial sites at which pigments might have been used in order to make associations with particular yet unknown meanings.

Musical instruments which, if interpreted correctly, evidently assert to the practice of music-making. This in turn could have been part - although this is not necessarily true - of ritual practices that involved either singular or joint singing and dancing.

Personal ornamentation, e.g. perforated teeth, shell beads, marine shells, shaped stone. Ornamentation of this kind could be indicative of individual or group identity, and is thought to have been characterized by regional diversity.

Parietal and portable art and aesthetic elaboration of utility objects such as decorated or aesthetically enhanced tools and hunting weaponry.

Symbolic notation systems, implying the external storage of information outside the brain, in turn enabling more rapid acceleration of cultural or behavioural innovations.

Many of these traits corroborate each other. Observed practices such as seasonal migration and larger-scale networks can be linked to the apparent long distance exchange of raw materials, and of materials that would only be found in particular regions, such as shell beads in marine areas (Mellars, 2005). Similarly, the great innovations in tool making can with fair certainty be linked to the hypothesized advances in hunting new and larger, more dangerous prey, especially when such tools are eventually discovered at sites where they are accompanied by particular animal remains. With regard to other traits, overviews commonly already contain a significant degree of interpretation. This is particularly evident where non-utilitarian behaviours and artefacts are discussed in terms of their presumed symbolic properties, as will be treated in the following analysis.

Overall, these traits can be clustered under a reduced set of cognitive capacities. Abstract thinking - "the ability to act with reference to abstract concepts not limited in time and space" (McBrearty & Brooks, 2000, p. 492) - applies to symbolic thinking, but also to behaviours such as complex tool making that characterized by sequential stages and advanced planning, and to subsistence practices such as occupying and hunting larger territories, which would equally require considerable foresight and planning. Planning depth, defined as "the ability to formulate strategies based on past experience and to act upon them in a group context" can also be regarded as a significant capacity in itself (2000, p. 492). It has applications in domains such as migration and foraging, but also in advanced tool making where mental processes need to take into account, and work towards an intented result in the future. Symbolic behaviour, or "the ability to represent objects, people, and abstract concepts with arbitrary symbols, vocal or visual, and to reify such symbols in cultural practice" (2000, p. 492), can apply to artefacts, but also to estimated belief systems such as early religious ideas. Additionally, symbolic thinking might be involved when individuals establish both their own identities, as well as joint group boundaries.

4.2.2. Debating modernity

The behavioural modernity debate in Palaeolithic archaeology is closely linked to the prevailing single species model of human origins, which generally states that modern humans evolved in Africa around 200.000 years ago, and subsequently spread across the globe, thereby replacing all existing other species at different continents, and at different points in time (Aiello, 1993; Harpending & Rogers, 2000; McDougall et al., 2005; Rightmire, 2009). Along with this worldwide dispersal came the appearance of behavioural modernity in the archaeological record, and inferences about its biological basis are commonly made (e.g. Clark & Lindy, 1988; Lindy & Clark, 1990a, 1990b; Henshilwood, 2007; Mellars, 2005). It is thought that, as our ancestors dispersed from Africa and seem to have replaced existing populations from other species, this is in large part due to their biologically-based superiority, translating into a variety of the above described behavioural practices that put them at an advantage compared to the other species still extant at the time. It is additionally thought that the replacement of Homo neanderthalensis in Europe by a single new species - ours - is the main explanation for the long assumed sudden breakthrough of modern behaviour or cognition, or a so-called 'cultural big bang'.

(Mithen, 1996a). While this is one side of the behavioural modernity debate, the other side consists of a gradualist view of the evolution of behavioural and cognitive modernity.

The big bang hypothesis of behavioural and cognitive modernity proposes that the set of traits described above more or less arrived as a package deal in the European Upper Palaeolithic, accompanying the migration of anatomically modern humans out of Africa, who were at the time on their way to replace all other existing species across the world. This view is heavily based on close readings of the archaeological record of Europe, in turn determined by strong biases: geographical and climatological circumstances in Europe might be better suited for preserving perishable materials such as wood, than the warmer and humid regions of Africa or the less sheltered areas of the Middle East. Evidently, the closeness of sites in Southwestern and Central Europe initially led to their significantly more extensive analysis than lesser known parts of other continents, some of which remain vastly understudied even today. Yet at the same time, the striking abundance of what seemed to be entirely new sets of behavioural innovations and its co-occurrence with the advent of Homo sapiens, has also been interpreted as an indication that a specific evolutionary process may indeed have been at work around this time, sparking an actual revolution, the breadth and complexity of which would be previously unseen in the history of the human lineage. Mithen (e.g. 1996a, 1996b) has compellingly argued that an ultimate breakthrough occurred via the previously described process of cognitive fluidity. While human cognition before the Upper Palaeolithic was already fairly advanced in separate domains, it did not become fully modern, enabling symbolic practices such as artmaking and religion, until the boundaries between the major domains of natural history, social, technological, and general intellingence collapsed. Klein (1995, 2000, 2009), in turn, has repeatedly endorsed a theoretical explanation of the package deal-like appearance of modern cognition by invoking a neural mutation that must have taken place in Africa around 70.000 BP. Although such a mutation is impossible to ascertain empirically due to the fact that ancestral brains do not fossilize, Klein is convinced that this is nonetheless the key explanation for the apparent symbolic explosion observed in Upper Palaeolithic Europe after anatomically modern humans' arrival.

The alternative, gradualist view gained an increasing presence as excavations in various parts of the world started to yield findings that did not fit the idea that characteristics thought to be indicative of behavioural and cognitive modernity were limited to the European Upper Palaeolithic. In this view, hypotheses such as cognitive fluidity or Klein's neural mutation are regarded as speculative, and not befitting more recent expansions of the available archaeological record. Connections between biology, cognition and behaviour tend to be maintained, but are more closely aligned with the appearance of anatomically modern humans in the fossil record (Barham, 1998; Deacon, 1989; Henshilwood & Sealy, 1997). It is argued that many of the traits that are attributed to the package of behavioural modernity can in fact be found in earlier phases of the evolution of our species. Because Homo sapiens did not reach Europe until after 50.000 BP, the African record is to be looked at in more detail. Excavations of this kind have indeed produced a variety of behavioural practices commonly listed among overviews of innovations thought to be characteristic of the Upper Palaeolithic and the Later Stone Age.

Some archaeological sites have yielded rich sources of information on the joint occurrence of different practices. At the South African site of Pinnacle Point, dated to around 164.000 BP, researchers found evidence of the exploitation of aquatic resources such as shellfish, as well as traces of potentially symbolic ochre use and bladelet stone technology (Jerardino & Marean, 2010; Marean, 2010; Marean et al., 2007). The site of Blombos Cave houses, in addition to the engraved ochres, an ochre-processing workshop with seemingly specific tool applications, evidence for the production of bone tool and shell beads, and indications that the occupants of the cave engaged in different types of more specialized hunting and foraging, such as the acquisition of marine resources (Henshilwood et al., 2001, 2009, 2011; Langejans et al., 2011; Thompson & Henshilwood, 2011, 2014; Vanhaeren et al., 2013). At Diepkloof Shelter, dated to around 62.000 BP and equally in South Africa, evidence was found for both ochre use and geometric mark-making, as well as for elements such as long-distance raw material acquisition and blade technology in tool production (Dayet et al., 2013; Porraz et al., 2013; Texier et al., 2010). The site of Katanda, in the present Democratic Republic of Congo, yielded bone point technology as early as ca. 90.000 BP (Brooks et al., 1995; Yellen et al., 1995), whereas shell beads were manufactured from around 78.000 BP in Blombos Cave and different regions that are in current Algeria and Israel (d'Errico et al., 2005; Vanhaeren et al., 2006). Ochre use in itself has been widely cited as possibly going several hundreds of thousands of years back, at sites such as Kapthurin, Kenya, and Twin Rivers, Zambia (Barham, 1998; McBrearty & Stringer, 2007).

Gradualist views of the evolution of modern behaviour appear to answer partly to the so-called sapient paradox, coined and described by Renfrew (e.g. 1996, 2007, 2008). The paradox concerns the apparent time lag between the advent of genetic modernity, i.e. the emergence of anatomically modern humans around 195.000 BP, and modern behaviour that only clearly surfaced around the Upper Palaeolithic transition, and according to the gradualist view, in the preceding decades. If a genetic basis for cognitive and behavioural modernity is as crucial as proposed by linking these to the speciation process that gave rise to anatomically modern humans, why would this not have been reflected almost immediately and more abundantly in the archaeological record? Even taking into account the role of taphonomic processes and preservation biases, this issue stands. Additionally, the great variation in behavioural practices following the Upper Palaeolithic transition also does not appear to fit with close genetic correlates. As Renfrew (1996) notes, many behaviours that are arguably very advantageous did not surface until the Neolithic around 12.000 - 10.000 BP. Among these are the agricultural cultivation of a defined range of domestic plants, specialized tools for their exploitation, the keeping of a limited number of domesticated animal species, the intensive use of animal bones for yet new tool types, village life with permanent settlements as opposed to the repeated occupation of seasonal sites or an overall migratory lifestyle, advanced pyrotechnology, baked pottery, systematic cemetery-like burial, and even longer distance networks sometimes involving seafaring. All of these traits seem to be absent from the Upper Palaeolithic which ended with the Neolithic around 12.000 - 10.000 BP, depending on the geographical focus. However, if anatomically modern humans and their genes increasingly started to occupy Europe and the rest of the world, and if behaviour was such a close correlate, there is no a priori reason why advanced Neolithic behaviour could not have emerged significantly earlier. The elements of modern behaviour lagging behind on modern anatomy, and great variation within modern behaviour are key to the sapient paradox. One of its solutions might be to regard the consequence of genetic change as the emergence of a *potential* for traits such as symbolic cognition or particular behavioural innovations (Renfrew, 1996), although this raises the question why seemingly advantageous behaviour would have remained latent for such a long time. Another way out is to redefine the lines of the behavioural modernity debate in itself. In order to explore this, the chapter will ultimately return to the additional, meta-level question whether cognition, which must have in large part a biological basis, is as closely linked to behavioural outcomes as is often assumed by those involved in this debate, or whether the interplay is perhaps of a more complex nature, and the link between biology and culture of a less outspoken nature than hitherto assumed (d'Errico, 2011; Hodgson, 2013; Shennan, 2001; Sterelny, 2011).

Because of the ever increasing archaeological record of Middle Stone Age Africa displaying early occurrences of presumed characteristics of behavioural and cognitive modernity, strict versions of the big bang hypothesis of human culture and cognition are now largely discredited. Somewhat counterintuitively, concepts such as ‘revolution’ continue to be used in the present debate, which seems to suggest that the package of traits observed in Europe from around 40.000 BP is still thought to encompass a major breakthrough of previously unseen behavioural innovations, and this impression could persist if not sufficiently contextualized within a broader archaeological context. In order to remedy this, Mellars has emphasized that when using the word ‘revolution’, most authors are “visualizing this phenomenon essentially as a before-and-after scenario, associated directly with the appearance of new populations in Europe and deriving ultimately from regions beyond Europe (...).” (2005, p. 23) Moreover, “this pattern could be seen as a revolution in terms of its reflection in the archaeological records of the classic Middle to Upper Paleolithic transition, but empathically not as implying an autochtonous, *in situ* evolution of these behavioral patterns within Europe itself.” (2005, p. 23)

One way to frame big bang versus gradualist ideas of the evolution of modern behaviour and cognition, is to step back from discussions of the behavioural record of anatomically modern humans during different phases of their evolutionary development, and to look instead at their relationship with other species. As mentioned before, the behavioural modernity debate as a whole - encompassing both the sudden emergence and the gradual evolution perspective - is closely connected to the single species model of modern human origins. This model too, however, is sometimes confronted with an alternative model, i.e. the multiple species model, or the model of multiregional continuity (d’Errico, 2003; d’Errico et al., 1998; Zilhão, 2007; Zilhão & d’Errico, 1999). It argues that the emphasis on the emergence and dispersal of anatomically modern humans unjustly disregards the relevant presence of other species of the genus Homo, some of which persisted for extended periods of time before Homo sapiens, while displaying behaviours - recorded in artefacts - that are reminiscent of the traits that are currently classified as practices characteristic of modernity. Homo erectus, who roamed Asia from around 1.5 million years ago, does not appear to have vanished until around 60.000 BP. The recently discovered Homo floriensis species or population existed until around 12.000 BP on the Indonesian island of Flores. Most extensively discussed is of course Homo neanderthalensis, coexisting with our ancestors in Europe for about 10.000 years, after the latter’s arrival on the continent around 45.000 BP (McBrearty

& Brooks, 2000; Mellars, 1998a, 1998b). The behavioural modernity debate is often heavily focussed on Homo sapiens because the latter's arrival in Europe was accompanied by the quick demise of Neanderthals. Because they managed to persist for several hundreds of thousands of years before this meeting, conclusions are easily made as to the extent of the cognitive and behavioural differences between these two species, with Homo sapiens winning out with apparantly great ease (e.g. Mellars, 2005). Yet at the same time, Neanderthals' persistant occupation of Europe and the Middle East equally suggests the presence of capacities for innovation, cultural adaptation, cooperation, etc. This has led some researchers to argue that multiregional continuity, rather than mere influx and replacement by a single new species, is key to understanding human evolution. Like Homo erectus in Asia, European and Middle Eastern Homo neanderthalensis may not only have evolved behaviour and cognition that rivals sapiens' minds, but may also have mingled with Homo sapiens to a significant extent, leaving considerable traces in the gene pool (d'Errico, 2003; d'Errico et al., 1998; Zilhão, 2007; Zilhão et al., 1999). The comparative perspective of art across human species will be discussed in more detail in Chapter 6.

As for the present analysis, geometrically engraved artefacts dating to the African Middle Stone Age and the Middle Palaeolithic of the Levant, are often heralded by proponents of the gradualist view in order to demonstrate that the origins of features such as symbolic cognition are not to be found solely in Upper Palaeolithic Europe, but may instead stretch further back in time and space. Moreover, symbolic cognition has been described by some as the crucial point that distinguished anatomically modern humans from other preceding or contemporaneous species (e.g. Henshilwood, 2007; Henshilwood et al., 2003; Marean, 2007; Wadley, 2001). The emphasis placed on symbolism within modernity may then result from "a search for the soul, for the inventive spark that distinguishes humans from the rest of the animal kingdom." (McBrearty & Brooks, 2000, p. 533) Because symbolic cognition is thought to be linked to a variety of striking and seemingly non-utilitarian practices such as artmaking, religion, ritual burial, personal ornamentation and so forth, these traits quickly became predominant features in assessing the levels of modernity in different phases of Homo sapiens' evolution, as well as its relationship to other species. Symbolic cognition then not only becomes an important feature within the trait-wise classification of behavioural modernity, it additionally is thought to encompass the very essence of the new state of being modern. Henshilwood illustrates how terms such as “modern behaviour” are sometimes used interchangeably with “symbolically organised behaviour” or “full symbolic *sapiens* behaviour” (2007, p. 123, original italics). In this view, modern behaviour can thus essentially be defined in a symbolic manner, such as when “modern human behaviour is mediated by socially constructed patterns of symbolic thinking, actions, and communication that allow for material and information exchange and cultural continuity between and across generations and contemporaneous communities.” (Henshilwood & Marean, 2003, p. 635) Discussing modern behaviour, Marean writes that “there is a growing consensus around a definition that has symbolic capacity at its core.” (2007, p. 367) Wadley similarly argues that “storage of symbolic information outside the human brain is accepted here as the first undisputed evidence for cultural modernity. (...) Modern human behaviour in this context is distinguished by a symbolic use of space and material culture to define social relationships, including significant groupings based on attributes such as kinship, gender, age or skill. Symbolism maintains, negotiates, legitimizes and transmits such relationships.” (2001, p. 201)

Whether geometrically engraved artefacts embody the first known instances of artmaking in human evolutionary history is a matter of debate. The connection between artmaking and behavioural modernity is made based on the record of Upper Palaeolithic Europe with its numerous examples of parietal and portable figurative imagery, but such instances of artmaking are absent from the African Middle Stone Age and the Middle Palaeolithic of Europe and the Middle East. Discussing early mark-making, most archaeologists tend to focus their argumentation on the question whether the artefacts concerned display evidence of the presence of symbolic cognition, rather than whether they are the first instances of artmaking. Because the presumed symbolic meaning is expressed in markings, the artefacts are sometimes described as instances of abstract patterning or abstract representations (e.g. d’Errico et al., 2003; Henshilwood, 2007; Lewis-Williams & Pearce, 2004). Conclusions as to their status as objects of art are often lacking, or are merely made indirectly. Mellars, for instance, writes that the artefacts embody “a range of explicitely ‘artistic’ or ‘decorative’ items, for which an interpretation in terms of complex symbolic communication systems now seems beyond question.” (2005, p. 17) If deliberate patterning is shown to have occurred, this potentially indicates artistic intent (Renfrew, 2007). Because intentionality can, however, be characteristic of other explanations such as the engravings being a notation system, this inference cannot be made with certainty.

Furthermore, the link between symbolic meaning and art is commonly assumed without further argumentation, as will be discussed in the next section. In the current absence of insight into whether this assumption is correct - i.e., art cannot emerge in the absence of symbolic cognition - it would be a mistake to consider conclusions for either question - the artefacts as symbolic pieces, and the artefacts as art - to be inextricably linked. As such, objects such as the Blombos ochres can be theoretically non-symbolic but art, art but non-symbolic, symbolic instances of art, or neither of these. Because the argumentation in favour of interpretations as art is fairly limited, the following analysis will focus on the primary question whether geometrically engraved artefacts display unambiguous evidence of symbolic cognition.[51] At the end of this chapter, the discussion will return to the nature of the behavioural modernity debate in itself, and will explore to what extent the artefacts could indeed be connected to, or be part of the realm of art.

4.3. Symbolism and geometric mark-making: the burden of evidence

4.3.1. The nature of symbolism in archaeological research

Discussions of Upper Palaeolithic art tend to be centered around the assumption that the earliest known cave paintings, figurative engravings and mobiliary artefacts, starting from close to 40.000 BP, display clear and even unequivocal evidence of symbolic cognition among our ancestors. For example, Deacon writes that "the first cave paintings and carvings that emerged from this period do give us the first direct expression of a symbolizing mind. They are the first irrefutable expressions of a symbolic process that is capable of conveying a rich cultural heritage of images and probably stories from generation to generation. And they are the first concrete evidence of the storage of such symbolic information outside of a human brain."

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[51] The discussion will not extent to the secondary question whether symbolic thinking should be considered to be a hallmark feature of modern cognition, and whether its expression in behavioural practices, such as perhaps the creation of geometrically engraved artefacts, should truly be regarded as a feature previously unseen in other ancestral species. This, in turn, connects back to the additional question raised by Henshilwood and Marean (2003), i.e. whether the common behavioural-trait approach - matching a set of trait-like behavioural characteristics to the concept of modernity - is a valid method for assessing the presence of behavioural modernity in the archaeological record.

(1997, p. 374) Balter, too, is convinced that "after all, art is an aesthetic expression of something more fundamental: the cognitive ability to construct symbols that communicate meaning, whether they be the words that make up our languages, the musical sounds that convey emotion, or the dramatic paintings that, 30.000 years after their creation, caused the discoverers of the Chauvet Cave to break down in tears." (2009, p. 709) In a discussion of the earliest possible traces of artmaking, and the 233.000-year-old Berekhat Ram figurine in particular, d'Errico et al. write that it "would be the oldest known example of representational art and *thus* symbolism." (2003, p. 20, italics added) Zaidel, within a neurocognitive framework, argues that "a certain threshold of symbolism capacity, abstraction, and referential cognition must be reached before art can be produced (...)." (2011, p. 44)

Analyses of prehistoric art tend to employ a relatively easy, pragmatic identification of any representational image as a symbol. Although seldom if ever explicitely clarified, symbolic interpretations of figurative imagery appear to be in a large part inferential conclusions drawn from a wider archaeological context, such as the apparent package of modernity described above. Clear definitions of what is meant by a symbol are often absent, leading to the symbolic nature of figurative art being regarded as a fact. Among those that do tackle this matter, some have argued for a limited set of broad characteristics thought to indicate the symbolic nature of a representation. Mithen (1996b, p. 199), for example, recognizes that the concept of a symbol is "notoriously difficult" to define, and suggests five general properties. First, a symbol's form may be arbitrary in relation to what it refers to, i.e. its referent. In the case of representational symbols, the actual representation need not even be taken to be automatically the same as a referent. Second, "there may be considerable space/time displacement between the symbol and the object or event to which it refers." (1996b, p. 199) The meaning of a symbol must also be shared between at least two individuals, fulfilling the presumed social function of symbolic meaning. In addition, there might also be variance in the attribution of meaning to a symbol, in addition to a more general and shared meaning. Finally, "the form of a symbol may be unique, but nevertheless correctly interpreted by an observer without having had prior experience of the specific symbol." (1996b, p. 199) Overall, Mithen appears to describe a symbol as an instance of meaning attribution to a medium - which can, but does not have to be a material artefact - whereby this meaning is necessarily shared, and a least possesses a general, socially recognized component.[52]

[52] A very similar argument is made in Mithen (1996a).

Another important aspect of symbolic cognition is highlighted by Barnard (2012). In his view, symbolism is at the core of human nature: “to use symbolism is to be human. It follows that to think in symbols is to be human too.” (2012, p. 3) While communication in general does not necessarily require symbolic thinking - many animal species communicate without possessing such advanced cognition - the specifically human linguistic mode of communicating is permeated with symbols. The structural properties of language, such as complex grammar, enable the conception and social transmission of meaning, which can in turn lead to phenomena such as mythology, religion, and art. This is because the metaphorical properties of symbolic thinking in turn spark creativity, leading to many of the behavioural practices that are widely regarded as quintessentially human. Crucially, Barnard further argues, symbols are always to be understood within a wider network of symbolic references. As such, the often emphasized arbitrary relationship between a symbol and a referent only makes for part of the picture. If symbolic meaning is not shared between individuals within the context of a more general symbolic system, full symbolism does not appear to be in place (2012).

It is additionally not uncommon to presuppose a gradual elaboration of symbolic cognition. Donald’s three-stage model of the mind (1991, 2006) proposes exactly this. The evolution of the mind ocurred according to three types of domains that follow each other chronologically, and incorporate elements of the preceding ones. The first, mimetic domain refers to the role of mimesis in understanding and reproducing bodily movements, eventually resulting in practices such as gesturing, dance and ritual, while also allowing for the spread of advanced tool-making and fire-tending. This is thought to have started over the course of Homo erectus’ existence, who is thought to date back to 1.9 million years BP. After this, mythic culture arose on the basis of spoken language, involving plentiful storytelling in the form of myths, concerning subjects such as morality, appropriate behaviour, etc. These elements were often closely intertwined with practices such as ritual, and religion evolved as an institutional means for regulating mythic culture. During this phase, art clearly arose as a material expression of mythic thinking. Finally, theoretic culture appeared as a much more recent phenomenon accompanying the development of writing technologies. According to Donald, theoretic culture “is symbol-based, logical, bureaucratic, and heavily dependent on external memory devices, such as writing, codices, mathimatical notations, scientific instruments, books, records, and computers.” (2006, p. 8) Theoretic culture is strongly characteristic of modern western societies, as “the culture of government, science, and technology, and of many forms of art." (2006, p. 8) In Donald's view, symbolic cognition is present in all three phases to a certain extent, and reaches its culmination point in the domain of theoretic culture. The external storage of symbolic information in material culture allows its extension beyond mere symbolic thinking in itself, or beyond the presence of a capacity for such thinking. Because of its externalization, symbolic thinking gains the ability to influence social behaviour, thought to be a hallmark of full behavioural and cognitive modernity (Donald, 1991; Henshilwood, 2007). Although from a different perspective, Chase (2001) similarly distinguishes multiple views of symbolism, with referential symbolism being the basic, capacity-feature that allows for estbalishing arbitrary relationships between signs and their referents. Symbolic culture, in turn, consists of the range of findings that are commonly discussed in the archaeological record as the first traces of symbolic cognition, but this might, according to Chase, consist of a later manifestation of already existing symbolic cognition.

Assessing whether Middle Palaeolithic geometrically engraved artefacts are of a symbolic nature brings along the additional difficulty that the markings in question are abstract, contrary to the figurative imagery of the Upper Palaeolithic, where at least the displayed elements are clearly perceivable as corresponding to the outside world. As such, it is not even clear whether the markings primarily constitute signs that are intended to confer a particular meaning, or whether they originated otherwise - a possibility that will be discussed below. While the attribution of meaning is equally uncertain in the case of figurative imagery, the clear representational nature of the latter does at least make clear that *something* was intended to be represented, a point that cannot be made with certainty in the case of geometric engravings. Opinions differ as to whether symbolic cognition existed at all before the proclaimed Upper Palaeolithic or Later Stone Age transition. According to some, practices such as "concept-mediated marking" took place as early as the Lower Palaeolithic or Early Stone Age, which supposedly ended between 280.000 and 250.000 BP (Bednarik, 1995), and an increasing number of archaeologists, especially concerning the African record, are convinced that the earliest traces of symbolism are certainly found in practices such as ochre use, shell beads manufacture and mark-making, some of which may date back to the dawn of the Middle Stone Age. Others would argue that symbolic cognition did not appear until after ca. 50.000 BP, among which are those invoking cognitivist models for the proposed transition around this time (Chase & Dibble, 1987; Klein, 1995, 2000, 2009; Mithen, 1996a).

When attempting to support symbolic claims for Middle Stone Age and Middle Palaeolithic artefacts, archaeologists tend to maintain the key definitional element of a symbol encompassing an arbitrary meaning that its shared, and is established and understood by means of a social convention. Henshilwood et al. define a symbol as a "sign that has no natural or resembling connection with its referent, only a conventional one." (2009, p. 42) Similarly, "in order to be symbolic, it is necessary that the design has a cognitively constructed and conventionally maintained relationship with some other thing, either physical or conceptual." (MacKay & Welz, 2008, p. 1529) Discussing shell beads, Bouzouggar et al. equally take a symbol to mean "something that represents something else by convention." (2007, p. 9969) Others endorse conceptual views that are aligned with some of the abovementioned ideas concerning full symbolism as an advanced stage of cognitive development that permits the storage of information outside of the brain, as well as its display in new contexts (d'Errico et al., 2005).

Many conceptual views of a symbol, such as Mithen's, imply considerable interpretative difficulties for the subject matter of prehistoric art. Because the original creators of the art, as well as all members of the surrounding culture have perished, it is evidently impossible to assess which meanings, if any, were attached to the art. This makes it challenging to substantiate several points in Mithen's overview of symbolic characteristics, such as the presumption that symbolic meaning must be shared, or that it must be characterized by a certain degree of displacement in time or space between the symbol and its referent. While this already poses a significant methodological challenge in the analysis of Upper Palaeolithic figurative imagery, it becomes even more difficult when addressing Middle Palaeolithic or Middle Stone Age abstract mark-making. According to Chase (1991), the difficulty of recognizing symbols in earlier Prehistory might be partially addressed by searching for material correlates of three properties. These are style, standardization, and the imposition of arbitrary form on material. "For style," Chase argues, "it is because in all modern cultures there is a very close link between symbolism and style (...)," whereas the imposition of arbitrary form is suggestive of symbolism because "symbols are themselves arbitrary, and language (which owes its very existence to symbols) involves the imposition of arbitrary form on sound." (1991, p. 193-194) The element of standardization refers to "the notion that cognitive categories (of things to be made) must somehow be associated with linguistic categories (words)." (1991, p. 194) Evidently, these properties too, like the presence or absence of shared and arbitrary meaning, are difficult to recognize in the archaeological record. Chase additionally acknowledges that each property in itself also appears in non-symbolic contexts, which means that the mere presence of, for example, imposed form, does not automatically translate into symbolism.[53]

Criteria such as those proposed by Chase (1991) make clear that the emergence of symbolic thinking is commonly thought to be closely connected to the evolution of language. Language, if understood as modern syntactical and word-based language, is often cited as the epitome of symbolic capacity: words are seen as the prime example of signs where the reference relationship is arbitrary (e.g. Chase, 1991). Words such as 'bison', 'lion' or 'man' are in themselves entirely unrelated to what they refer to, in the sense that the animals we refer to as such, could equally be referred to by means of other words, or symbolic categories. The fact that the animal we call 'bison' is denoted as such, is based on arbitrary convention. In this sense, symbolic cognition is a prerequisite for modern language use to arise. Causal inference is additionally made in another direction, i.e. from the presence of specific utterances of material culture to the presence of syntactical language. The general idea behind this seems to be that symbols, if defined in the most basic manner, contain shared meaning that can, in principle, only be transmitted in a verbal manner. Although other modes such as gesturing can also be employed within interpersonal communication, the particular content of the meanings involved cannot be shared knowledge between group members, and the arbitrariness of the relationship cannot not be established if it cannot be communicated by means of words. This has lead to almost automatic inferences from presumed to be symbolic practices such as shell beads manufacture and artmaking to the conclusion that fully modern, syntactical language must have been in place at the time of their appearance. Discussing the role of language in what appears to be a symbolic explosion, possibly sparked by increasingly elaborated social learning mechanisms, Henshilwood writes that

> "syntax, essentially defined as the ordering and arrangement of words and other structural elements in phrases and sentences in a systematic or rule-based manner

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[53] This is evident from subjects such as the evolution of lithic technology. Around the transition from Mode I technology, of which the Oldowan flaking industry is characteristic, to Mode II technology comprising the core-based Acheulean industry, a large increase in visuomotor control and goal oriented action appears to have taken place, suggesting a heightened awareness of imposed form that is particularly evident from the concern with a finished form in early handaxes (Stout et al., 2000, 2006, 2008). While a handaxe clearly reflects the imposition of form on material, it is far from evident that it is therefore a symbolic artefact.

> would have played a key role in this process and its full adoption must have been a crucial element of the symbolic behavioural package. Modern language is the only communication system with a 'built-in' meta-language that allows the creation of symbolic codes. (...) Without effective communication behaviour could not be symbolically driven." (2007, p. 123)

Others have advocated more caution as to whether inferences from material practice truly translate directly into the presence of modern syntactical language (Botha, 2008, 2010). Yet regardless of whether practices such as shell beads manufacture and mark-making truly involved symbolic meaning that, according to Henshilwood and others, could not be transmitted if it were not for modern syntactical language, symbolic cognition does appear to be structurally connected to language use.[54] The temporal origins of modern spoken language are as yet unclear. Communicative behaviour in itself evidently doesn't leave traces in the fossil or archaeological record, which means researchers need to make use of other language-related indications that are available in these records. This could be, for instance, vocal tract anatomy (Mithen, 1996a). If fully modern syntactical language could be shown to have been in place around a certain time, this would provide support for the inference that the *capacities* for symbolic behaviour, such as perhaps mark-making, would also have arrived in our ancestors' cognitive repertoire. However, because language evolution is difficult to date in itself, this inference is equally difficult to make. Moreover, if referential symbolism is distinguished from symbolic culture which, according to Chase (2001), might have evolved at different times, any clear evidence for language evolution can only be extended to the evolution of referential symbolism, and not to symbolic culture as such.

A pragmatic solution concerns replacing the absolute, definitional view of a symbol endorsed by numerous proponents of its presence in both figurative and abstract art, by a more relative, comparative view. In a semiotic view that is applied to a surprisingly limited extent in research on Middle Palaeolithic and Middle Stone Age mark-making, Peirce (1932/1960) distinguishes three different types of signs. Icons are signs that bear a physical resemblance to what they represent, i.e. there is a directly perceivable relationship that does not a priori require consciously learning the precise nature of the relationship. Indexical signs are those signs where the

[54] For example, "symbols are an integral part of language and enable people to organize and categorize their world according to belief, value, and sentiment systems and to provide them with options of behavior that are seen as acceptable for each particular cultural group." (Chase & Dibble, 1987, p. 264)

relationship with a referent is one of association. It stands in between iconic and symbolic signs, in that the relationship need not be immediately perceivable through visual resemblance, but is also not arbitrary and based on socially shared convention. A typical example are animal tracks, where the relationship between a certain animal and its type of tracks is merely associative (Mithen, 1996b). Symbolic signs, finally, are those signs where the relationship with a referent is indeed arbitrary, as advocated by Mithen and others in key definitions of symbols (e.g. 1996a, 1996b). This layered structure is not always recognized to its full extent, with the term 'symbol' commonly being used as an alternative for Peirce's concept of 'sign', i.e. including all instances where a reference relationship of any kind is present. Evidently, this will likely lead to the unequivocal acceptance of any kind of prehistoric representational image or abstract feature as being symbolic, implying that early geometric mark-making will be equally unequivocally accepted as symbolic in nature. However, as the present chapter discusses, this should be a question mark, rather than a given. A view such as Peirce's still maintains definitional aspects, but allows for parsimoniously determining the likelihood that something is a symbol, by assessing whether it can perhaps be accounted for by invoking less cognitive demands than are assumed by attributing full modern cognition to our Middle Stone Age and Middle Palaeolithic ancestors. In other words, this approach "would therefore dictate that a higher level of arbitrariness/conventionality should not be accorded if the artefacts under scrutiny obviously suggest the primacy of a 'lower' less-arbitrary level. In this way, available evidence is not over interpreted and the materiality of the object is preserved and emphasized." (Hodgson, 2014, p. 59)

4.3.2. The objects of analysis and their primary interpretation

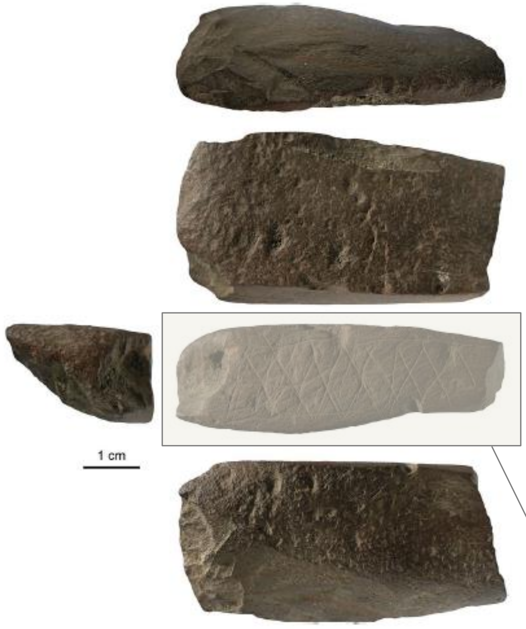
Among the most outspoken geometrically engraved artefacts are the Blombos ochres, unearthed in the cave of the same name on the Southern Cape coastline of South Africa (Henshilwood et al., 2002, 2009). The cave is home to different occupational layers that have received corresponding dates, with piece M1-6 depicted below having been unearthed from the M1 phase dated to ca. 77.000 BP. The M3-6 object is dated to the M3 phase of ca. 100.000 BP. They were found along with several thousands of pieces of ochre, only a very limited number of which appear to have been engraved in this manner. The pattern displayed on the most striking object, M1-6, has been described as "a row of cross-hatching, bounded top and bottom by parallel lines, and divided through the middle by a third parallel line which divides the lozenge shapes into triangles." (Henshilwood, 2007) This pattern has been interpreted as an early form of abstract representation, which means it could potentially be among the first known objects of art (Henshilwood 2007; Henshilwood et al., 2009). Engraving likely took place with stone flakes or blades, which were found with ochre traces on site (Henshilwood et al., 2009).

According to Henshilwood and others, the markings on the Blombos ochres can safely be regarded as being symbolic in nature (e.g. d'Errico, 2003; Henshilwood et al., 2002, 2009; Henshilwood & Dubreuil, 2009). The markings appear to fall under one of four categories, which are cross hatched design, dendritic shapes, parallel lines and lines juxtaposed at right angles (Henshilwood et al., 2009). The authors argue that this type of formal variation, although not as extensive as in complex symbolic systems, may indeed support the hypothesis that the markings corresponded to different kinds of information that were understandable to group members who acquired the relevant knowledge through sharing the meanings involved. In sum, "the Blombos Cave motifs suggest arbitrary conventions unrelated to reality-based cognition, as is the case in the Upper Palaeolithic, and they may have been constructed with symbolic intent, the meaning of which is now unknown." (Henshilwood et al., 2002, p. 1279) This interpretation is further taken to imply cognitive advancement in other domains: "these finds demonstrate that ochre use in the MSA was not exclusively utilitarian and, arguably, the transmission and sharing of the meaning of the engravings relied on fully syntactical language." (2002, p. 1279) The symbolic nature of the Blombos ochres is commonly taken to be a fact, rather than an optional explanation. As to their relevance within the behavioural modernity debate, d'Errico et al. (2003) write that "a fundamental turning point in the evolution of human cognitive abilities and cultural transmission was when humans were first able to store concepts with the aid of material symbols and to anchor or even locate memory outside the individual brain. The abstract patterns engraved on pieces of ocher found at Blombos Cave (...) are indeed among the earliest manifestations of this ability, on which all human cultures are based." (2003, p. 31) Elsewhere, the ochres are described as "the most ancient irrefutable evidence for symbolic behavior." (2003, p. 4)

Also at Blombos Cave, an engraved bone fragment was recovered that has equally been interpreted as bearing symbolic mark-making (d'Errico et al., 2001). It was dated to ca. 70.000 BP and bears a number of subparallel incisions that were deepened by repeated strokes, and that were shown to be different from those that would be expected if they were non-intentional consequences of cutting meat from the bone. Because of the overall archaeological context of Blombos Cave, which does not only include the engraved ochres and a presumed ochre workshop (Henshilwood et al., 2002, 2009, 2011) but also advanced toolmaking and subsistence strategies, the authors hypothesize that for this artefact too, symbolic cognition may have been at work (d'Errico et al., 2001). Additionally, the inference from mark-making to language is also made here: "the multiple-stroke engraving technique employed on the described fragment is evidence for coherent behaviour and technical knowledge that is shared and transmitted by a community. (...) the intentional transmission of symbolic material culture and the use of symbols to express cultural identity are impossible without the use of syntactic languages." (2001, p. 317)

The site of Klein Kliphuis, South Africa, has also yielded an ochre piece that was broadly dated between 80.000 and 50.000 BP. The authors report on two broken pieces as originally being one, and describe its modifications as if they were still joined. One side of the artefact displays a cross-hatched pattern consisting of three clear horizontal lines, each of which were deepened by repeated incision, and several vertical and diagonal lines. The lines were probably added in a succession of events, likely with different tools, and the vertical lines appear to have preceded the horizontal crossings. Another side of the artefact appears striated, i.e. the surface is covered in repeated scores, likely in order to produce pigment. Like M1-6 from Blombos Cave, the cross-hatching is thought to reflect intentional design: "indeed, the formation of lines through a series of actions strongly implies an element of design, regardless of whether it was expediently formulated or realised over multiple stages. By design we require only that the artisan(s) undertook the act(s) of scoring in order to give physical manifestation to a mental concept." (MacKay & Welz, 2008, p. 1528). Parallelled with the Blombos ochres, the authors argue that based on these findings, "MSA people engraved apparently non-representational designs into soft pigmentatious rock." (2008, p. 1529) They are more cautious when it comes to describing the marks as symbolic, as the available evidence does not in itself immediately warrant such an interpretation.

In Qafzeh Cave, Israel, researchers uncovered a Levallois core - part of the corresponding Middle Palaeolithic or Mousterian technological complex - bearing 27 linear incisions that were dated to around 100.000 BP. The lines are mostly parallel, obliquely positioned with regard to the vertical axis of the core. It is described as "one of the oldest symbolic pieces found in Middle Palaeolithic contexts" (Hovers et al., 1997), a conclusion that appears to be predominantly based on the elimination of non-intentional explanations for the markings, such as trampling or animal-inflicted damage. The Quneitra artefact, dated to around 54.000 BP, was found closeby on the Golan Heights. It is a piece of stone displaying four nested semicircles in addition to several straight, parallel lines. According to Marshack, the nature of the markings clearly suggests aesthetic intent: "(...) it is the product of preconception and careful planning. It involves an intentional centering of the nested semicircles and a stroke-by-stroke accumulation during which the concept of nested semicircles was kept in mind as the stone was turned and incrementally incised and the developing image and the placement of each stroke were evaluated against the plan. Following engraving of the semicircles, the long strokes were added, accommodating both to the centered arcs and to the shape of the stone. The final image or composition seems to be a type of depictive, schematic abstraction." (1996, p. 358-359) Its cognitive complexity is thought to be evident from the various cognitive and behavioural processes that were involved. Among these are "a planned sequence of categorizing strokes," and "an ongoing 'gestalt' evaluation of the developing form in terms of the size and shape of the stone." (1996, p. 359) Moreover, the markings display "an evaluation of the 'fit' of that developing form to an original concept," and "a continuing sequence of changing right and left hand behaviors." (1996, p. 359) Furthermore, Marshack recognizes symbolic content that is different from "gross symboling processes such as those involved in the use of red ochre, burial of the dead (...), or the manufacture of three-dimensional forms or shapes." (1996, p. 361) Instead, the Quneitra artefact would reflect the appearance of more complex abstract and schematic representations, which may even have been used within a ritual context. Both the author and the excavator of the artefact speculate that the abstract markings may indeed represent a figurative referent, such as the volcanic landscape seen from the Golan Heights, or a combination of a rainbow and falling rain. In the second case, Marshack even argues for "a Middle Palaeolithic reading of 'spiritual' significance for the appearance of a rainbow (...)." (Marshack, 1996, p. 363) Irrespective of which interpretation would or would not apply, a symbolic interpretation of the artefact appears unquestioned.



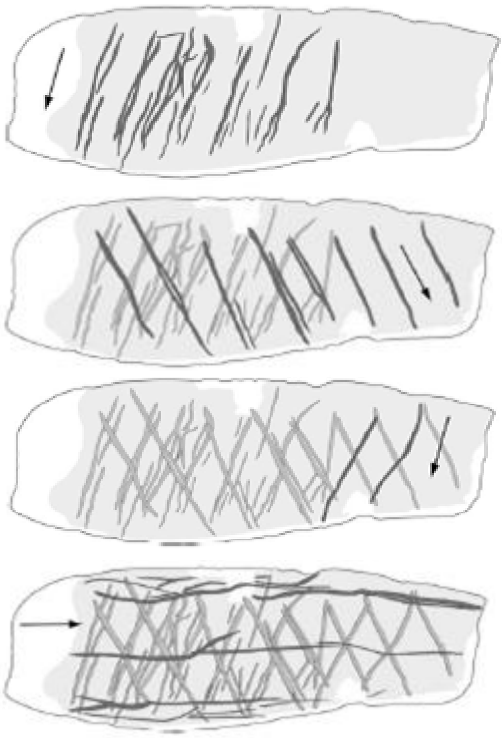


Fig. 42. Blombos ochre M1-6 from different angles, Blombos Cave, South Africa, ca. 77.000 BP.

Fig. 43. Engraving sequence of the cross-hatched pattern on M1-6.

Fig. 44. Enlarged view of the cross-hatched pattern on M1-6.

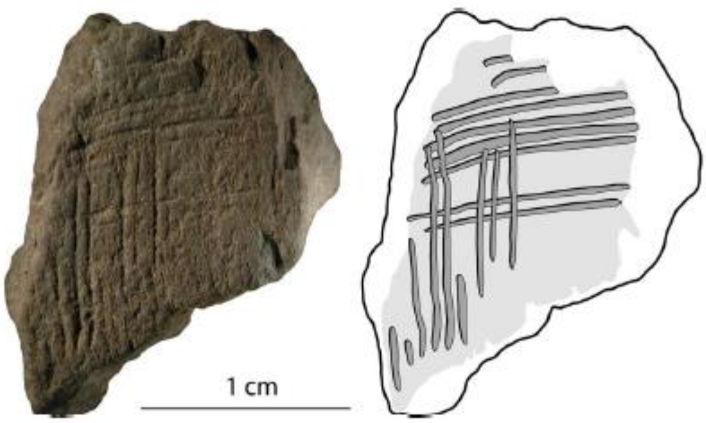


Fig. 45. Blombos ochre M3-6 with orthogonal engraving, Blombos Cave, South Africa, ca. 100.000 BP.

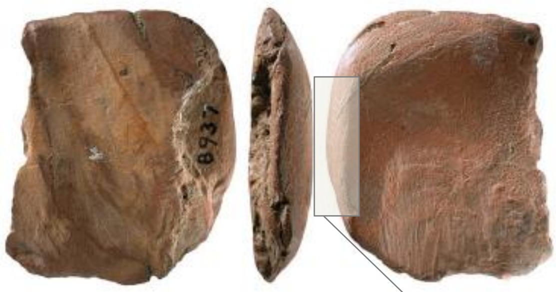


Fig. 46. Blombos ochre M1-5 with cross-hathed engraving, Blombos Cave, South Africa, ca. 77.000 BP

Fig. 47. Enlarged cross-hatched pattern on M1-5

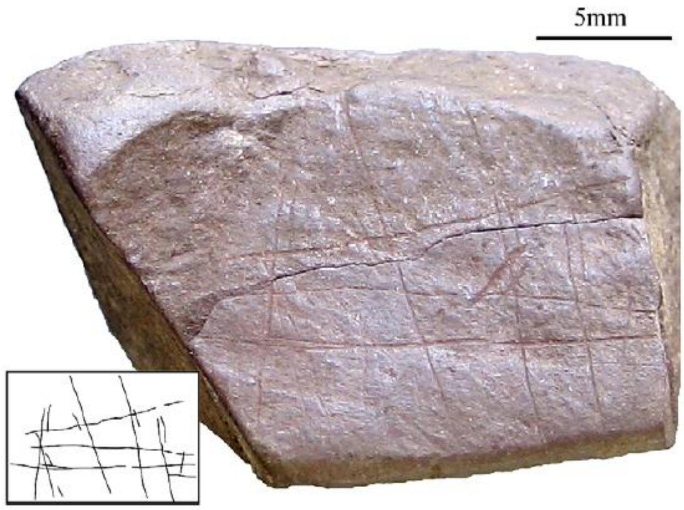


Fig. 48. Engraved ochre with cross-hatched pattern, Klein Kliphuis Shelter, South Africa, dated between 80.000 and 50.000 BP.

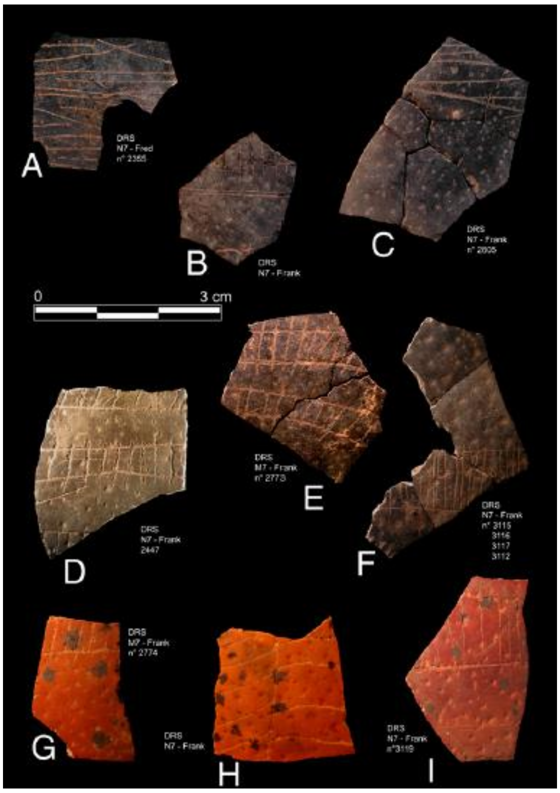
Fig. 49. Grinded side of the Klein Kliphuis ochre, displaying a pattern characteristic of pigment acquisition.

Fig. 50. Engraved bone fragment, Blombos Cave, South Africa, ca. 70.000 BP.

Fig. 51. Levallois core with linear engravings, Qafzeh Cave, Israel, ca. 100.000 BP.

Fig. 52. Line drawing of the Levallois core (with measurement scale for the line drawing).

Fig. 53. Quneitra artefact displaying straight line engraving and nested semicircles, Golan Heights, Israel, ca. 54.000 BP.



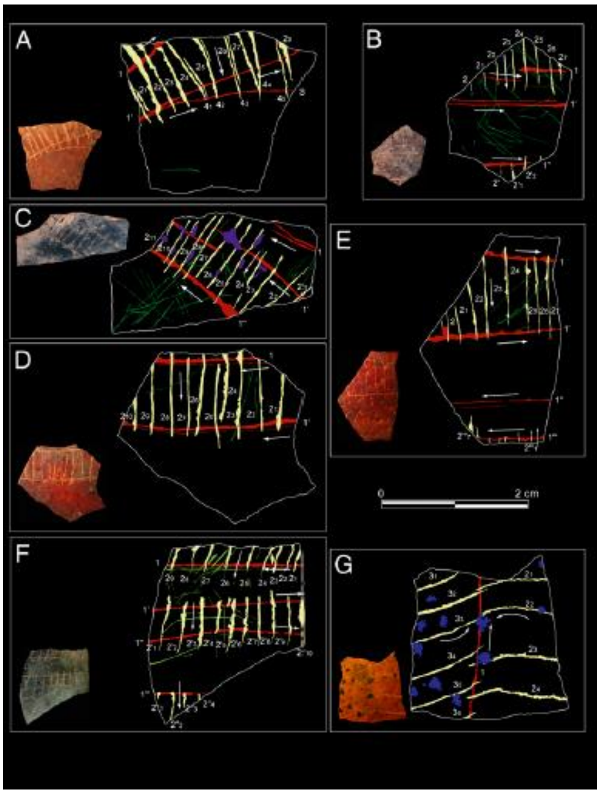


Fig. 54. Engraved ostrich eggshells with straight and subparallel lines (A and C), hatched band motifs (B, D, E, F, G and I). Diepkloof Rock Shelter, Western Cape, South Africa, ca. 60.000 BP.

Fig. 55. Engraving sequence, with numbers indicating the relative chronology of the patterns, and arrows the direction of the incisions. The sequence analysis suggests standardization in the pattern, where vertical lines always postdate the horizontal lines. Diepkloof Rock Shelter, Western Cape, South Africa, ca. 60.000 BP.

Excavations at Diepkloof Rock Shelter have yielded a set of engraved ostrich eggshell fragments containing one of four different motives, i.e. a hatched band motif, a motif with parallel and subparallel lines, a motif with intersecting lines, and a cross-hatched motif, with the first being the most common (Texier et al., 2010). The authors cite ethnographic evidence in order to substantiate the hypothesis that the eggshell fragments were part of containers displaying markings of ownership. Within this argument, they point out that the markings have commonalities yet are also characterized by variability: "there were rules for composing designs but room within the rules to allow for individual and/or group preferences." (2010, p. 6183) Applying engravings on objects that may be linked to functional uses within a group, is one way in which symbolism could impact social interaction.

A limited number of issues that appear to contradict symbolic interpretations, as well as arguments that would endorse the same explanations, appear to surface across the abovementioned studies. Notably, the artefacts are relatively rare findings. This may be due to preservation biases, although this would be more likely to affect the numbers of objects in the archaeological record if the materials used were perishable, whereas stone, bone, ostrich eggshell, and even ochre tend to be relatively well preserved. Alternatively, scattered and fairly limited excavations on the African continent might be responsible for a bias, yet the areas that are home to the most notable sites and that have been explored to a more significant extent, such as the Southern Cape of South Africa, have only yielded a small number of sites, where presumably modern behaviour nonetheless appears to abound. However, in the absence of clarity as to whether the current record is or is not representative, analysis of the available objects must depart from the presently known distribution of sites.

Aside from the record being scattered in itself, the markings found on the various objects are also not clear indications of a larger-scale symbolic system. The cases described above do not appear to be part of larger sets of the same, similarly marked artefacts. As a consequence, according to Hovers et al., "the variable nature of the pieces that had been found is not conducive toward forming a knowledge of conventionalised motifs and standardised techniques by which such items can be identified. Their symbolic significance thus can not be inferred from one case to another." (Hovers et al., 1997) At the same time, however, the markings on each object have at various occassions been interpreted as reflecting patterning and standardization through their apparent repetitiveness and the proposed grouped variation of motifs. For both the Blombos ochres and the Diepkloof engraved eggshells, claims have been made as to the presence of a limited number of recurring motifs, which in themselves consist of patterned geometric marks (Henshilwood et al., 2009; Texier et al., 2010), such as cross-hatching and parallel lines. Moreover, the apparent presence of limited variation in motifs within overall uniformity has been taken to support the hypothesis that the markings fulfilled a group identification function, combining "the notion of group identification (adherence to rules) and individual expressions (stylistic latitude)." (2010, p. 6180) Repetitiveness and patterning are thought to be characteristic of the Upper Palaeolithic (Hovers et al., 1997), and were for a long time thought to be unseen in the Middle Palaeolithic or Middle Stone Age (Chase, 1991; Mithen, 1996b).

Symbolic explanations for early mark-making might be substantiated if evidence could be gathered that they might have been part of a tradition, i.e. that they were part of a more extensive symbolic system that could be either extended in space, in which case similar artefacts would have to surface relatively frequently in larger regions, or in time, if they appeared diachronically in the same locations. As mentioned before, regional spread seems to be limited.[55] Diachronically, the site of Blombos Cave, for example, yielded geometrically engraved artefacts in layers that span around 28.000 years (Henshilwood et al., 2009). While the number of objects may in itself be small - of the several thousands of ochre pieces found, Henshilwood describes fourteen that bear markings that seem clear enough to classify them as one of the four pattern categories mentioned before - their reoccurrence does appear to suggest the repeated practice of mark-making, potentially in accordance with different occupational phases of the cave over the course of time.

Importantly, several of the archaeological sites that yielded geometrically engraved artefacts have also produced other proposed material correlates of modern behaviour, such as shell beads, bone tools and advanced hunting and subsistence behaviour (Hovers et al., 1997). This has been reported, for example, with regard to the site of Blombos Cave with its engraved ochres, shell beads, bone tools, ochre processing and marine resources exploitation (Henshilwood et al., 2001, 2009, 2011; Langejans et al., 2011; Thompson & Henshilwood, 2011, 2014; Vanhaeren et al., 2013), as well as for Diepkloof Rock Shelter and its marked eggshells, ochre use, advanced toolmaking and long-distance raw material acquisition (Dayet et al., 2013; Porraz et al., 2013; Texier et al., 2010). Archaeological assemblages such as these are commonly cited as supportive evidence for the symbolic nature of geometrically engraved

[55] Only a few other cases of geometric mark-making are known, and have been reported upon. Close to Blombos Cave, excavations have been underway since 2010 at Klipdrift Cave and Klipdrift Shelter, so far yielding a similar behavioural repertoire of, among other things, advanced lithic technology, ochre and ostrich eggshell use, patterned engraving, and the exploitation of aquatic resources (Henshilwood et al., 2014). In addition and within the same timeframe of the last 50.000 to 100.000 years of the Middle Stone Age, incised and notched objects were found at Klasies River, South Africa (Singer & Wymer, 1982; d'Errico et al., 2012), Apollo 11 Cave in Namibia (Wendt, 1972; Vogelsang, 1998), and Hollow Rock Shelter, South Africa (Evans, 1994). Additionally, Wonderwerk Cave, South Africa, has been cited as another notable example, among other things containing several ironstone slabs that appear to be marked, though in a lot less noticeable way than the Blombos ochres or the Diepkloof engraved eggshells (Chazan & Horwitz, 2009).

artefacts, although the inference made from the assemblages to the artefacts' specific interpretation remains to be substantiated, as will be discussed in more detail below.

4.4. The argumentation assessed

As is evident from this brief overview of notable examples, scholars commonly imbue geometrically engraved artefacts with symbolic meaning, to the extent that the correlation between abstract marking and inherent meaning is taken as an irrefutable fact. It is not clear, however, whether there is truly an a priori reason for describing the artefacts as such. Conceptual views of a symbol such as that of Mithen, or comparative views such as Peirce's typology of signs, are evidently of limited use for addressing this issue. Even if it were a given that Palaeolithic symbols contain arbitrary, shared meaning, definitional approaches to symbolism do not provide an opportunity for directly assessing the nature of a particular object, such as the cross-hatched M1-6 ochre from Blombos Cave. Recognizing this, authors reporting on the abovementioned artefacts tend to employ other supporting arguments. These can be broadly subdivided as arguments built upon the rejection of other potential, non-symbolic explanations for the markings, and arguments drawn from cognitive inferences made on the basis of contemporaneous practices, such as shell beads manufacture, ochre use, and burial. Both of these are discussed in the following paragraphs.

4.4.1. Eliminating other potential explanations

Symbolic interpretations of geometrically engraved artefacts are often thought to be supported by research indicating that other explanations seemingly do not apply. It is first and foremost important to exclude the possibility that the markings were produced unintentionally, perhaps not even with an anthropogenic origin. If, for instance, normal processes of damage or decay were found to be responsible, or could be responsible based on the available evidence yielded by the artefacts, symbolic interpretations would become in all probability irrelevant.[56] Henshilwood et al.

[56] The only remaining possible scenario in which unintentional markings would still be linked to symbolic cognition, would be if there was evidence in favour of the option that already existing marks were later endowed with symbolic meaning in the minds of our ancestors - a possibility that is both impossible to test, as well as being poorly supported by archaeological analyses that do largely point towards intentionality.

(2009) have systematically addressed other potential explanations of the markings in terms of their intentionality, and subsequently - if found to be intentionally attributed - their symbolic nature. The most arbitrary cause for the markings would be if they were caused by trampling, i.e. natural causes that cannot be attributed to human or animal action. Geometric-looking marks on objects located within a cave or shelter could, for example, be caused through falling debris. Yet in those instances, the engraved lines would be random and more superficial than intentionally produced markings. Additionally, most pieces appear to be unbroken, and markings usually appear to have been made after the ground surface piece acquired its final shape (Henshilwood et al., 2009).[57] In the case of the engraved core from Qafzeh Cave, a surface analysis of both the grooves and the surrounding material showed that both were affected by the same post-depositional processes, which excludes that the markings were accidentally caused at a point in time that was significantly different from the making of the cortex itself (Hovers et al., 1997). A secondary unintentional explanation are animal-induced marks. These could, for example, occur through gnawing on bones. Clearly, animals would be unlikely to chew other materials than bone, which means markings on ochre, stone or eggshell, even if they were less regular than the aforementioned examples and could hypothetically be unintentional, are not caused by animals. (d'Errico et al., 2001; Hovers et al., 1997).

Among the various anthropogenic explanations for the markings, the least likely to be linked to any symbolic meaning, is the possibility that they were caused when humans cut meat of animal bones. This could apply to bone artefacts such as the Blombos fragment, yet microscopic evidence contradicts this. Cutmarks would logically be made with the sharp edge of a cutting tool, typically a stone flake. The corresponding marks would then be "V-shaped, narrow and shallow (...) generally straight and, rarely, slightly sinuous." (d'Errico et al., 2001, p. 314-315) Comparative analysis with bone fragments that have indeed been shown to bear cutmarks indicates that the markings on the Blombos piece are significantly different: "the latter are U-shaped, unusually wide and deep, sinuous, multiple parallel, and in an unusual anatomical location. (...) five incisions on the piece were produced by repeated strokes. (...) Single cut marks produced by multiple strokes are not uncommon but the repetition of this action on several adjacent incisions was never observed on modern butchered bones. The repeated use of this multiple stroke

57 With the exception of the Diepkloof eggshell fragments which are broken elements of hypothesized water containers.

technique suggests a deliberate intention to produce deep visible incisions." (2001, p. 315) Again, the butchery marks explanation cannot directly account for markings on other materials such as ochre or stone. In these cases, however, it might be possible that the marks were caused unintentionally if pieces of these materials were used as cutting boards. According to Henshilwood et al., "a flat surface used as a base on which to cut soft material will need to be of a size compatible with the task." (2009, p. 38) Most of the engraved pieces are too small to be used in this manner. The Qafzeh core, for example, is reported to measure 6.2 x 4 x 1.6 cm, the most elaborately engraved Blombos ochre piece, M1-6 measures 7.58 x 3.48 x 2.47 cm. Flat surfaces are also uncommon among engraved artefacts. The cross-hatching on M1-6, for example, occurred on what appears to be the side of the piece, whereas the other, larger and flatter sides appear untouched (Henshilwood et al., 2002, 2009). Finally, like butchery marks on bone, demonstrated cutmarks tend to be structurally different: they "are generally straight, sub-parallel, overlapping, and oriented along the long axis of the board (…)." (Henshilwood et al., 2009, p. 38)

Even if anthropogenic intentionality can be ascertained, a number of options still remain. The Blombos ochres and the Klein Kliphuis piece in particular can potentially be explained by virtue of scraping in order to produce ochre pigment. Evidently, this would only apply to ochre itself, which means it cannot account for, among other things, the patterning on the Diepkloof eggshells. The possibility of testing an ochre chunck through scoring with regard to its potential for grinding it for later pigment use has been investigated in detail for the Klein Kliphuis artefact. According to the authors, this is refuted by the fact that the engravings are cross-hatched, a practice entirely unnecessary for testing pigment quality (MacKay & Welz, 2008). Additionally, the surface is otherwise unaltered, contrary to some ochre objects where grinding marks and possibly intentional engravings are sometimes hard to distinguish (e.g. d'Errico et al., 2001). Henshilwood et al. (2009), in turn, again describe how grinding marks for testing ochre quality would be of a different nature, with, among other things, deep and linear marks that are only made in one direction, through unrestrained back and forth motion.

For engravings in general, not limited to those that appear on ochre pieces, other potential explanations remain. The engravings could have been the product of doodling, or they could have been part of a notation system. A doodle can be defined as "a design or representational image made while a person's attention is otherwise occupied (…)." (Henshilwood et al., 2009). It is often cited by those on the revolution side of the behavioural modernity debate, as it would explain the markings without having to invoke symbolic cognition, a capacity that proponents of the revolution view tend to attribute to the phase of Homo sapiens' arrival into Europe (e.g. Klein, 1995, 2000, 2009; Mellars, 2005). According to Henshilwood et al. (2009), the distraction thought to be characteristic of doodling is not in accordance with the available evidence for the Blombos ochres. Their analysis shows that at least some of the marks found at Blombos Cave require joint hand coordination, with one hand needed to hold the piece, and another for creating the engravings with a certain precision and constancy in incision depth. Doodling is not explicitely explored for the other geometrically engraved artefacts mentioned above, but it appears likely that the same sensorimotoric requirements apply to, for example, the motifs on the Diepkloof eggshells, and the sequential marking on the Klein Kliphuis ochre piece. In cases where the markings could theoretically be more suggestive of doodling because of their simpler nature, such as the Qafzeh cortex and the Blombos bone, the optional explanation of doodling appears equally unlikely, as doodling would in itself require the primary existence of a certain drawing tradition where abstract marking was already a custom, making this explanation a circular one (Henshilwood et al., 2009). As for notations, "a marking system specifically conceived to record, store, and recover information outside the physical body" (2009, p. 42), Henshilwood et al. (2009) argue that this is also unlikely to be a proper explanation. Markings, they state, should display clearly discernable variance in order to count as notations, as should there be evidence for sequential stages of marking. While this may be true for the Blombos ochres, other findings such as the cross-hatched ochre from Klein Kliphuis display these elements to a certain extent (MacKay & Welz, 2008). While it is uncertain to what extent the latter displays variance, sequential marking is nonetheless present. In addition, it is not clear whether there would be an a priori reason as to why markings should differ in their appearance, since a simple additive notation system might only require repeated, but similar-looking engravings.

In sum, different elements point towards an anthropogenic, intentional origin for the markings. Microscopic analysis has contradicted various utilitarian explanations such as butchering and pigment grinding, whereas animal-induced marks do not apply to all of the aforementioned artefacts. While cases such as the Blombos bone fragment and the Qafzeh Cave core appear relatively simple, though nonetheless intentionally marked, in several cases, there is evidence for advanced neuro-motor control in the different directions and the sequence of the engraved lines. The main difficulty seems to lie in distinguishing various remaining options such as doodling, notation systems, and alternatives such as markings of ownership, or displaying a shared mental concept (Henshilwood et al., 2009). The latter option would be most closely aligned with the artefacts' interpretation as early works of art, as well as with their symbolic interpretation.

4.4.2. Circumstantial evidence

One part of the argument in favour of symbolic interpretations thus consists of attempting to eliminate one by one any other potential, non-symbolic interpretation for mark-making. Another part involves gathering circumstantial evidence, i.e. equally symbolic interpretations of contemporaneous practices, with the implicit inference being that if symbolic cognition was indeed in place at a time ascertained by, for instance, shell beads manufacture or burial, it might equally well have been at work in geometrically engraved artefacts. Clearly, the validity of this inference depends first and foremost on whether the often cited behavioural practices such as ochre use are indeed adequately supported as being symbolic in themselves. This section briefly reviews notable examples and interpretations of three widely cited indicators of behavioural and cognitive modernity, along with the appearance of art. They are the use of ochre, the manufacture of shell beads, and the practice of burial.

Of these three, ochre use is currently known to be the earliest practice. When describing ochre use as an instance of modern behaviour, archaeologists usually refer to the grinding of iron oxide pigment chunks that range in colour from yellow over red to brown. The most commonly used type of ochre appears to be red ochre, which draws its colour from its chemically different structure, containing the mineral haematite. Consequentially, red ochre and presumably associated colour preferences often star in accounts of the evolution of symbolic behaviour (Bar-Yosef, 2002; d'Errico, 2003; Henshilwood et al., 2002; McBrearty & Brooks, 2000; Mellars, 2005; Watts, 1999). A review by McBrearty and Stringer (2007) cites Kapthurin, Kenya, as being the oldest known example, reaching almost 300.000 years back in time. This means that ochre use - the precise nature of which is unknown - dates back to the dawn of the Middle Stone Age, which is usually said to have followed up on the Early Stone Age between 280.000 and 250.000 BP. Alternatively, sites such as Kapthurin can be seen as indications that even our Early Stone Age ancestors, far preceding the emergence of anatomically modern humans around 195.000 BP, used ochre for either practical or symbolic purposes.[58] Ochre belonging to later stages of the Middle Stone Age was found in Twin Rivers, Zambia, dated to around 225.000 BP, as well as in Pinnacle Point, South Africa, dated close to 160.000 BP (McBrearty & Stringer, 2007). Among the more recent examples are Klasies River and Blombos Cave, both in South Africa. Blombos Cave is particularly notable as the systematic excavations at this site yielded what was interpreted as an ochre-processing workshop (Henshilwood et al., 2011). It contained, among other things, ochre powder, grindstones, hammerstones, and abalone shells that appear to have been used as pigment containers.

Obviously, the great difficulty with ochre use lies in interpretation. Of crucial importance is whether symbolic thought was at work. For many, this is a self-evident truth, to the extent that ochre use is sometimes regarded as the primary origin of symbolic cognition in itself. Knight et al. (1995), for example, discuss how symbolism arose when red ochre was used as a fertility signal, employed in early art forms such as dance and body painting. Even if ochre is not thought to be intertwined with the *origin* of symbolism, it is nonetheless regarded as one of its quitessential manifestations. Concerning the currently known oldest recovery of processed ochre, d'Errico et al. write that "recent excavations at the sites of Twin Rivers in Zambia (…) and Kapthurin in Kenya (…) have yielded convincing proof of the symbolic use of pigments during the Acheulean-Middle Stone age transition (ca. 200.000 years ago)." (2003, p. 4) Additionally, "the systematic use of pigment for decoration is generally considered evidence of symbolic thinking and a hallmark of behavioral modernity." (d'Errico et al., 2003, p. 19) The symbolic relationship that is being proposed appears to be generally based on colour symbolism, i.e. it is thought that red ochre was abundantly used because of certain meanings that were attached to this particular colour, and that elude present-day researchers (Henshilwood et al., 2009). Humphrey notes how the colour red can have informational value in a wide variety of contexts, which seems to warrant a certain degree of social mediation in meaning attribution in order to make precise associations:

> "The reason why red should be in certain situations so disturbing is more obscure. If red was always used as a warning signal there would be no problem. But it is not, it is used as often to attract as to repel. My guess is that its potential to disturb lies in this very *ambiguity* as a signal colour. Red toadstools, red ladybirds, red poppies, are

[58] Although modern behaviour is commonly equated with the emergence of anatomically modern humans and their presumably biologically-based modern cognition, it cannot a priori be excluded that other species were not capable of symbolic thought.

> dangerous to eat, but red tomatoes, red strawberries, red apples, are good. The open mouth of an aggressive monkey is threatening, but the red bottom of a sexually receptive female is appealing. The flushed cheeks of a man or woman may indicate anger, but they may equally indicate pleasure. Thus the colour red, of itself, can do no more than alert the viewer, preparing him to receive a potentially important message; the content of the message can be interpreted only when the *context* of the redness is defined." (Humphrey, 1973b, p. 98)

One way in which ochre could then be symbolically used, is as body decoration. Not requiring any external materials but nonetheless indicative of aesthetic and symbolic considerations, body decoration might qualify as the earliest form of art. In addition to these potential functions, a variety of other options have been raised. Notably, these are utilitarian, and do not presuppose any symbolic meaning. Ochre has been found to possess medicinal qualities, such as an antiseptic function (Klein, 2009; Velo, 1984). It additionally protects the skin against the sun and insects (Keeley, 1980). Moreover, it can assist in the preservation of hides becauses of its antibacterial function (Keeley, 1978; Audouin & Plisson, 1982), although experimental evidence has indicated that this effect may be relatively limited, and that ochre application to hides might have been characteristic of the later stages of hide processing in which case it may have been decorative (Watts, 1999, 2002). Alternatively, ochre can be used as a component in the adhesives used for hafted tools (Lombard, 2007; Wadley, 2005; Wadley et al., 2004).

Alltogether, ochre pigment qualifies as a potentially symbolic behavioural element, but its various other uses prevent us from concluding with certainty that *all* archaeological sites yielding evidence of ochre processing are therefore also immediate evidence for the presence of symbolic cognition. Ritual or symbolic interpretations are not the only ones available, and citing any trace of ochre use as an unequivocal type of evidence of behavioural or cognitive modernity is therefore unjustified, and creates weak inferential support for the analysis of geometrically engraved artefacts. Yet even if, for example, there was clear evidence of a seemingly non-utilitarian preference for red ochre over others such as yellow pigment, the conclusion that its use was certainly symbolic, is weakly supported. In the absence of any contextual knowledge and the mere citation of ethnographic examples where colour presumably had indeed symbolic connotations, it is impossible to exclude whether the colour preference was not just precisely this: an aesthetic preference for red over yellow, perhaps because of its vibrance as a colour, but without any conjectured symbolic relationships. Here, Peirce's typology of signs comes in particularly handy: even if archaeologists found evidence for both a preference and a referential relationship, it would still be possible that the latter was of an indexical nature, such as when red ochre refers to fertility (e.g. Knight et al., 1995). Additionally, colour preference in itself can be explained in an entirely non-utilitarian way: because red ochre, as opposed to yellow ochre, contains significantly higher levels of haematite, functions such as hide preservation, and possibly hafting, are fulfilled with considerably more ease (Audouin & Plisson, 1982; Wadley, 2005). As such, a colour preference need not even entail a referential relationship, but merely a practical, beneficial effect. A stronger case for ochre's symbolic use could be made if processed pigment was found in association with other, more clearly symbolic practices, yet as will be noted below, this associative support is often weak as well. Alternatively, methods from experimental archaeology might prove to be useful (e.g. Rifkin, 2012). These can clarify, among other things, sequences in pigment application and specific tools that might have been used.

Shortly after 100.000 BP, the first sets of shell beads started to appear in the human behavioural and cultural repertoire. Like ochre use, the gathering and manufacture of these beads, i.e. their preparation for wear by piercing and stringing them - is widely cited as a hallmark of behavioural modernity, regardless of whether gradualist or sudden emergence views are endorsed (e.g. Bar-Yosef, 2002; d'Errico, 2003; Henshilwood & Marean, 2003; McBrearty & Brooks, 2000; Mellars, 2005). Investments in personal ornamentation are thought to be endowed with symbolic significance. If shell beads were shown to be connected to, for instance, individual or group identity, some argue that this would imply a conventional, and thus symbolic relationship (e.g. MacKay & Welz, 2008), and that their status as symbolic artefacts is "undisputed." (Henshilwood, 2007, p. 126; see also d'Errico et al., 2005; Henshilwood et al., 2004) A similar argument comes from Wadley: "jewellery can be seen as style that could signify a form of cultural identity. Ornamentation provides information about its wearer; this information is a culture-specific code. It might be impossible for archaeologists to crack the code, but it is not difficult to recognize its symbolic content." (2001, p. 208) Clearly, such statements, like those concerning ochre use, are dependent upon careful consideration of the available archaeological evidence, and of the interpretations made.

Middle Stone Age and Middle Palaeolithic shell beads are often associated with a few notable sites. In addition to the aforementioned geometrically engraved artefacts and the ochre workshop, Blombos Cave yielded a collection of 41 Nassarius kraussianus beads that are dated between 75.000 and 78.000 BP (d'Errico et al., 2005;

Henshilwood et al., 2004; Vanhaeren et al., 2013). At the Grotte des Pigeons in Taforalt, Morocco, researchers found a similar set of Naussarius gibbosulus beads, which were dated to around 82.000 BP (Bouzouggar et al., 2007). Similar patterns of bead manufacture were found at various other Moroccon sites (d'Errico et al., 2009). Also in North Africa, at Oued Djebbana in Algeria, as well as at the Israelian site of Skhul, the same species of beaded shells were found in layers of human fossils that were in themselves dated between 100.000 and 135.000 years BP, a date considerably further back in time than both Blombos Cave and Taforalt (Vanhaeren et al., 2006). Qafzeh Cave, Israel, also yielded shell beads in layers dated to around 92.000 BP (Bar-Yosef et al., 2009), whereas a potential case has been made for beads of around 70.000 years old in Sibudu Cave, South Africa (d'Errico et al., 2008).

At several occasions, the shells were found to contain red ochre traces, which indicates that either the shells were coloured, or that they were worn against a surface, such as human skin, that was already covered in pigment (Bouzouggar et al., 2007; d'Errico et al., 2009; Henshilwood et al., 2004; Vanhaeren et al., 2013). Of the Middle Stone Age shells found at Blombos Cave, 88% percent displayed a regular dorsal perforation that is not found among living Nassarius kraussianus. Experimental archaeological techniques have shown that if a shell is pierced with a bone point - the tool that was likely used for piercing shells - this produces the same perforation pattern found among Middle Stone Age shell beads (d'Errico et al., 2005). Also in various cases, the beads were recovered in small groups, which has led some researchers to suggest that these might have been beaded necklaces; the string tying them together may have perished over the course of time (e.g. Henshilwood et al. 2004; Vanhaeren et al. 2013). This is further supported by evidence indicating that different groups of beads often also display different wear patterns, suggesting that multiple individuals were involved. This in turn might strengthen the argument for the symbolic component of shared meaning (Henshilwood, 2007). Various ways in which such stringing could have taken place are explored by Vanhaeren et al. (2013). As such, shell beads give insight into associated skills that Middle Stone Age ancestors must have possessed, such as drilling, threading, and tying knots. Different elements suggest that shells were not only intentionally strung together as beaded necklaces, but that they were additionally specifically selected for this purpose. The Taforalt beads were found around 40 kilometers from the coast, whereas the beads in Qafzeh Cave were also transported over some 35 kilometers from the Mediterranean Sea, suggesting considerable long distance acquisition of the shells (Bar-Yosef et al., 2009; Bouzouggar et al., 2007). Explanations as to the accidental arrival of the shells on the sites have been analyzed and refuted. At Blombos Cave, for instance, no animals except one species of gastropods are known to have foraged for the Naussarius shells, with these animals in themselves only being found in, or very close to the ocean. At Blombos Cave, only adult-sized shells were recovered, which indicates deliberate collection and specific choice.

Findings such as beads having been strung together, apparent differences in strings of beads, and ochre traces on the shells have often been taken to mean that manufacturing and wearing shell beads was not merely an aesthetic practice, but also contained a strong symbolic component. Specifically, shell beads are commonly thought to reflect either individual or group identity, with their role as markers based on a conventional relationship that is socially shared. Moreover, the possibility that they functioned as identity markers would then indicate that the individuals who wore them were capable of advanced self-awareness and self-recognition, especially if shell beads were additionally connected to social status (d'Errico et al., 2005, 2009). While all of these cognitive and social associations may be true, it is not sure whether this reflects symbolic thinking. Again, Peirce's typology of signs provides an alternative perspective. If, for example, different types of beaded strings signalled different individual or group identities, this relationship appears to have been established mainly by association. Similarly, if personal status or wealth was to be expressed by means of the number of beads worn by someone, for instance, it is not immediately clear whether this indicates, and thus cognitively presupposes, the understanding of an arbitrary, conventional relationship. In sum, symbolic inferences from shell beads, and secondary inferences from such beads as to the presence of other symbolic capacities such as language (Botha, 2008, 2010), appear poorly supported.

Fig. 56. Shell beads from the Middle Stone Age layers of Taforalt, Morocco (1-13), and a comparison with a modern specimen of Nassarius gibbosulu from Djerba, Tunisia, ca. 82.000 BP.

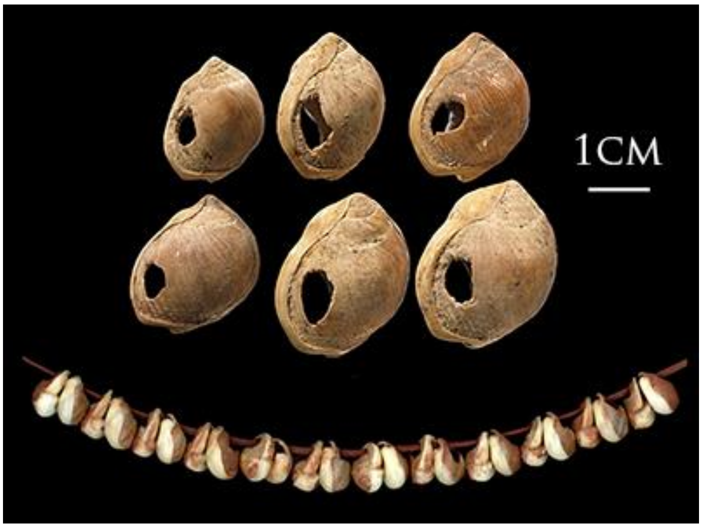


Fig. 57. Shell beads and hypothesized stringing from Blombos Cave, South Africa, ca. 78.000 BP.

Fig. 58. Experimental archaeological bone tool perforation.

Finally, symbolic interpretations of geometrically engraved artefacts are sometimes substantiated by referring to the practice of burial. Intentional burial, it is thought, displays evidence of a special treatment of the deceased, which could be an indication of ritual practices. These might in turn be part of a religious belief system, involving concepts such as afterlife belief, or the belief in a distinction between a material, perishable body, and an immaterial and enduring soul. Because this requires relatively advanced abstract thinking and concepts of imagined afterlife worlds and a soul - which can never be perceived by the senses and must be conceived of by means of abstract, referential thought - intentional burial is often regarded as a clear indication of symbolic thought. Like ochre use, shell beads and artistic practices, it is widely cited as a prime example of behavioural modernity (e.g. Bar-Yosef, 2002; d'Errico, 2005; Henshilwood & Marean, 2003; McBrearty & Brooks, 2000; Mellars, 2005).

Potential archaeological findings of burial need to be assessed first and foremost in terms of their intentionality. In some instances, human remains are found in compositions that appear to be suggestive of their conspecifics' intent, but that can, at the same time, be explained as merely incidental outcomes. In the Atapuerca Caves in northern Spain, the 400.000-year-old remains of at least 28 individuals were found at the bottom of a 12 meter vertical shaft, but it is highly uncertain whether this constitutes an intentional, let alone a symbolic burial. It is more likely to be either a case where individuals accidentally fell down the shaft, or where bodies were deposited for mere practical reasons, such as hygiene (Mithen, 1999). Evidently, the greatest difficulty will be not so much in identifying the intentionality of a burial, but in assessing whether such burial took place within a religious or ritual frame of mind. The act of interring in itself could equally have occurred for hygienic reasons, especially as populations became increasingly sedentary, for instance by means of seasonal occupation of the same sites.

The most notable indication for religious or ritual considerations is the presence of grave goods. This is also the main argument used to support intentionalist claims for the oldest currently known presumed burial site, which is located at Qafzeh Cave, Israel. The site contains evidence of hearths and large mammal exploitation, advanced lithic technology, shell beads, grinded pieces of ochre, and notably also the remains of five individuals. At least one of these appears to be intentionally buried, contains traces of red ochre, and a set of deer antlers found is thought to be a grave gift for the individual concerned (Hovers et al., 2003). As the burial site is dated to around 92.000 BP, this would mean afterlife belief was present among Middle Palaeolithic ancestors at this time. Criticism has been levelled as to whether a symbolic explanation is justified in this case. According to Gargett (1999), natural causes might instead be responsible for the preservation and lay-out of the bodies, whereas the presence of deer antlers in itself does not prove that they were a grave gift. Drawing from cognitive archaeological insights, Coolidge and Wynn (2009) have outlined how the specific nature of potential grave gifts may yield more insight. Discussing the ca. 30.000-year-old Sungir burial in present-day Russia, they describe the wide variety of material artefacts found. In association with a grave containing two skeletons, archaeologists found over 10.000 stranded beads, what appeared to be belt made of 250 polar fox teeth, ivory clothing pins and a pendant, decorated antler batons, and a human femur packed with red ochre. In addition, several mammoth ivory spears were found, which would be both too small and too fragile to be used for actual hunting. This indicates, according to the authors, that there was not merely afterlife belief present, but additionally also belief in an afterlife that was fundamentally different from the utilitarian concerns of life on earth (2009). Arguments such as this one highlight the importance of carefully considering the available evidence, and of assessing any material artefacts as detailed as possible as to their relevance for assumptions of religious or symbolic belief. Although this does not prove that the deer antler set at Qafzeh Cave was not a grave gift, its credibility appears to be lower than for burial sites at the height of the Upper Palaeolithic.

4.4.3. Critical perspectives and alternative explanations

This brief overview of presumed to be symbolic practices such as ochre use, shell beads manufacture and burial, underlines the many methodological and interpretative difficulties that arise when attempting to sustain symbolic explanations for geometrically engraved artefacts in this manner. First, each of these practices in itself cannot be with certainty endowed with symbolic meaning. Ochre use and burial might be motivated by a variety of practical concerns, and shell beads, as well as ochre, might indeed entail referential relationships, albeit of an indexical rather than symbolic or arbitrary conventional nature. Second, the basic premise underlying such comparative analyses appears to be that if burials really did contain symbolic elements, perhaps as early as 92.000 BP at sites such as Qafzeh Cave, or if shell beads were manufactured and worn with certain symbolic meanings attached, this is evidence for the *presence* of symbolic thought in the cognitive repertoire of our ancestors. However, even if this were true, symbolic content does not unequivocally translate to geometrically engraved artefacts. There is no a priori reason as to whether these artefacts could not have an entirely different kind of origin, with any religious or otherwise symbolic beliefs being characteristic of a limited range of other behavioural practices alone. In sum, it cannot be excluded that shell beads manufacture, for instance, was an activity endowed with symbolic meaning, but even if this were true, considerably more support is necessary in order to make claims concerning geometrically engraved artefacts with the argumentative strength often presupposed.

As for the artefacts in themselves, some have attempted to explain the markings as unintentional, or have discredited their potential relevance by pointing out that we know so little about them (e.g. Klein & Edgar, 2002; Lewis-Williams, 2002). As extensive microscopic and comparative analysis of the objects has shown, unintentionality clearly cannot be a valid explanation for more elaborate motifs such as the cross-hatched Blombos ochres. Doubt has also been expressed as to their relatively low frequency in the archaeological record of Middle Stone Age Africa (e.g. Mellars, 1996a, 1996b). Even when taking into account elements such as preservation bias, their occurrence remains uncommon, and their small numbers seem unbalanced with regard to the great significance attached to them for both the origins of symbolism and the emergence of art. Because the basic property of a symbol is that it contains a conventionally established meaning that is socially shared, the apparent absence of a frequent occurrence of the artefacts also seemingly diminishes the possibility that they were part of an extensive, socially mediated symbolic system. According to yet others, the social component attributed to the engravings may be an overestimation, as they may equally have possessed mere individual significance for their makers (Malafouris, 2008; Wynn & Coolidge, 2007).

Wadley has additionally pointed out that symbolic interpretations of geometrically engraved artefacts may in themselves be a consequence of the trait-wise approach to behavioural modernity, or what she calls a "'shopping list' approach." (2001, p. 207) Because such lists are heavily based on the archaeological record, they tend to be focussed on the presence or absence of certain types of material artefacts, and less on the potential width and complexity of social behaviours. According to Wadley, "this approach is theoretically flawed because there is no *a priori* reason for linking new techniques to symbolism. Artefacts are thus not automatically imbued with symbolism; that happens only when they are used to define or mediate social relationships." (2001, p. 207, original italics) Such statements equally indicate that a larger-scale reference network appears to be necessary in order to substantiate symbolic claims. The current state of the archaeological record does not allow for ascertaining the presence or absence of such networks during the Middle Stone Age and Middle Palaeolithic.

One reason for the popularity of symbolic interpretations of these artefacts might be the fact that they are traditionally studied within Palaeolithic archaeology alone, where interpretation often relies heavily on ethnographic analogies, and on the general application of social and cultural anthropological insights (Barnard, 2012). Palaeoarchaeologists thus cannot avoid making use of inferences such as those described above, although a considerable issue in this regard is evidently that any positive conclusions in terms of symbolic meaning are only as strong as the supporting evidence. Archaeologists more critical of such symbolic interpretations have, however, not provided a clear alternative explanation, instead merely pointing out methodological weaknesses. Evolutionary approaches may, however, provide a fresh theoretical perspective.

Several evolutionary hypotheses of art extensively make use of the concept of patterning, thereby referring to a variety of different types, such as patterning in visual stimuli (e.g. Pinker, 1997), and patterning in social information (e.g. Boyd, 2009). The arts provide an ideal medium for structuring patterns and transmitting them to small and larger audiences. Depending on the precise evolutionary explanation - i.e. adaptation vs. byproduct - the presence of patterns in art yields significant functional value for those engaging in either the creation or perception of art. Yet even in the byproduct version, endorsed by Pinker, the ability to recognize and process patterns in the surrounding environment is in itself adaptive - whether art plays a functional role to this end is the core of this adaptationist-byproduct debate. The pleasurable experience associated with pattern perception, however, is not. This likely makes up part of the explanation for the appearance of geometrically marked artefacts. One parsimonious account is that they produce appealing visual effects for their makers and others who perceived the patterns. This does not have to exclude other potential explanations such as some instances of marking perhaps being notation systems. In such cases, using marks for notation would indicate that mark-making in itself was already characteristic of our ancestors' behavioural repertoire - a point also made by Henshilwood et al. (2009) with regard to doodling.

The hypothesis that the engravings mostly elicit a pleasurable response, and that visual perception is the key to their understanding, has been further explored by Hodgson as part of his neurovisual resonance theory (e.g. 2006a, 2014). The reason why abstract markings, rather than more intuitive figurative imagery, appear to be the first traces of artmaking, is probably due to the anatomy of the visual cortex. As various parts of the cortex evolved to process specific categories of graphic primitives, this is probably reflected in the appearance of similar patterns in early geometrically engraved artefacts (Hodgson, 2006a). Based on hypotheses discussing the adaptive benefits of pattern recognition and adequate processing, neurovisual resonance theory states that the perception of the same patterns on artefacts leads to “a sense that the world is being disambiguated correctly, which forms the basis of a proto-aesthetic awareness.” (Hodgson, 2014, p. 64) The arousal experienced through the perception of visual primitives and patterns subsequently becomes a hyperstimulus in the case of art (e.g. Hodgson, 2006a; Ramachandran & Hirstein, 1999). Intentionally made marks can then be described as “an auto-cued, self-induced reward.” (2014, p. 64) Hodgson summarizes:

> “The precise mechanism by which the Blombos engravings were realized is therefore likely to be as follows: during the process of acquiring ochre the individuals concerned will have noted - through the aforementioned resonance - that the accidentally made scratches on raw ochre created unintended patterns the instigators will have attempted to either reproduce or improve upon. In this sense, the accidental scratches served to scaffold the intentional engravings through neurovisual resonance, which conforms to the notion that behaviour is structured by embodied processes in that a previous active motor behaviour, which gave rise to the accidental scratch marks, led to a ‘passive’ perceptual response that facilitated a further motor activity for producing the intentional patterns. In other words, passive perceptual factors became engaged with active motor procedures in a way that had not occurred before.” (2014, p. 64)

This line of reasoning might also explain the co-occurrence of seemingly intentional and non-intentional markings on the same objects (e.g.d’Errico et al., 2012). Here, unintentional scratches might have elicited an arousal response that eventually sparked a new behavioural practice of intentional marking (Hodgson, 2014). As for meaning, neurovisual resonance theory does not presuppose that this must have been present as a motivational factor for the onset of engraving. The logical trajectory, according to Hodgson, would have been that visual and neurocognitive appeal gained personal significance during a later stage, such as for body decoration, only later acquiring any sociocultural or symbolic functions (2014).

It is important to note that a function such as group identification, sometimes heralded as a clear symbolic explanation (e.g. Texier et al., 2010) for geometrically engraved artefacts, might, in Peirce's view and echoed by Hodgson, equally be seen as indexical (Hodgson, 2006a).

Hodgson's view implies that the engraved artefacts may contain a *potential* for symbolic use, while this does not have to be, and probably is not the original motivation for their creation. This has been echoed by Mithen within his cognitive fluidity framework. In his view, the interpretation of animal tracks, i.e. the attribution of basic meaning to these tracks, already involves an indexical, and perhaps protosymbolic component, although full symbolism is not stated to occur until this capacity is integrated with the abilities to create marks, classify marks in conceptual categories, and socially communicate the applicable reference relationships (e.g. Mithen, 1996a, 1996b). Dissanayake (2009) equally outlines how the earliest traces of art may lie in protosymbolic behaviours. The basic feature of artmaking for her is artification, or the addition of extraordinary elements to ordinary reality. Engraving or other geometric types of mark-making, such as the creation of cupules by hammering rock surfaces, might be the very earliest traces of artification that are discernable in the archaeological record. Cross-cultural research has found that the practice of making cupules dates back to around 200.000 BP, with the Indian site of Bhimbetka Cave often cited as a notable example (Bednarik, 1993, 1995, 2003; Dissanayake, 2009). Practices such as body decoration might have predated this, but these are evidently not preserved, or at best indirectly suggested by ochre traces or modifications found on skeletal remains (e.g. Coe, 1992).

Approaches based on evolutionary theory can also add to the debate in a secondary way. Some archaeologists have questioned the long assumed to be quintessential connection between art and symbolism, as evidenced from the examples cited at the beginning of this chapter (e.g. Currie, 2011; Humphrey, 1998). Here too, archaeology provides only limited insight. While the necessity of symbolism for art cannot be stated with any certainty, nor can it be clearly sustained that symbolism is *not* necessary. This depends in part on whether any set definition of art is used. The second chapter of this dissertation discussed the complexities involved in defining art within an evolutionary framework. Merely going by the various definitions available would not provide much progress as to understanding the relationship between symbolism and art, as opinions often differ concerning the necessary components of such a definition. In one example, Coe (1992) outlined how the element of shared meaning, or symbolism, might even have to be avoided in order to produce an empirically workable definition. The attribution of meaning is evidently a difficult matter in the case of prehistoric art, where contextual information is almost always absent, and where any attribution of meaning is necessarily inferred from the objects in themselves - a situation that can quickly lead to circular reasoning. Because of the often elusive character of particular symbols or meanings, Coe advocated to focus instead first on more basic properties of art, rather than on taking meaning to be a crucial component of a definition of art. Referring to Boas, she further argues that “the study of art can be ‘obscured’ by a discussion of meaning (...). Boas argued that ‘significance’ or meaning is ‘neither universal nor can it be shown that it is necessarily older than form’, and that ‘not all societies have art that is meaningful or has associative connotations’. (...) In addition, within a society there can be ‘considerable wavering’ about the particular meaning of a symbol (...).” (Coe, 1992, p. 222)

4.5. The behavioural modernity debate revisited

Traditional accounts of the behavioural modernity debate tend to describe the emergence of modern cognition, and the resulting behaviour, as closely accompanying the appearance of anatomically modern humans in the fossil record. Among the outstanding issues are the question whether this process was of a sudden or rather gradual nature (e.g. McBrearty & Brooks, 2000), whether Neanderthals did or did not display similar types of behaviour, expressed in the prevailing single species vs. multiregional model (e.g. d’Errico, 2003; Mellars, 2005), and the nature and potentially vast implications of notable findings, among these being geometrically engraved artefacts (e.g. Henshilwood et al., 2009). Overall, the emphasis tends to be on cognitivist interpretations, based on the presumed close correlation between biology, cognitive abilities, and behavioural outcomes, thought to have emerged together - at least in a capacity-like format - at the dawn of our species. Among these cognitivist models are Klein’s neural mutation (1995, 2000, 2009) and Mithen’s process of cognitive fluidity (e.g. 1996a), as well as general views of the interconnectedness of biology, cognition, and certain types of material culture (e.g. Henshilwood, 2007; Mellars, 2005).

Depending on geographical location, a reliance on close connections between anatomy, cognition, behaviour and culture can be problematic in various ways. In the African record, Homo sapiens is thought to have arisen around 195.000 BP (McDougall et al., 2005), but most early traces of presumed modern behaviour do not appear until around 100.000 BP, and even then in patchy distributions - a point addressed as the aforementioned sapient paradox (Renfrew, 1996, 2007, 2008). In the European record, the connection with biology appears to be more straightforward as Neanderthals quickly vanished after the advent of Homo sapiens, seemingly supporting the proposed correlation (Mellars, 2005). Yet in this record, methodological issues in archaeology can easily obscure the validity of this correlation, especially when investigating the contemporaneous Châtelperrionian and Aurignacian cultural complexes - the first attributed to Neanderthals as a tail of the Middle Palaeolithic Mousterian, and the second assumed to be characteristic of newly arrived Homo sapiens. As sites were repeatedly occupied, with different levels belonging to different technological complex-phases, and perhaps to different species, contamination can occur in both directions (Nowell, 2010). Any advanced Neanderthal behaviour might be interpreted as the product of Homo sapiens, confirming the common view that Neanderthals were overall less intelligent and skilled, or on the contrary, apparently 'modern' behaviour might be erroneously attributed to Neanderthals. Moreover, general issues with uncertainty in dating can equally cause confusion in temporal phases or geographical locations where two species can be easily mixed up (Nowell, 2010).

In recent years, the lines of the behavioural modernity debate have been significantly redrawn. Many have questioned whether a cognitive change of any kind - a specific one such as in the case of a mutation, or a more general one accompanying anatomical modernity - is the key to understanding the eventual outcomes we now classify as modern behaviour. Although it is clear that evolved cognition must have played an important role, a variety of other explanatory elements may have been at work. Social, cultural and demographic factors may also have been responsible for considerable changes in patterns observed in the archaeological record. Including such factors might answer to the issue that instances of proclaimed modern human behaviour often appear and disappear over the course of the Middle Stone Age and Middle Palaeolithic.

Geometrically engraved artefacts, for example, are characterized by a patchy distribution both in time and space. This has been invoked by authors such as Mellars (1996a, 1996b) with the aim of questioning the validity of their symbolic interpretations. The supporting evidence often invoked in sustaining symbolic claims, discussed above, does not appear to be strong enough in itself, as more parsimonious explanations for mark-making may equally apply. However, the weakness of this evidence does not exclude symbolic content either, and as archaeologists tend to note, absence of evidence - in this case of symbolic cognition - is not evidence of absence. Moreover, the method of looking for contemporaneous and thought to be symbolic practices such as ochre use, shell beads manufacture and burial, and which is common in the above cited palaeoarchaeological studies, might in itself be an artefact of the traditional cognitivist and linear view of behavioural and cognitive modernity. The method seems to imply that symbolic thinking is in essence clearly rooted in biologically-based evolved cognition, and that, if expressed in behavioural domains such as social interaction, cannot remain hidden in other domains such as supernatural thought or artmaking. Yet there is no a priori reason as to why this should necessarily be true. The remainder of this chapter therefore explores how, if the behavioural modernity debate is adjusted to accomodate the role of other variables, new perspectives on geometrically engraved artefacts can emerge.

The most notable factor that has been explored in general with regard to its potential implications for the behavioural modernity debate, as well as for the interpretation of geometrically engraved artefacts, is population size, and by extension group dynamics. The relevance of framing the emergence and presence of symbolic practices within a wider social context has been outlined before by Wadley (2001). Chase (2006) has also comprehensively argued how symbolic cognition may not have become recognizable in the archaeological record until it started to affect and perhaps regulate social relationships, at which point it could become materialized in the form of artefacts. Intuitively, this suggests that changes in population size or the composition of groups might also spark new or different trajectories for certain types of artefacts, such as geometrically-marked objects.

The potentially catalyzing effect of population increase for the cumulative evolution of cultural innovation has been put forward by both archaeologists attempting to explain parts of the archaeological record that display innovation (e.g. Henshilwood, 2007; Henshilwood et al., 2009), as well as by evolutionary scholars developing more theoretical insights (e.g. Boyd & Richerson, 1985; Richerson & Boyd, 1998, 2005; Richerson et al., 1996). Larger population sizes can create selection pressures for both behaviours such as larger-scale cooperation and social network formation, as well as for cultural products such as ethnic markers in the form of material artefacts (e.g. Boyd & Richerson, 1987; Richerson et al., 1996). Additionally, population increase, which on a smaller scale can translate to larger group sizes for individuals, enlarges the pool of innovators and thus the chance that beneficial innovations are made, for instance in tool manufacture. Because the size of the group is larger, existing innovations are likely to be maintained within a common cultural memory, rather than perhaps dying out along with a single innovative individual. Sterelny (2011) has referred to this from a niche construction point of view as the accumulation of cognitive capital. This aspect has also repeatedly been modelled and empirically supported, yielding computational evidence in favour of the finding that greater population size increases both the number and complexity of innovations (Henrich, 2004; Powell et al., 2009; Shennan, 2001).

Henshilwood (2007) cites evidence based on mitochondrial DNA analysis, which would indicate that population size did not extend a few thousand individuals, before taking off exponentially after around 70.000 BP. This might explain why geometrically engraved artefacts are scarce before this time, although such a demography-based hypothesis should predict that the same types of artefacts start to abound relatively soon after in the archaeological record - a pattern that is clearly not found. Additional answers might come from the inclusion of ecological data. With regard to the seeming explosion after Homo sapiens' arrival in Europe and the apparently slow spread and patchy distribution of Middle Stone Age innovations, Henshilwood (2007) cites not only these lower population numbers as a cause, but also the different ecological niches of these two timeframes. While innovations only had to spread from East to West in Europe and the Middle East, behavioural practices of the African Middle Stone Age needed to cross different ecological zones on a North-South axis, which likely slowed transmission processes down. In addition, climatological factors are likely to have played a role at least in some phases. The potential influence of this factor has also been reported for the appearance of stylized Venus figurine pendants dated to the Magdalenian period of the European Upper Palaeolithic. The spread of local variants of these pendants is thought to have accompanied the recolonization of Europe after the end of the Last Glacial Maximum around 18.000 BP, potentially as an ethnic marker for newly established and larger-scale collaborative networks (De Smedt & De Cruz, 2012).

Importantly, acknowledging the relevance of other variables such as demographics, ecology and climatology does not mean that cognitivist explanations should be less important, or that they should be mutually exclusive. In this regard, Hodgson (2013) has developed a model that combines the forces of social and cultural transmission within ever larger groups with neurocognitive insights on mirror neurons and imitation, in order to establish a joint model of the evolution of modern cognition and behaviour. In sum, a continued and thorough integration of factors such as cognition, demographics, ecology and climatology will shed more light on what appear to be notable turning points or phases of acceleration in the archaeological record. This also means that concepts such as 'transition' or 'revolution' are perhaps better discarded in favour of a mosaic evolution-type structure. The latter is considerably more complex because of the integration of more circumstantial variables, and notably acknowledges the vast number of influential relationships between these variables (Straus, 2012). In sum, our knowledge of the emergence of what tends to be referred to as modern cognition and behaviour would be greatly enhanced by the "(…) acknowledgement of a far more complex, longer term process of human evolutionary change, situationally variable in nature, scope and tempo among the three Old World continents and from region to region therein over the course of the whole late Middle and Upper Pleistocene." (Straus, 2012, p. 351)[59] Numerous interactions between variables, as well as shifts in frequency distribution, rather than singular and linear evolutionary trajectories, are key to understanding the emergence of modern behaviour and cognition. This means that the available models discussed at the beginning of this chapter receive an important addition. The almost entirely discredited but occasionally maintained sudden emergence perspective centered around the European Upper Palaeolithic (Klein, 1995, 2000, 2009; Mithen, 1996a), milder versions of this hypothesis (e.g. Mellars, 2005), and the gradualist evolution view (e.g. Henshilwood & Marean, 2003; McBrearty & Brooks, 2000) all fit both within a cognitivist as well as a single species approach. In addition, the multiregional continuity model was proposed in order to account for apparent archaeological oddities such as seemingly modern Neanderthal behaviour (e.g. d'Errico, 2003; d'Errico et al., 1998; Zilhão, 2007; Zilhão & d'Errico, 1999), which is now complemented by the multifacetted view outlined above (e.g. d'Errico & Stringer, 2011; Hodgson, 2013; Shennan, 2001; Sterelny, 2011).

Taking this broader view of the behavioural modernity debate into account, geometrically marked artefacts might indeed be symbolic artefacts, despite the fact that they do not neatly fit within an expected pattern of clear and common behavioural manifestations of biologically-based symbolic cognition. Their numbers appear to be too few, and the nature of their markings too irregular in order to be steady features of a new and modern behavioural repertoire. Yet according to population-based models, utterances of symbolism, perhaps proto-

[59] Along with this, it may be necessary to revise, and according to some, discard temporal phases and breaks such as the European and West-Asian Middle Palaeolithic and subsequent Upper Palaeolithic with a transition in between, and the African Middle and Late Stone Age with its corresponding transitional phase (Straus, 2009).

symbolism or indexical referencing when thinking conservatively, can perfectly well have taken place in relatively isolated locations at earlier phases in time, before disappearing again due to locally shifting factors. Henrich's (2004) aforementioned model of demographics in relation to cultural evolution illustrates how the relationship is not only one of increase in both population size and cultural complexity, but also the reverse: a drop in population size, sometimes in conjunction with geographical isolation, might have as a consequence a steep decline in cultural complexity levels, with previously existing innovations disappearing again. This case study has been explored by Henrich with regard to tool variation in Tasmania after its separation from the Australian mainland, but there is no a priori reason why symbolically endowed behaviours would be an exception.

Alternatively, the seemingly hesitant start of geometric mark-making, if not merely an artefact of archaeological preservation biases, may in itself be part of a co-evolutionary trajectory of mind and culture. Authors such as d'Errico et al. (2005) noted that the engravings might be evidence of an upcoming behavioural practice of storing information outside the brain, in which case their potential for influencing social mediation would be larger than if this merely occurred inside the mental world of the brain. Additionally, explanations of engravings as notation systems or mnemonic devices have been described as instances of an extended mind (De Smedt & De Cruz, 2011b). The functional benefits derived from such practices, e.g. a better control of the surrounding environment, can indirectly have impacted ancestral fitness. One proposed function of marks as a mnemonic method is that they could have registered seasonal migration patterns of animals (2011). Hypothesizing from this point, greater control of hunting and foraging would have led to the ability to sustain larger groups, which in turn might have created pressures for better social regulation - an adaptive problem where symbolic artefacts could have acquired new and deeper functions than mere practical notation.

Finally, what does this analysis of early geometric mark-making contribute to insights into the evolutionary origins of art? Hodgon's neurovisual resonance theory outlines how the first instances of art were probably of an abstract nature, in accordance with the anatomy of the visual cortex (e.g. 2006a, 2014). Geometrically engraved artefacts are, however, mostly described in terms of their symbolic potential, but less clearly as the first currently known instances of art. Because symbolic meaning does not appear to be a prerequisite for art, the latter does not conceptually depend on the former, although the connection between both is evidently possible too. If it is hypothesized that the artefacts do embody the first instances of artmaking, pragmatically regardless of whether they are symbolic in nature, the major conclusion to be drawn from this, is that the length of art's history doubles, or perhaps triples.[60] In addition, considering the artefacts as art highlights the importance of including a wide number of explanatory variables, a point not always incorporated in evolutionary hypotheses. A case study on geometrically engraved artefacts shows that it will not be fruitful to place a heavy emphasis on social factors, such as in ethological hypotheses, nor should evolutionary psychology's cognitivist outlook be a priori more important. Within the above discussion, Boyd and Richersons cultural and co-evolutionist framework awards most attention to the complex dynamics of social mediation through artefacts, although here, in turn, the importance of selection for relevant cognitive abilities is moved to the background. Only a joint undertaking might yield further insight into the double question whether the artefacts concerned are truly symbolic, and whether they are art.

4.6. Concluding remarks

This chapter focussed on geometrically engraved artefacts as both a presumed indexical trait for the presence of symbolic cognition - widely regarded as the epitome of behavioural modernity - as well as an instance of a trait that, if interpreted correctly, pushes the origin of modern cognition significantly further back in time than the long celebrated Upper Palaeolithic transition. Whether the artefacts are indeed symbolic may be a question that will never be answered with certainty. Supporting evidence from contemporaneous practices is relatively weak, although the use of this comparative method can, in itself, be debated as to its inferential strength. Whether the artefacts constitute the first currently known art is equally riddled with mystery, as the creators' original intent remains unsure.

From the above discussion of philosophical and interpretative issues in the behavioural modernity debate, it becomes obvious that the debate on the symbolic nature of geometrically engraved artefacts, is almost entirely located within a cognitivist interpretation of the emergence of behavioural modernity, in itself framed within a clear single-species model taking a gradualist approach. Recent theoretical and methodological modifications of the behavioural modernity debate,

[60] This inference is based on the artefacts alone, and does not include possibilities such as body decoration by means of ochre being the actual first kind of art.

however, have illustrated that this comprises only a very partial account of how modern cognition and behaviour arose. Multiregional views, but mostly mosaic evolution conceptualizations of behavioural and cognitive evolution, have increasingly questioned the theoretical premises of the traditional account of this debate. Departing from the assumption that biology, cognition and behaviour are inevitably and always closely correlated, also sparks the spin-off question of whether Neanderthal, Homo sapiens' brief cohabitant, might have made art as well. Before exploring this question, the following chapter first investigates the cognitive foundations of Upper Palaeolithic figurative art.

5

Metacognition and the origins of art

5.1. Introduction

The figurative art characteristic of the proclaimed Upper Palaeolithic transition in Europe is traditionally described as the quintessential proof that human ancestors had acquired fully modern behaviour and cognition around this time (Henshilwood & Marean, 2003; McBrearty & Brooks, 2000). While opinions have differed for a very long time, and continue to do so, concerning the precise nature and content of the parietal and portable art found, nearly all researchers agree that they contain symbolic meaning and intent, although the particular meanings involved elude us until this day. Emphasis is often placed on the presumed presence of religion during the same timeframe, and the emergence of material culture is often taken to be closely intertwined with concepts such as supernaturalism and altered states of consciousness (e.g. Breuil, 1952; Clottes, 1997, 2003; Clottes & Lewis-Williams, 1996; Lewis-Williams, 1997, 2002).

In recent years, several of the ideas commonly argued for by palaeoarchaeologists have been put in a different light, sometimes by researchers within the discipline of archaeology itself, but more often by outsiders such as psychologists and philosophers. One such example is the hypothesis developed by the psychologist Nicholas Humphrey (1998). It questions the undisputed status of figurative cave art as being fully symbolic, in favour of a paradigm shift that denotes the makers of Upper Palaeolithic art as perhaps being the remnants of an ancient mind, rather than the heralds of its modern counterpart. This perspective has received little or no resonance in scholarship on Palaeolithic art, and the limited number of replies from other fields have been very critical. In this chapter, Humphrey's original hypothesis is reassessed from a philosophy of mind angle, and specifically from the perspective of metarepresentational cognition. This will be accomplished by drawing together strands of evidence from research on theory of mind, metarepresentation, language and prehistoric art. It is proposed that the advent of figurative art indeed does not presuppose fully modern cognition, but that the artefacts and paintings can instead be thought of as witnesses of a gradual process in the evolution of advanced, metarepresentational cognition.

5.2. Upper Palaeolithic figurative art and its mainstream interpretations

Research on Upper Palaeolithic art is heavily focussed on the archaeological record of southwestern and central Europe, with a strong emphasis on cave paintings from the Franco-Cantabrian region including the famous sites of Chauvet, Lascaux and Altamira, and portable art, such as Venus figurines that span both the width of the continent and the duration of the Upper Palaeolithic. However, as the previous chapter and the brief overview at the beginning of this dissertation have shown, the development of artmaking is not only characterized by striking cross-cultural examples of undisputed art objects, but also by an increasing body of artefacts from eras that are more remote in time (e.g. Bahn & Vertut, 1997; Bednarik, 2003a). These artefacts tend to be characterized by geometric mark-making and non-figurative pigment use only. As such, they will be left aside for the present analysis, which will be concerned with establishing connections between mental capacities such as theory of mind, and the creation of figurative representations. A cross-cultural perspective, on the other hand, does seem to be in order. While much scholarship on figurative art during Prehistory is heavily focussed on the Franco-Cantabrian region and several sites in southwestern Germany, worldwide discoveries demonstrate the occurrence of representational imagery in sites that are not commonly included as part of the cradle of figurative artmaking. A recent analysis of earlier discovered figurative depictions and handprints on the island of Sulawesi, Indonesia, found that these are between 30.700 and 39.400 years old (Aubert et al., 2014). For Aboriginal Australian rock art, the earliest currently known direct date for painting or drawing lies between 27.000 and 28.300 years ago, but ochre crayons dating as far back as 50.000 BP have also been found, suggesting that the oldest art of Oceania is perhaps not yet found, or may have perished (David et al., 2013a).

Figurative representations, also referred to as iconic, can be defined as "the two- or three-dimensional rendering of humans and other animals, or to be more precise, the representation of things resembling those in the external world, or indeed imaginary worlds, fauna and flora especially, but also topographical features, built environments, and other human-made objects." (van Damme, 2008, p. 38) In prehistoric art, figurative imagery occurs both in parietal art - art that is created on walls and solid structures - and in portable art - art that can be carried around because of its small size. The cave paintings are by far the most outspoken and striking examples of prehistoric art, and they have led many researchers to determine that they must certainly have been of a symbolic nature. Apart from the fact that art in itself is usually equated with symbolic thought, the presence of iconic imagery seems to add even more to this idea. With regard to recognizing artefacts as art, Mithen writes that this should only apply to "those which are either representational or provide evidence for being part of a symbolic code, such as by the repetition of the same motifs. The earliest phase of the Upper Palaeolithic provides us with examples of both." (1996a, p. 176) Neumann, in turn, asserted that "each of these painted animals (…) is the embodiment and essence of the animal species. The individual bison, for example, is a spiritual-psychic symbol; he is in a sense the 'father of the bison', the idea of the bison, the 'bison as such'." (1971, p. 86)

From these statements, it is not immediately clear what is meant by a symbol. Again, the intuitive definitions of a symbol that tend to be employed (e.g. Mithen, 1996a), are of limited use. The properties of a symbol can be described as an arbitrary relationship to a referent, communicative intent, potential displacement in time and space of a symbol and its referent, individual and cultural variation, and the allowance of variability in execution (Mithen, 1996a, 1996b). Yet such a view does not allow us to clearly assess whether symbolic intent was involved in figurative cave art. There is no a priori reason why a figurative depiction of a particular animal should definitely contain an arbitrary reference relationship with, for example, an abstract concept. A more conservative view therefore appears in order, such as the one provided by Peirce (1932/1960). Based on the hierarchical typology of icons, indices and symbols, figurative prehistoric art should provisionally be regarded as a collection of icons, until clear evidence arises that they are indeed of a symbolic nature.

Among the first responses to the discovery of prehistoric sites, which began in the southwest of France, was the assumption that the paintings were forged by those who discovered them, as it was not thought credible that prehistoric people would have been capable of making the creations found, and certainly not of possessing the ability of abstract thinking (Bahn & Vertut, 1997; Guthrie, 2005). This later evolved into a phase where they were indeed recognized as artworks, but without any meaning attached. They were described as *l'art pour l'art*, or as *art ludique* (Richard, 1993). This term was developed to contrast *art magique*, used to denote the religious and symbolic interpretations that subsequently emerged. The prevalence of these approaches, relatively soon after the discovery of the paintings and their initially reluctant acceptance as art, is probably due to a number of reasons. Prehistoric art was uncovered and recognized in an age were the church had much influence in education and research, and many of the earliest scholars were members of the clergy, such as Abbé Breuil (Guthrie, 2005). In addition, the most well-known sites are invariably located in countries and regions that were, at the time, heavily influenced by Catholicism, such as southwestern Germany, Spain and southern France. Finally, early scholars were additionally often anthropologists, or archaeologists that drew significantly from anthropological and ethnographic paradigms and evidence. As a result, their interpretations quickly became coloured by observations from extant cultures about ritual, magical thinking, symbolism, supernatural beings and the overall framing of art within a religious context (Guthrie, 2005).

This eventually produced two main views on the nature of prehistoric art. One of these regarded cave art as a part of hunting magic, a belief system thought to increase the number of animals, and to ensure a successful hunt (Breuil, 1952), whereas the other emphasized the symbolic influence of fertility by displaying voluptuous female figures and large groups of animals (Laming-Emperaire, 1962; Leroi-Gourhan, 1964). The connection between art and religion persists in prehistoric art scholarship up until today. Authors such as Clottes and Lewis-Williams have extensively argued that cave art is to be understood as an instance of shamanistic practices, that it emerges from the experience of altered states of consciousness, and that our ancestors thought of it as a means of contacting supernatural or spiritual beings (Clottes, 1997, 2003; Clottes & Lewis-Williams, 1996; Lewis-Williams, 1988, 1997, 2002). They apply this view to figurative paintings and the abstract markings that occur with them, as well as to portable objects such as therianthropic images. These are interpreted as being merged representations of animals and humans, which might indicate special symbolic or religious relevance (Lewis-Williams, 2002).

Not all archaeological interpretations are necessarily religious, although this does not exlude that they attribute symbolic meaning to prehistoric art. Discussing mobiliary objects from the southwestern German Aurignacian, broadly dated between 35.000 and 28.000 years ago, Porr (2010a) explains these artefacts within a cultural memory framework. This is regarded as a type of social memory, involving shared ideologies, origins and myths. Portable art objects might then be ways of materially anchoring these memories, which can subsequently be accessed by engaging in rituals. The Aurignacian objects mentioned display low degrees of standardization - contrary to, for example, tools from this period - but high degrees of effort, suggesting that they were extraordinary objects with individual significance. According to Porr (2010a), this is further supported by the findings that they appear to have been worn in combination with ornamentation such as beads, were made of ivory, and contain traces of wear, indicating that they were rubbed against clothes or skin. Mithen (e.g. 1988a, 1996a, 1996b, 1999) has compellingly argued for a cognitive explanation where full symbolism arose via the breakdown of divisions between different, and more functional cognitive domains, such as natural intelligence for hunting, and social intelligence for interacting with conspecifics. In this view, figurative art is one of the absolute exponents of symbolic cognition. Its functions can, however, still be varied. Parietal cave paintings and many instances of portable art can be seen as possessing an instructive and mnemonic function, storing and helping to retrieve information about the natural world (Mithen, 1988a). Religious art, in turn, might have been a means for anchoring counterintuitive concepts present in religion - concepts for which no immediate natural domain appears to exist in the mind (Mithen, 1999). Along the lines of Mithen's hypothesis, De Smedt and De Cruz (2011b) have similarly proposed a mnemonic function for prehistoric art, which should, according to them, be linked to an emerging pattern of using external storage systems such as complex material culture.

5.3. Critical perspectives on symbolic interpretations

Despite the enduring popularity of the view that prehistoric art is intimately connected to religion, other scholars have questioned whether a symbolic interpretation of cave art, of which religious explanations are the main exponent, is truly as unquestionable as it has been claimed to be. However, the connection between art and symbolism is not necessarily a “conceptual truth,” as Currie points out (2011, p. 19). There is no way of knowing for certain whether the art that is so commonly heralded as the ultimate outcome of the advent of modern human cognition is perhaps instead “art without any of the standard cultural trimmings: symbol, tradition, general and reflective beliefs about the world and about value.” (2011, p. 19)

So how could cave art have been created by our Upper Palaeolithic ancestors if they were not in possession of complex symbolic cognition, or at least, if such cognition did not play a role in the creation of their art? According to Hodgson (2003, 2008), the explanation might be the functional anatomy and evolution of the brain. Guthrie (2005), in turn, concludes from his analysis of paintings, drawings and handprints from the Upper Palaeolithic that they were likely the work of unskilled children and young adolescents, most of which would have been males. He deduces this from the size of the handprints and from the overall thematic emphasis on boyish subjects such as female physiques and hunting scenes. In addition, he rightly remarks that while overviews of prehistoric art tend to focus heavily on the most impressive parts of the most remarkable sites, the vast majority of the art is in fact of fairly low graphic quality, often consisting of little more than sketchy lines reminiscent of animal shapes. If prehistoric cave art was indeed an instance of pastime graffiti, it most decidedly did not reflect advanced religious or symbolic thinking. Halverson (1987) adopts a different, non-symbolic view, proposing that the earliest figurative depictions represent a developmental stage in human cognition where for the first time images were detached from their actual referents, which were mostly real life animals. Although the images themselves are often figurative, they nonetheless represent a type of abstraction, in the sense that they may have been a step towards conceptual thought. This does not, however, imply symbolic thought as the reference relationships are merely iconic, rather than arbitrary, providing yet another way in which Upper Palaeolithic cave art might not fit the often assumed symbolic framework.

In a provocative article from 1998, Humphrey proposed the hypothesis that cave art, rather than being evidence of a major and fundamental cognitive breakthrough towards modernity, might instead point towards an earlier, premodern stage in the evolution of human cognition. Methodologically, he supported this argument by means of a comparative psychological perspective that took into account any cognitive inferences that can or cannot be made from prehistoric cave art, but notably also present-day individuals with cognitive impairments. Specifically, he considered the possibility that the deficits characteristic of individuals with an autism spectrum disorder could potentially shed light on the nature of the minds of the ancestors who were the creators of, among other things, the record of cave paintings. Like several of the aforementioned authors, Humphrey doubted the assumption that figurative art in particular is necessarily linked to the advent of symbolism in human cognitive evolution:

> "But what makes us so sure that Upper Palaeolithic humans *were* engaging in ritual, music, trading and so on *at the level that everyone assumes*? One answer that will clearly not do here is to say that these were the same humans who were producing symbolic art! Yet, as a matter of fact this is just the answer that comes across in much of the literature: cave art is taken as the first and best evidence of there having been a leap in human mentality at about this time, and the rest of culture is taken as corroborating it." (1998, p. 186, original italics)

Humphrey's alternative hypothesis was sparked by noticing striking visual resemblances between Upper Palaeolithic cave paintings on the one hand, and the drawings of one particular autistic child, Nadia, on the other. Nadia was a young child that suffered severe language and social cognition impairment, characteristic of autism, but who nonetheless possessed astonishing drawing abilities strongly atypical of normally developing children of her own age (Selfe 1977). In a set of pictorial comparisons between Nadia's drawings and paintings from Chauvet Cave (ca. 35.300 - 38.700 BP), Lascaux Cave (ca. 17.000 BP) and Pech Merle Cave (ca. 25.000 BP), Humphrey found a number of formal resemblances. Both of these drawing styles – the contemporary yet cognitively affected style of Nadia and the prehistoric style of the cave painters – were characterized by strong realism and naturalism. As opposed to Nadia, non-autistic children of the same age typically produce schematic images, where the intended depiction is often clearly recognizable but not executed in a dynamic, naturalistic style. In addition, similar graphic techniques appeared to have been used in both cases. Among these were an emphasis on linear contours, often drawing the outer lines of a figure several times, and the use of foreshortening in the perspective of the humans and animals that were depicted. Normally developing children would, on the contrary, make much slower progress in understanding perspective laws and how these could be employed to create naturalistically looking images. Moreover, the liveliness of both Nadia's and prehistoric humans' drawings was greatly increased by selectively emphasizing salient parts of animals and humans, such as their heads. In terms of the combination of different figures within one image, Humphrey noticed the recurring overlapping of, for example, different horses of a group. As such, elements of composition in the whole of one drawing appeared to be commonly overlooked in favour of formal details.

Fig. 59. Black and white version, with colour rendition, of horses at Chauvet Cave, ca. 35.300 - 38.700 BP.
Fig. 60. Line drawing of horses by Nadia at 3 years and 5 months old.

Fig. 61. Black and white rendition of a bison at Chauvet Cave, with colour version, ca. 35.300 - 38.700 BP.

Fig. 62. Line drawing of a cow by Nadia at around 4 years old.

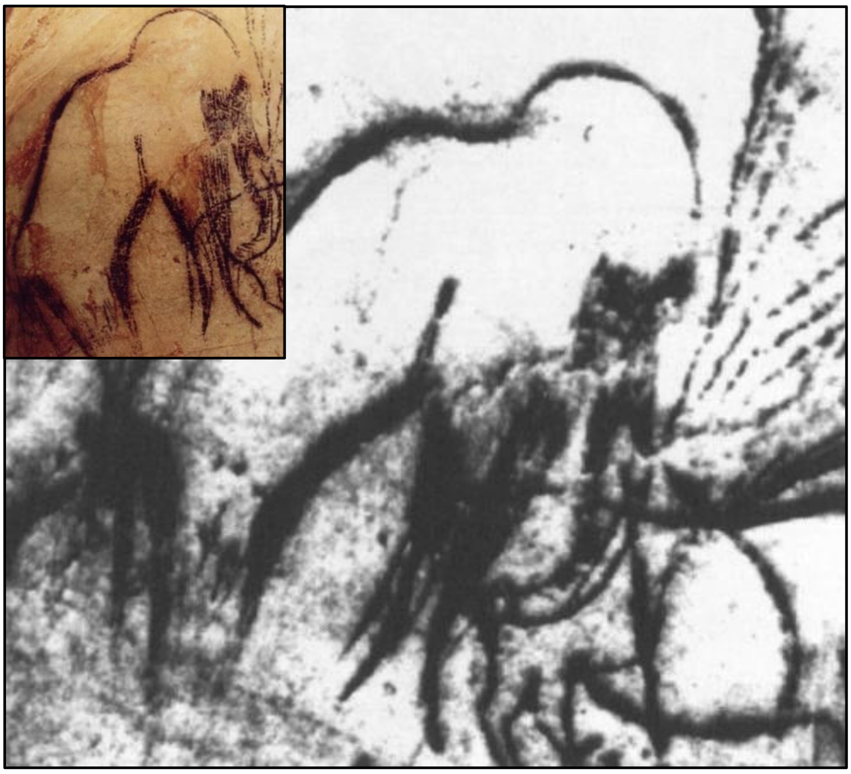


Fig. 63. Black and white rendition of a mammoth at Pech Merle, ca. 25.000 BP (rotated with regard to the original painting).
Fig. 64. Line drawing of an elephant by Nadia at around 4 years old.

Based on this preliminary visual analysis, Humphrey developed a twofold argument concerning the interpretative power of Nadia's drawings for our understanding of cave art. In a first step, he pointed out how the presence of severe cognitive impairment does not prohibit exceptional drawing skills: "given that Nadia could draw as she did *despite* her undeveloped language, impoverished cognitive skills, apparent lack of interest in communication, and absence of artistic training, it is evident that so too *could* the cave artists have done. Hence the existence of the cave drawings should presumably *not* be taken to be the proof, which so many people have thought it is, that the cave artists had essentially modern minds." (1998, p. 171, original italics) In other words, the cave painters might have shared a similar cognitive set-up and this would by no means have stood in the way of achievements such as the imagery at Chauvet Cave. The argument becomes both more interesting and controversial upon deriving the second step: "suppose, indeed, it were more generally the case that a person not only *does not need* a typical modern mind to draw like that but *must not have* a typical modern mind to draw like that. Then the cave paintings might actually be taken to be proof positive that the cave artists' minds were essentially pre-modern." (1998, p. 171, original italics)

In his subsequent analysis, Humphrey paralleled the original study of Nadia by Selfe (1977) when he identified Nadia's language impairment as the potential key to the riddle of cave art. Selfe found that Nadia's cognition was characterized by literal mindedness: she could match items that possessed similar perceptual properties, such as a picture of a chair and a rendition of the chair's silhouette, but not different kinds of objects belonging in the same conceptual category, such as various types of chairs within the concept 'chair'. Selfe connected this to a lack of conceptualization: individuals such as Nadia were proficient at registering a primary representation such as a chair, but did not proceed to have any conceptual thought about this representation. She reasoned that perhaps this might have been due to precisely the absence of verbal mediation during the developmental phase where graphic competence is normally acquired: "these children therefore have a more direct access to visual imagery in the sense that their drawings are not so strongly 'contaminated' by the usual 'designating and naming' properties of normal children's drawings." (Selfe, 1983, p. 201) In sum, it is perhaps the absence of language ability that explains the presence of exceptional drawing skills.

When parallelled with cave art, Humphrey realised that he either needed to argue that language was absent among the general population that roamed Europe around the dawn of the Upper Palaeolithic when the cave paintings appeared, or that the specific artists who made the cave paintings were individuals that lacked language ability and simultaneously possessed the drawing skills observed in Nadia. He recognized the speculative and untestable nature of the second claim and the incompatibility of the first claim with the body of research on language evolution, which tends to converge on the idea that spoken language dates back to around 100.000 BP (e.g. Schultz et al., 2012).

A third possibility presented itself in the form of social language use. Perhaps, Humphrey argued, language was present but limited to the social domain around the time of the first cave paintings. Rather than the fullblown lexical and syntactic system we currently know as language, its predecessor may have consisted of a suite of mimetic devices, such as imitative gestures and sounds, for communication about the animal world. If there was indeed a differential involvement of language in the social domain - the interaction with conspecifics - and other domains, such as animals in the natural world, one would expect a different level of conceptualization and, following Humphrey and Selfe, a different graphic representational outcome. Specifically, one would predict striking naturalism in domains where concepts do not yet prevail, such as animals, but the opposite with regard to humans. This is indeed the pattern that is found: clear human representations are rare to non-existent in the early cave paintings, and when they do appear, around 17.000 BP at Lascaux, they are of a stylized, abstract nature (Humphrey, 1998). Interestingly, in Nadia's case where language was entirely absent, no significant difference occurred in how animals and humans were drawn. Finally, naturalistic imagery such as the depictions found at Chauvet and contemporaneous sites appears to have halted around 10.000 BP. According to Humphrey, this may be due to the rise of language, which brought about increased conceptualization and evident benefits, but came at the cost of naturalism in art: "human beings could have Chauvet or the Epic of Gilgamesh but they could not have both." (1998, p. 176)

5.4. The nature of metarepresentational ability

Humphrey's interpretation of cave art in a comparative framework with cognitively impaired individuals was met with a range of critiques targeting the rather controversial nature of the comparison itself, as well as various of its content-wise elements and theoretical assumptions. The publication of his original paper has since been followed by a continued interest in so-called 'artists savants', in the precise nature of cognitive impairment in autistic individuals, and of course in the riddle of cave art itself. In order to follow up on the proposed connection between art and cognitive impairment linked to autism, this chapter adopts Dan Sperber's distinction between intuitive and reflective beliefs, focusing on metarepresentational thought and his concept of of cultural attraction. A key feature of metarepresentation is the capacity for theory of mind, which has repeatedly been shown to be affected to various degrees in individuals with an autism spectrum disorder (e.g. Baron-Cohen, 1987; Baron-Cohen et al., 1986; Wing et al., 1977). In this chapter, it will be argued that the impairment perspective on theory of mind often taken by cognitive psychologists, together with a philosophical mind view centered around metarepresentation, can shed a new light on Humphrey's above described analysis, and ultimately on the record of cave art in itself.

5.4.1. Sperber's metarepresentational mind view

The approach followed in this chapter starts from a massively modular view of the mind (e.g. Carruthers, 2006; Samuels, 2000; Sperber, 1994; Tooby & Cosmides, 1992) For decades, the disciplines of philosophy of mind and cognitive anthropology have been the stage of often heated debates concerning the extent to which the mind has a modular structure, and whether or not some or all of these modules should be seen as general-purpose or domain-specific in their operation. Various definitions for a module exist, but among its basic characteristics are that it is a distinct computational unit, often corresponding to specific neural circuitry, and with a genetic basis (e.g. Barrett & Kurzban, 2006; Geary & Huffman, 2002). In 1983, Fodor famously set out a two-level model of the mind that became a reference point for all later work on mental modularity. According to Fodor, input systems in the periphery of the mind are modular. They are specialized to handle specific kinds of sensory input, which they then process and pass on to the central part of the mind. This part performs conceptual processing of the output received, and is non-modular. It is instead described as general-purpose, indicating that its operations are not functionally specified.

In response to Fodor's view, Sperber (1994, 1996, 2000) proposed an alternative structure for the mind where its central part, responsible for thought and conceptual processes, is also of a modular nature. The mind as a whole retains the previously proposed two-tiered structure. Perceptual processes occur in sensory input modules and have conceptual representations as output. Conceptual processes in turn have both conceptual representations as input and output. The conceptual level too is domain-specific, although one conceptual module can take input from various perceptual modules. Moreover, modules have different domains: the domain a module evolved for is its *proper domain*. The capacity for face recognition, for example, is housed in a specialized cognitive system with clear adaptive benefits, as it allows for recognizing conspecifics, for communicating with them in basic ways through facial expressions and gesturing, for instance, and for reading their emotions and intents. The latter in particular, also termed theory of mind, is important for estimating the likelihood of adversary or affiliative behavioural actions. A module's *actual domain* comprises the representations that fit the module's input conditions, such as caricatures and smileys as face-like stimuli, which could be expressed in a *cultural domain* containing a variety of cultural representations where such stimuli are present (Sperber & Hirschfeld, 2004).

Furthermore, one can make a distinction between first-order and metarepresentational conceptual modules based on which type of concepts they process. First-order modules, or intuitions, deal with concepts or representations and generate intuitive beliefs that we adopt without deliberation. Metarepresentational modules handle concepts of concepts and representations of representations. They enable us to put the output of conceptual modules between brackets and take a reflective and critical attitude towards them, a process that results in reflective beliefs (Sperber 1994, 1996; Baumard & Boyer 2013). Different metarepresentational modules can be subsumed under the wider cognitive evolution of metarepresentational ability. In sum, Sperber's mind view proposes a total of three layers: the first level is composed of perceptual modules, which pass on their conceptual output information to the second tier of conceptual modules. These in turn are responsible for our intuitive, automatic beliefs. Finally, the overarching capacity of metarepresentation, which could theoretically be seen as a third layer, integrates conceptual information from a meta-perspective, yielding reflective beliefs. The entire structure can be schematically visualized as follows.

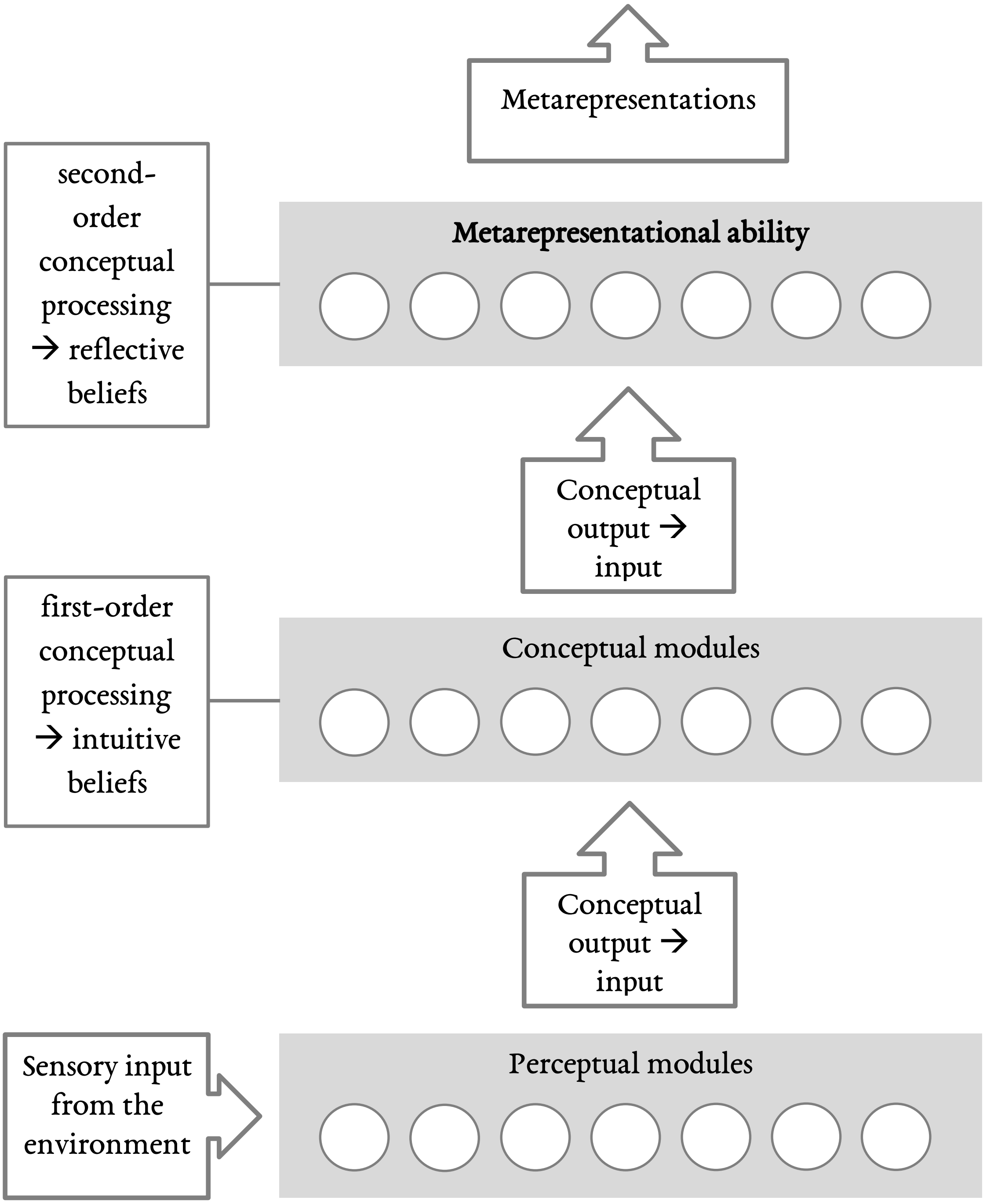


Fig. 65. Schematic representation of Sperber's mind view, with the two-tiered structure of perceptual and conceptual modules, and the overarching ability of metarepresentation. Numbers of domain-specific modules in each level are for illustration, and do not necessarily represent equal numbers, or processes of immediate, vertical transmission between content-wise corresponding modules in different levels.

The distinction between intuitive and reflective beliefs has led to the development of a dual mind theory that proposes two mental systems (Evans, 2010; Kahneman, 2011), but it also clearly fits within a massively modular view of the mind. In fact, to a certain extent, both views are compatible (Mercier & Sperber, 2009). However, there is no need to assume that the mind comprises two systems, or that these two types of beliefs are necessarily and always sharply delineated. As Baumard and Boyer explain, "both intuitions and reflections are probably produced by large numbers of domain-specific systems. In addition, reflections are not just parallel to intuitions, as some dual-processing models imply. Reflections are triggered and constrained by the specific contents of intuitions." (2013, p. 297) In other words, intuitions are able to exert a significant influence on which reflective beliefs people adopt. On average, and ceteris paribus, people prefer beliefs that are either in line with or minimally violate their intuitive expectations (Boyer, 2001; Sperber, 1996). If we zoom out from the individual to the population level, this process of preferential adoption explains why some representations become widely distributed, and thus cultural, whereas others do not (Sperber 1996). For instance, religious, creationist, anti-GMO and other irrational beliefs are popular to a large part because they tap into people's intuitons about essences, purposes and intentions (Blancke & De Smedt, 2013; Blancke et al., 2015; Boudry et al., 2015; Boyer, 2001). Understanding culture thus requires an epidemiological approach in which the distribution of representations is explained and understood in terms of the susceptibilities and intuitive preferences of the human mind. Sperber coined the term 'epidemiology of representations' to denote this approach.

Another name for the epidemiology of representations is 'cultural attraction theory', which highlights another dimension of Sperber's naturalistic approach to culture If one looks at the distribution of representations within the hypothetical space of all possible cultural representations - which includes but is not limited to ideas and beliefs, and elements of fashion, stories, art styles, language, music and religion - one will observe a pattern as if these representations tend to converge on ideal-type tokens called 'cultural attractors'. (Sperber, 1996) To explain these convergences, one needs to identify the factors of attraction that make a particular representation more or less salient. The relevance of a representation is determined by the attention it is able to grasp, the novelty of the information it purveys, and the ease by which the mind can process it. Factors of attraction can be either psychological or ecological. Examples of psychological factors are personal or locally shared interests, knowledge, desires and so on, as well as universally shared intuitive expectations. Ecological factors are relevant properties of one's environment and are thus external to the mind (Claidière et al., 2014). Examples are public representations such as texts, and artefacts such as bikes (Sperber, 1996).

For the purpose of this chapter, we are mostly interested in psychological factors, and in particular in the role of evolved intuitions, which are the output of conceptual modules. These modules naturally find relevant the information that belongs to the domain they have evolved to process, i.e. their proper domain. However, they can become activated by any type of information that satisfies their input conditions, the modules' actual domain. This is clear from the aforementioned example of a face recognition module (Sperber & Hirschfeld, 2004). As a consequence, this implies that the activation of a module does not necessarily betray its evolved function. On the contrary, within a cultural environment that consists of representations that are in place exactly because they have been able to successfully exploit modules, we can expect that most of its functioning will not be adaptive (Sperber 1996), and that many instances where a module is put to work, might be located in the cultural domain. In sum, we come to prefer many representations not because they are functional, helpful, or true, but simply because they are attractive (Boudry et al., 2015; Miton et al., 2015; Sperber, 1996).

Like first-order conceptual modules, metarepresentation is not a general processing device, but is instead composed of domain-specific mental systems that are specialized in the processing of representations of representations, beliefs of beliefs and concepts of concepts (Sperber 1994, 1996). They are in place because a metarepresentational ability provided adaptive benefits in our ancestral environment, probably, at first, to navigate our social lives. Humans are an exceptionally social species so it paid off, in evolutionary terms, to understand the complex behaviour of our conspecifics in terms of the mental states (beliefs, desires, intentions, goals, feelings) that cause that behaviour. In order to perform this remarkable feat, however, humans needed to metarepresent other people's mental states. Hence, there are good reasons to assume that the first adaptive function of our metarepresentational ability is to understand other people (Leslie, 1987; Sperber, 1994). In other words, it probably originally evolved as "a theory of mind module." (Sperber 1994, p. 60) In Sperber's own terminology, theory of mind can be described as the module's proper domain. However, this does not rule out that metarepresentational abilities evolved to perform other functions such as the evaluation of arguments and the comprehension of utterances (Sperber 2000).

5.4.2. Metarepresentation, theory of mind, pretense, and symbolizing

Any discussion of metarepresentation, and especially its relationship to theory of mind, is incomplete without referencing the work of Leslie (1987). In his seminal paper, he outlined the complex interplay of metarepresentation, pretense and theory of mind, proposing the crucial mechanism of decoupling. Leslie was primarily interested in explaining the cognitive nature of pretense in general, and pretend play in children. Pretense involves the intentional distortion of reality, a phenomenon that also features prominently in evolutionary hypotheses that endorse simulationist views on art's evolution. Its primary mechanism - decoupling - was mentioned already in the discussion of this hypothesis. Essentially, it denotes how primary representations, or perceptions defined by a "direct semantic relation with the world," (1987, p. 414) are mentally quarantined before making certain adjustments, which then result in secondary representations that often contain imaginary components (1987). Two kinds of representations thus emerge, being linked through the mental understanding that one is a modified version of the other, and crucially regulated via decoupling so as not to affect the important truth-relationship of the primary representation.

Pretend play is at the heart of children's behaviour, with a variety of examples such as bananas being used as telephones, or empty cups and dishes being used as if they featured in actual kitchen-related situations. Invoking the work of Piaget, Leslie further noted that in some of these cases, "a present object that is only vaguely comparable to an absent one can evoke a mental image of it and be assimilated to it, resulting in the creation of a symbol. The ability to pretend depends on this capacity to represent absent objects and situations." (1987, p. 412) In essence, this means that pretense is strongly intertwined with the capacity for symbolic thought. Both of these share the mental establishment of a relationship between a present object and an absent referent, although in the case of pretense, this relationship is often not arbitrary.[61] Connecting this back to Sperber's mind view, the secondary

[61] In some instances, there is indeed visual resemblance between, for instance, an object used during play and the absent object it refers to, such as in the case of a banana and telephone. Leslie (1987) sums up three structurally different kinds of pretense: (1) referential opacity, which occurs when an object is substituted (termed "deviant reference pretend" by Leslie), (2) non-entailment of truth if pretend elements are added to an existing object or situation (termed "deviant truth pretend"), and (3) non-entailment of existence, such as when an object is entirely imagined (termed "deviant existence pretend") (Leslie, 1987, p. 416)

representation can be described as metarepresentational in nature, and to a certain extent a reflection on the primary representation that is at its essence (Baron-Cohen, 2006; Leslie, 1987; Sperber, 1994).

Pretend play is a standard developmental phase that takes off around the age of two in normally developing children. This is also the phase during which theory of mind starts to develop, which is often said to reach the crucial stage of understanding other individuals' perspective around the age of four. Leslie continues in connecting these concepts:

> "The emergence of pretense it not seen as a development in the understanding of objects and events as such, but rather as the beginnings of a capacity to understand cognition itself. It is an early symptom of the human mind's ability to characterize and manipulate its own attitudes to information. Pretending oneself is thus a special case of the ability to understand pretense in others (someone else's attitude to information). In short, pretense is an early manifestation of what has been called *theory of mind*. (...) primary representations are by definition *transparent* that is, they directly represent objects, states of affairs, and situations in the world. Pretend representations, by contrast, are *opaque*, even to the organism who entertains them. They are in effect not representations of the world but representations of representations. For this reason I shall call them second order, or borrowing a term from Pylyshyn (1987), *metarepresentations*." (1987, p. 416, original italics)

Theory of mind has been elaborately researched and described, notably by Baron-Cohen from a developmental psychological perspective. He defines this capacity as the ability "to infer the full range of mental states (beliefs, desires, intentions, imagination, emotions, etc.) that cause action. In brief, to be able to reflect on the contents of one's own and other's minds." (Baron-Cohen, 2000, p. 3) If fitted within Leslie's framework, "to employ theory of mind requires that one can comprehend opaque states in oneself and others." (1987, p. 421) Theory of mind requires the decoupling of one's own mental states from others', with the significant possibility that these may be very different from one's own. This is true, for instance, if the observed person has different background knowledge when arriving in a particular situation, which could easily cause his or her cognitive and emotional response to differ. Understanding this seems self-evident as theory of mind is a central component in our evolved social cognition, but this can obscure the fact that it essentially requires taking a step back and considering other individuals' cognitive states at a meta-level. Metarepresentational ability is thus equally key to theory of mind as it is to pretend play, to the extent that pretend play is sometimes seen as a developmental precursor of theory of mind. Charman et al. explored the vast complexity of these phenomena in relation to yet others such as imitation and language, and found that sustaining joint attention, play, language, theory of mind, and imitation might all be part of "a shared social-communicative representational system in infancy that becomes increasingly specialised and differentiated as development progresses." (2000, p. 481-482)

The centrality and close interconnectedness of the abilities of pretense, theory of mind and metarepresentation is evidenced from impairment studies. These provide empirical evidence for the proposed connections, and illustrate how the meta-perspective needed may not be achieved by individuals with certain conditions, notably those with disorders that are part of the autism spectrum. Children with autism have repeatedly been found to have issues with pretend play and theory of mind (e.g. Baron-Cohen, 1987; Baron-Cohen et al., 1986; Wing et al., 1977). Importantly, this cannot be reduced to overall delay or impairment in mental development. Studies that use not only children without cognitive and developmental issues as a control group, but also children with Down's syndrome, tend to conclude that the latter often succeed much better in tasks that require metarepresentational ability than children on the autism spectrum - an effect pointing out that overall levels of mental development are not the explanation (Hill & McCune-Nicolich, 1981; Scott & Baron-Cohen, 1996). Rather, children with autism have, in Leslie's words, "a specific metarepresentational deficit." (1987, p. 423) They are also found to have considerable difficulties with producing imagined representations, even when given specific instructions to do so (Scott & Baron-Cohen, 1996).

The following sections will explore the implications of philosophical and psychological insights into metarepresentation for understanding figurative cave art. Metarepresentational ability and theory of mind will not be considered to be synonymous, although Sperber's proposal of theory of mind as the original proper domain for metarepresentational thought appears to go in this direction (1994). Evidence concerning the workings of theory of mind will, however, be used as a proxy for the concrete operation of the rather abstract concept of metarepresentational ability. As such, the analysis is not so much concerned with only applying the particularities of Sperber's mind view to cave art, but instead explores its key elements in relation to other relevant insights. Some important points and outstanding questions will be discussed afterwards.

5.5. Metarepresentational insights into prehistoric figurative art

5.5.1. Representation and art

While religious accounts of prehistoric art are both the most well-known and the least doubted explanations, the above cited examples of non-symbolic approaches to cave art highlight that conclusions as to any symbolic or religious content in portable and parietal art are perhaps drawn too quickly. While they are not necessarily wrong, the available evidence is surely not strong enough to warrant their uncritical acceptance. If the connection between symbolic cognition and art is not, as Currie refers to this matter, "a conceptual truth," (2011, p. 19) non-symbol based hypotheses should be investigated as potentially being of equal importance in understanding the archaeological record. In order to do so, this analysis first returns to one particular explanation, Halverson's art for art's sake hypothesis (1987, 1992). In what is both a historical overview of the intellectual study of prehistoric art and a proposal for a fresh perspective, Halverson takes up again the very first ideas of *l'art pour l'art*, which were uttered because ancestral humans were originally thought to be incapable of modern-like magical or religious contemplations (Guthrie, 2005). He frames these within a cognitivist hypothesis, arguing that the earliest phases of figurative prehistoric art depict little more than the very first explorations in representational rendition. In this view, questions concerning the meaning of the cave paintings and corresponding art might even become entirely void: "there remains another possibility (...), which is that Paleolithic art has *no* meaning, that is, that it had no religious-mythical-metaphysical reference, no ulterior purpose, no social use, and no particular adaptive or informational value." (Halverson, 1987, p. 66, original italics)

Representation, in this context, can simply be defined as a two-dimensional rendition of an object, person, animal, or element of the natural environment if parietal art is concerned, and a three-dimensional execution in the case of portable art. If Peirce's typology of signs is applied again, the visual appearance of the cave paintings parsimoniously corresponds to nothing more than the level of iconic representation. The images depicted bear clear visual resemblances to the outside world, most notably a wide and varied range of animal species (Bahn & Vertut, 1997). Although Halverson's perspective is termed "art for art's sake," (1987, p. 63) he acknowledges the potential issue that confusion will arise over the aesthetic, detached connotations made with this concept in 19th century western philosophical thought, and hence proposes to refer to the earliest cave art instead as "'representation for representation's sake,' which is not only less invidious but also more accurate in that the concept of art could have been no less alien and meaningless than religion, myth, or metaphysics 'at the dawn of human reflection.'" (1987, p. 66) This closely corresponds to the premise of Humphrey's hypothesis (1998) that the images may be nothing more than immediate observations realized in a graphically elaborate manner, and often with great attention to detail - a feature commonly found among the art-like behaviour of individuals on the autism spectrum (Selfe, 1977).

But if the imagery found should not be framed within complex religious, magical or otherwise symbolic contexts, how can its appearance be explained? In the hypothesized absence of, for instance, shamanist practices among our Upper Palaeolithic ancestors, the appearance of representational imagery must still be accounted for, as current archaeological investigations still support its entire absence before ca. 35.000 BP and sudden appearance around this time. Answering this question requires both addressing the mechanism behind, and the motivation for this new behaviour. According to Halverson, our Upper Palaeolithic ancestors' motivation for engaging in figurative artmaking is fairly straightforward. It is not necessary to invoke any specific functions for the art, such as the traditional religious accounts, or any others such as group identification. Instead, the explanation might simply lie in the pleasurable experience that is usually associated with making and perceiving art. Creating figurative imagery is, in Halverson's words, "autonomously rewarding." (1987, p. 67) As such, it is closely related to the often associated behaviour of play (e.g. Boyd, 2009; Dissanayake, 1974; Halverson, 1987). The question about what mechanism or mechanisms are involved in the process of artmaking, yields more insight into the riddle of its emergence.

Describing his meaning-detached approach to prehistoric art, Halverson (1987) notes how two-dimensional representations are achieved by means of a process of abstraction, especially in those instances where formal elements in the underlying rock surface are not used as a basis for depicting certain animals. In this case, the image comes immediately from the mind of the painter, which is a crucial and previously unseen development. The two-dimensional representation in itself becomes partly endowed with a third dimension, such as when body parts of animals are depicted in profile as if they would be seen in reality, e.g. with one leg behind the other. In this manner, "the image attains its own freefloating existence, independent of scene or surface. (...) Percepts become concepts. *This* horse becomes *a* horse, disembedded from the concrete." (1987, p. 66) This primary mechanism -

abstraction - neatly fits in Sperber's hypothesis concerning the evolution of the mind. While the first tier is composed of perceptual modules that process environmental input and yield conceptual output, or simply concepts, the second tier of conceptual modules has conceptual information as both input and output (e.g. Sperber, 1994). Halverson's vision of figurative art only requires the presence of the first elementary tier, where visual stimuli, such as actual horses, are transformed into concepts, or "*a* horse." (1987, p. 66) This is reminiscent of earlier cited statements concerning the symbolic nature of the depictions, such as Neumann's idea that "the individual bison, for example, is a spiritual-psychic symbol; he is in a sense the 'father of the bison', the idea of the bison, the 'bison as such'." (1971, p. 86)

While symbols necessarily presuppose meaning, Halverson points out the lack of clear evidence in favour of this hypothesis, and notes how the relentless quest to discover *the* meaning of the paintings may have stood in the way of acknowledging the very essence of early Upper Palaeolithic art, which is representation in itself. A potential consequence of this is that hypotheses involving inferences about certain meanings from the nature of some sites might lose their significance. For example, the apparent fact that some paintings are found in areas of caves that are difficult to access, has sometimes been taken to mean that these must have been deep, spiritual areas kept away from broad daylight and ordinary worldly stimuli, where chosen individuals could establish contact with religious beings (e.g. Lewis-Williams, 2002). Guthrie's critical account (2005) clarified how these conclusions are quite likely artefacts of taphonomic processes, requiring no specific explanation at all. If representation is key, this was likely only relevant for the individual making the paintings, which would mean the accessibility of the paintings for viewers should not affect their explanation. Instead, Halverson's approach can be summarized as follows: "it may be that the true significance of Paleolithic art lies in the history of consciousness. This art provides our earliest evidence of abstraction, the foundation of reflective thought. The images are abstracted from nature, yet concretely represent natural objects with their own independent existence, made, not given. Consciously created, they would invite a conscious response rather than the automatic or habituated reaction evoked by their natural counterparts." (1987, p. 70)

In sum, this perspective, though not at the forefront of debates concerning the nature of prehistoric art, fits in with both Humphrey's hypothesis and Sperber's mind view. It generally presupposes that in the earliest figurative art, we are witnessing the dawn of the capacity for abstraction and reflective cognition, and the basis of consciousness of the mind's operations. The paintings themselves are exploratory, play-like creations in this regard, motivated by the pleasurable experience of artmaking as such. The hypothesis implies that they were in themselves key to the further elaboration of conceptual and eventual symbolic thought: through the externalization of images on the cave walls, they actively entered the level of consciousness, and may have sparked new cognitive phases of abstraction (Halverson, 1992). Neither meaning nor metarepresentation are needed for this.

5.5.2. Modularity in metarepresentation and theory of mind

Perspectives such as Halverson's suggest that metarepresentation is not necessary for artmaking, i.e. that Sperber's third layer, or the overarching capacity for metarepresentation, might theoretically have been entirely absent, and that this would not have prohibited the appearance and proliferation of figurative artmaking. Producing a primary representation also does not require specialized cognitive machinery such as Leslie's quarantining, and thus metarepresentation, in order to apply modifications through imagination (1987). Some empirical support for this comes from Scott and Baron-Cohen's comparative study on imaginative drawing in relation to theory of mind (1996). But despite the existence of individuals with impairment in this domain, metarepresentational ability is a crucial component of present-day human cognition, and theory of mind is at the very essence of regulating social interaction. Claims as to its absence in some types of cognitive impairment are therefore complicated, and discussing issues with metarepresentation requires looking more closely at its structural nature.

This is relevant, among other things, for answering the question whether producing figurative representations onto rock surfaces or in portable objects does not in itself constitute a form of metarepresentation. After all, we are dealing with the externalization of a mental image in the mind of its maker, or an external representation of a representation that existed in this individual's mind. This is clear from the fact that many images are found inside caves, where live examples would evidently have been completely absent. If it were true that drawing, painting or sculpting in itself constituted full metarepresentation, any hypothesis proposing more basic cognitive foundations for the appearance of figurative art, such as Humphrey's, Halverson's, or the current Sperber-based approach, would become virtually insignificant. Again, developmental psychological studies of the development of theory of mind among young children, or in a comparative manner between normally developing children and children with autism, provide answers.

Leslie's conclusion that individuals with autism have "a metarepresentational deficit" primarily implies that they have issues with both the mechanism of decoupling, and as a result, understanding in terms of theory of mind. Because representation in itself does not appear to be affected, as found for example in Scott and Baron-Cohen's study (1996), a question arises pertaining to the precise nature of this deficit. Several studies have explored where the boundary of this deficit might lie, i.e. where a cognitive impairment in metarepresentation starts to interfere with the understanding of certain but not other representations. Researchers tend to converge on the opinion that considerable issues present themselves in the domain of so-called false belief. The well-known Sally -Anne test was developed by Baron-Cohen, Leslie and Frith (1985), and investigates the extent to which children in various cognitive developmental groups are capable of understanding others' mental states. In a puppet-style game, a child is asked to witness a scenario where Sally and Anne have a basket, box and marble. Sally places the marble in the basket and subsequently leaves the room, after which Anne changes the location of the marble from the basket to the box. Sally then re-enters, and the participant child is asked where Sally will look for the marble. Children who have normally developing insight into other people's mental states - a feature that should be in place around age 4 - on average tend to understand that Sally does not know that the marble was moved, and that she will look for it in its original place. Children with an impairment in this domain, such as those with an autism spectrum disorder, usually do not appear to understand that Sally's background knowledge towards the situation is different than their own, and that she will act accordingly. As a consequence, they tend to state that Sally will look for the marble in the box. In Baron-Cohen et al.'s original study (1985), 85% of 4-year-old normally developing children and 86% of the participating children with Down's Syndrome passed the false belief task, whereas 80% of the children with autism failed the provide the right answer. This was later confirmed by Leslie and Frith (1988). If operating successfully, the mechanism of decoupling works as follows: the participating child acquires a primary representation of the situation, which is that the object, after its move by Anne, is now located in the box, or in location B. Sally, however, still believes that the marble is in location A, the basket. Because the child should maintain its correct perception of the world, Sally's belief should be lifted into the realm of mental representation, i.e. Sally *believes that* the marble is in the basket.

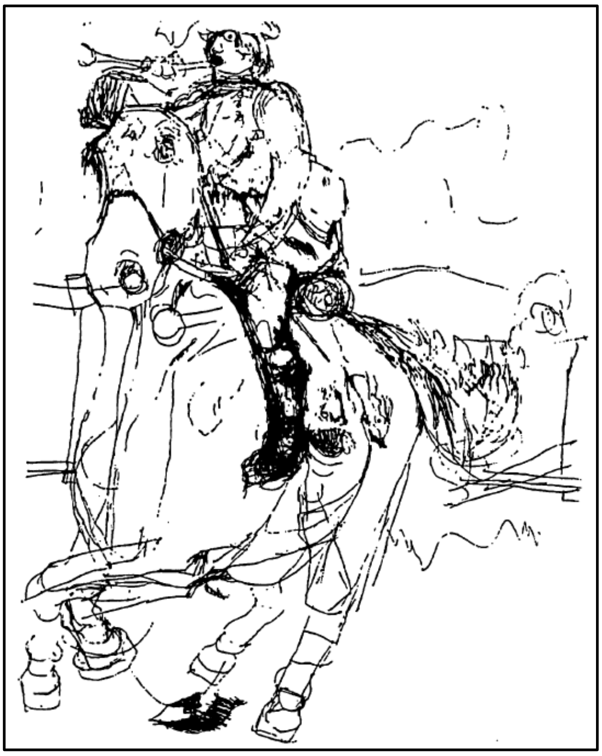
This way, the two beliefs are cognitively separated, with Sally's false belief not being able to affect the child's own belief, corresponding to reality (Leekam & Perner, 1991).

In later research, questions arose as to the precise nature of this deficit. Theoretically, issues with decoupling appear to result in great difficulty with understanding any kind of metarepresentation, with the representations in question not necessarily having to be mental states. Leekam and Perner (1991) conducted a similar comparative study between children with and without autism, which included a false photograph task. The experimenters took a polaroid picture of a doll wearing a certain colour of dress, before changing the dress to a different colour while the photograph developed. The participating child, having witnessed the dress change, then needed to predict the doll's dress colour in the picture before looking at the developed image. Contrary to the false belief task, autistic children had no issue with understanding that the dress would have its original colour in the picture. Normally developing children either failed or succeeded in both, usually depending on their age (3 vs. 4-year-olds). Charman and Baron-Cohen (1992) subsequently added the medium of drawing. They argued that very young children might be unfamiliar with photographs and cameras, and that drawings can also represent non-existing things, contrary to photographs. Participating children were asked to name a present object, before drawing it. After seeing the drawing, which was then put aside, a new object was introduced, which they also had to identify. After a memory question about the object that was previously there, they subsequently had to state which object was depicted in the then covered drawing. Children with normal insight into drawing representations would name the original object, whereas others might confuse it with the second object. The results confirmed that autistic and normally developing children were equally able to successfully complete the false drawing task. This was confirmed again by Charman and Baron-Cohen (1995).

In sum, metarepresentational ability seems to be modular. In children with autism, it is often heavily affected if mental representations of mental representations need to be made, but not if mental representations of normal, visually perceived representations are made. This further confirms that metarepresentation and theory of mind are not a prerequisite for producing figurative imagery. It also highlights that the crucial matter in the metarepresentational deficit is indeed the understanding of mental representations. If this part is impaired, issues arise with what Sperber would refer to as reflective beliefs (1994). These are the product of the overarching third tier of metarepresentational ability, and while this ability has now been shown to be modular, it does appear that second-order conceptual processing is at stake. The previous section already noted, though, that this second-order processing theoretically would not have been necessary for the emergence of figurative artmaking - a point that is supported by studies on the modularity of metarepresentation. Possibly, the 'simpler' kinds of metarepresentation evolutionarily preceded the more complex understanding of other people's mental states, despite the fact that the second is now commonly seen as the essence of metarepresentation. The primary kind of representation may have been iconic, and may have sparked the further elaboration of conceptual thought: "if the iconic sign induced comparison and analysis, these would lead naturally to a multiplication of concepts, hence to an increasingly differentiated cognitive world, and thus to an increasingly intelligible world, a world to be *thought* as well as interacted with." (Halverson, 1992, p. 234, original italics)

5.5.3. Conceptualization, naturalism, and the artist savant

The savant syndrome is a rare condition, occurring among individuals with mental disabilities such as autism, where severe impairments in some domains go together with extraordinary skill in other domains, as well as other cognitive features such as exceptional memory or synaesthesia (Miller, 1999; Snyder, 2009; Treffert, 2005). The savant syndrome affects the domains of art, music, calender calculation, mathematics and spatial or mechanical skills, and the manifestation of these skills is often based on imitation, rather than creative innovation (Snyder, 2009). According to some (e.g. Snyder & Mitchell, 1999), savant skills are characteristic of ordinary cognition, but tend to be inhibited in normally developing individuals: "owing to some atypical brain function, savants have *priviliged access* to raw, less-processed information - information in some interim state before it is packaged into holistic labels." (Snyder, 2009, p. 1399, original italics) Characteristic of this type of thinking is that attention is heavily focussed on details, "working from the parts to the whole." (2009, p. 1399) The assumption that savant skills are present, but latent in normal cognition, is supported by the fact that they can suddenly emerge in the event of specific illnesses such as frontotemporal dementia or left hemispheric strokes (Miller et al., 2000; Sacks, 2007). They can also disappear along with some illnesses, or with increasing age (Selfe, 1977). Additionally, there is evidence that several savant skills can be artificially induced by applying repetitive transcranial magnetic stimulation to the left anterior temporal lobe (Snyder, 2009). In the case of drawing, this increases naturalism and sensitivity to details (Snyder et al., 2003). Overall, "savant skills are facilitated by priviliged access to raw, less-processed sensory information, information that exists in all brains but is inaccessible owing to top-down inhibition. Thus, autistic savants tend to see a more literal, less filtered view of the world." (Snyder, 2009, p. 1402)



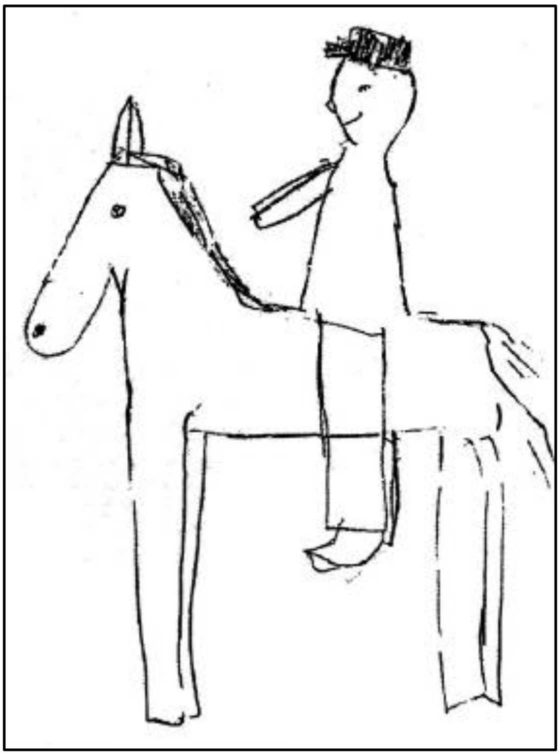


Fig. 66. Horse and rider drawing by Nadia at 5 years and 6 months old, displaying extraordinary naturalism and perspective insight.
Fig. 67. Average drawing of a horse and rider by a 6-year-old child that does not have autism.

The savant syndrome plays a crucial role in Humphrey's adoption of Nadia in his comparison with Upper Palaeolithic figurative art. The naturalism observed in both cases is hypothesized to be the result from a lack of conceptualization or mediation through language, instead reflecting the mere literal rendition of perceptual processing of an image without the influence of categorization or conceptualization. This would fit within the savant syndrome, such as the finding that this syndrome leads to increased naturalism in depiction. In the case of prehistoric art, recognizing and determining naturalism is a complicated matter. The liveliness of many paintings is often emphasized, and there is additional empirical evidence in support of the claim that Upper Palaeolithic cave painters were very skilled at depicting animals with great attention to realistic details. Horvath et al. (2012) compared error rates in the depiction of limbes and feet in quadrupeds before and after the work of Muybridge in the late 19th century, and found that, while his photographic innovations clearly resulted in a drop in depiction mistakes, prehistoric cave painters significantly outscored both pre- and post-Muybridge artists in terms of the correctness of their rendition of quadruped movement. Perhaps because the former were heavily dependent upon hunting animals for prey, they may have been better at observing and correctly rendering quadruped movement.

In another studying pertaining to the depiction of horses, researchers compared the coat types of horses painted in caves such as Chauvet, Lascaux and Pech Merle with genotypes of predomestic horse remains in Siberia and the Iberian Peninsula. Whereas evidence already existed in support of the presence of bay and black coloured horses during the Upper Palaeolithic in these regions (Ludwig et al., 2009), this study added information about spotted horses (Pruvost et al., 2011). These were observed as paintings at the cave of Pech Merle, dated to around ca 25.000 BP. Close matches were found between these depictions and the predomestic horse genotypes, indicating that the cave painters at this site must have, at least on some occasions, represented the exact information they saw in the surrounding environment.

Fig. 68. Bay coloured horse from Chauvet Cave, black coloured horses from Lascaux Cave, and the spotted horses from Pech Merle, followed by the actual coat colours of these horse phenotypes.

Before this finding, the same spotted horses were approached in a very different manner: "(...) but here we are dealing with what has been called 'stylized naturalism', drawings by artists with a message to convey, and using stylistic conventions: nobody would assume from the spotted specimens at Pech Merle, that the horses of the period had big bodies, small legs and tiny heads; so how reliable are the other features on display? These are not 'Palaeolithic photographs' - we need to allow for convention, technique, lack of skill, faulty memory, distortion, and whatever symbolism and message were involved." (Bahn & Vertut, 1997, p. 140) Clearly, at least for the spotted horses of Pech Merle, none of these features are necessary to invoke, as they were indeed Palaeolithic photographs.

Exactly this point has been challenged by others, who have picked up on the idea of stylized naturalism by arguing that we are *not* looking at exact and literal renditions, but rather at schematic representations that are indeed suggestive of at least early stages of conceptualization. Halverson, in particular, has noted how the nature of many paintings seems to indicate that they were drawn from conceptual imagination:

> "the difference is between imagining a cow and recalling the last time you saw one. (...) In the former case - imagining a cow - you would almost certainly 'see' the beast all by itself without background or companions. It would, moreover, almost certainly appear standing in profile with a strong outline but with dimly perceived color, texture, and mass. It is very unlikely that you would imagine it lying down or from a head-on viewpoint or that it would be grazing, running, mooing, or doing anything in particular. The components of the image would no doubt include a face with muzzle and a large brown soulful eye, horns and ears, a tail, legs, and probably an udder; it may or may not have hooves. On the whole, it is not a very precise, detailed, or stable image, but one that captures the essentials of form." (Halverson, 1992, p. 225)

Here, a crucial issue presents itself. In Humphrey's original account, the comparison with Nadia and her autism-related language impairment led to the hypothesis that severely delayed or even absent language development might be connected to a lesser degree of conceptualization. If Nadia did not use actual words for denoting animals, humans or other elements of the surrounding environment, this appeared to suggest that the greater absence of conceptualization mediated a more direct access to basic visual perception and the immediate, literal representation of an image. This point is supported by savant analyses such as Snyder's, where the same point is described as access to lower-level processing (2009). Simply stated is naturalistic, immediate depiction possible *by virtue of* the absence of conceptual thought. The present analysis, based on Sperber's mind view and following Halverson's earlier discussion along the same lines, argues instead that the earliest phases of figurative cave art yield to us the very first stages of conceptualization. If the cave paintings are the product of first-order conceptual processing, they are concepts as an outcome.

In Humphrey's account, conceptualization during image-making is strongly intertwined with language ability. Not only did Nadia have no actual language during the time when she made her striking drawings, she also appears to have lost part of her skills when she did acquire more ability in this domain (1998; Selfe, 1977).[62] Humphrey, and also Selfe, endorse a negative correlation between drawing skills and language, implying that the latter interferes with the former, and did so too in prehistoric times. Among the criticisms uttered against this hypothesis was that the currently available data on language acquisition do not support the idea that language was absent during the early phases of the Upper Palaeolithic (e.g. Bloom in Humphrey, 1998), an argument that Humphrey himself does not wishes to substantiate. His alternative proposal that language may only have been used in the social realm at this time, is very difficult to support empirically. A recent review of fossil and archaeological data placed the likely appearance of fully modern spoken language at around 100.000 BP, at which point a final process towards brain size increase appears to have taken off (Schultz et al., 2012). The social brain hypothesis as a whole, used by Humphrey in support of the possibility of social language use only, takes increasing group size as the main selection pressure for the evolution of language, with earlier forms such as vocal or gestural communication perhaps already emerging several hundreds of thousands of years before (Aiello & Dunbar, 1993; Schultz et al., 2012).

From this perspective, it appears untenable to presuppose that language did not extend beyond the social domain for the greater part of the last 100.000 years. One important question is whether it is really necessary to invoke the absence of allround language in other domains during the earliest phases of the Upper Palaeolithic. Nadia is a specific case of an artist savant, and is not representative for all individuals with an autism spectrum disorder, a point made by Bahn and Bloom in response to Humphrey's paper (1998). On the contrary, the vast majority of these do not display Nadia's extraordinary drawing skills. As a consequence, the

[62] Research on the savant syndrome yields that it is not unusual for exceptional skills to diminish or disappear with age, so there need not necessarily be a correlation with the onset of language (Snyder, 2009).

relationship between language ability and graphic competence may not be as straightforward as suggested by the case of Nadia, and solely based on this, it would not be necessary to sustain language's absence during the Upper Palaeolithic in order to explore a metarepresentation-based analysis such as the present one. But if language was present, what was its nature around the time of the emergence of figurative imagery? This question is important as fully modern, spoken and syntactical language involves a considerable amount of conceptualization, such as when objects in the world are cognitively grouped under one category, i.e. a word. If this level of language was already reached around 100.000 BP, the figurative imagery of the Upper Palaeolithic could theoretically not reveal to us the first stages of conceptual thought.

Schultz et al.'s (2012) date of 100.000 BP is based on an apparent brain size increase around this time, which, like previous phases of encephalization, they attribute to certain environmental selection pressures, with an emphasis on increasing size and shifting composition of social groups. This evidence is based on the fossil record, but is relatively ambiguous. Mithen (1996a) briefly reviews the same kind of informational source, and notes how analyses of cranial shape illustrate that Broca's and Wernicke's areas, crucial for language, appear to have already been developed as early as Homo habilis' existence, with similar findings in the later species of Homo erectus and Homo neanderthalensis. In the latter, vocal tract anatomy does not seem to differ significantly from anatomically modern humans. This is evident from a hyoid bone, belonging to a Neanderthal skeleton, that was found in Kebara Cave, Israel, and dated to 63.000 BP. The hyoid bone can be used to determine the position of the larynx, mainly responsible for the respiratory system, and the pharynx, or the upper part where the respiratory system and digestive system join. In humans, these are located dangerously close together in terms of the possibility of choking on food. As a consequence, it is likely that this potential disadvantage was compensated by the advantages of a certain degree of language use, as this kind of anatomy would otherwise be selected against (Mithen, 1996a). In sum, fossil evidence can be employed to point out the 100.000 BP onset of another phase of encephalization, but also to signal much earlier traces of the language capacity, making its inferential power relatively weak.

An archaeological argument for language use would be that certain types of technology would be too difficult to achieve if verbal communication was not available for instruction. However, it seems rather arbitrary to decide that advanced Acheulean handaxe manufacture, which reaches striking symmetry that requires considerable skill already around 300.000 BP (Wynn, 2002), did not depend upon verbal communication concerning the production process, but that Upper Palaeolithic artefact production did. There is a no a priori reason why manufacturing relatively recent composite tools for instance, could not have been learnt by means by visual instruction, whereas earlier products such as handaxes, or the sequence-based and complex Mousterian Levallois technology, practised by Neanderthals, would presuppose no such verbal instruction at all. These are conclusions that would necessarily follow from the claim that modern spoken language did not arise until around 100.000 BP.

These examples illustrate how palaeoanthropological and archaeological data remain ambiguous and therefore of limited use. As Schultz et al. do recognize, there is a vast difference between "speech (the capacity to vocalise) and language (in the sense of fully grammatical propositions) that needs to be borne in mind." (2012, p. 2137) The boundary between these is unclear, and it must have been a gradual process towards the appearance of modern spoken language. According to Sperber, metarepresentational ability and language probably co-evolved. Language is in itself heavily dependent on the capacity to metarepresent, leading him to think that within this co-evolutionary process, metarepresentation preceded language. The capacity for theory of mind, at the essence of metarepresentation and sometimes described as its proper domain (e.g. Sperber, 1994), enabled more advanced human communication that could have occurred previously, which in turn sparked the further development of language beyond relatively simple systems of encoding, which are reminiscent of some types of animal communication (Sperber, 1994, 2000).

If this is true, it is indeed possible that the dawn of figurative art reflects the first externalization of the capacity to conceptualize, which, as Halverson noted (1987, 1992), might take the lead in its own evolution towards more conceptual integration. Gradually, full metarepresentational ability might have developed, in accordance with fully modern language. This would mean that language as we use it today, with its clear conceptual categorization, evolved relatively late, perhaps in the last 20.000 years. This is at odds with dates such as 100.000 BP, but at the same time, evidence is lacking pertaining to the nature of language at this time, during the 50.000 or so years until the Upper Palaeolithic transition, and during the first phase of this new era. Consequentially, presently available empirical evidence does not allow disproving that our modern use of language is much more recent than previously assumed.

The matter of the presence or absence of language, and thus conceptualization, is also of relevance for addressing another particular element of Humphrey's hypothesis. If language and conceptual thought were indeed confined to the social domain, as Humphrey proposes, we would expect a different kind of representation of human figures, as conspecifics would have been the subject of language-mediated interaction. He notes that human representations are indeed either absent or rare, and if they do appear, that they are schematic in a way that is reminiscent of conceptual mediation, and opposite to the literal-minded rendition of animals. Nadia's overall lack of conceptualization led to a naturalistic depiction of both. Here, Humphrey perhaps overattributed attention to human imagery in parietal art, which does indeed surface only around the beginning of the Magdalenian, around 17.000 BP. In portable art, however, humans, and female figurines in particular, emerge around 35.000 BP, with the Venus of Hohle Fels as a notable example (Conard, 2009). Male representations, or representations of everyday human activity are very rare (Guthrie, 2005), which led to the popular explanations of the female figurines being fertily symbols, or being linked to female gender-related activities such as clothes manufacture, and to power and prestige (Soffer et al., 2000, but note the critical view of Guthrie, 2005). These objects are also often executed in a schematic way, i.e. attention to minor details is sometimes present, but more often absent, such as when body parts are overemphasized, or when facial features are absent.

The reasons behind this time lag between the representation of humans in parietal and portable art are unclear, but schematization appears to be present in both cases. If interpreted within a metarepresentational framework, this might indeed support Humphrey's original interpretation that humans are depicted differently because they are also cognitively processed in a different manner - a point that would be consistent with the particularity of the representation of mental representations versus more straightforward pictorial representations (Charman & Baron-Cohen, 1992, 1995; Leekam & Perner, 1991). The greater presence of humans in later stages of parietal art, might then reflect the ever more elaborate understanding of the former, potentially evolving in conjunction with language. However, this explanation struggles with the consequence that if fully modern language would not have emerged until around 20.000 BP, that it consequentially cannot be invoked as an explanation for the concept-mediated rendition of humans around 35.000 BP.

Alternatively, and importantly, the graphic naturalism often attributed to prehistoric art might in itself be vastly exaggerated, and the striking naturalistic images cited by Humphrey may be exceptional examples.[63] As such, the comparison might be based on a sampling issue, as was uttered in the comments on Humphrey's original paper (Zubrow in Humphrey, 1998). Both Halverson (1992) and Guthrie (2005) note the prevalence of mere schematic renditions of animals, often by means of only simple lines. This way, the graphic variation between humans and animals would largely disappear, and so would the necessity for explaining them in different ways. Interestingly, this would also have another notable consequence: if it is accepted that Humphrey's examples drawn from Chauvet, Lascaux and Pech Merle are exceptions rather than the rule, this diminishes the status of Upper Palaeolithic art as a whole as being an explosion of symbolic thought and culture. This, in turn, leads us back to the question whether we might be witnessing an outcome of premodern cognition after all.

5.5.4. The relevance of formal features

The essence of Humphrey's comparison between Nadia's and our ancestors' drawings was based on formal features of both. Humphrey determined that the similarities between them were so striking that they might hold an important key to our understanding of prehistoric art. His critics provided several counterarguments for this comparative method. They noted that Nadia's drawing skills were exceptional, not only in general, but also among other individuals whose mental impairment is characteristic of the autism spectrum. As such, using her case study analysis as the main cornerstone of Humphrey's comparison was regarded as an instance of cherrypicking, with the validity of the entire analysis depending on the exceptionality of Nadia (Bahn and McManus in Humphrey, 1998).

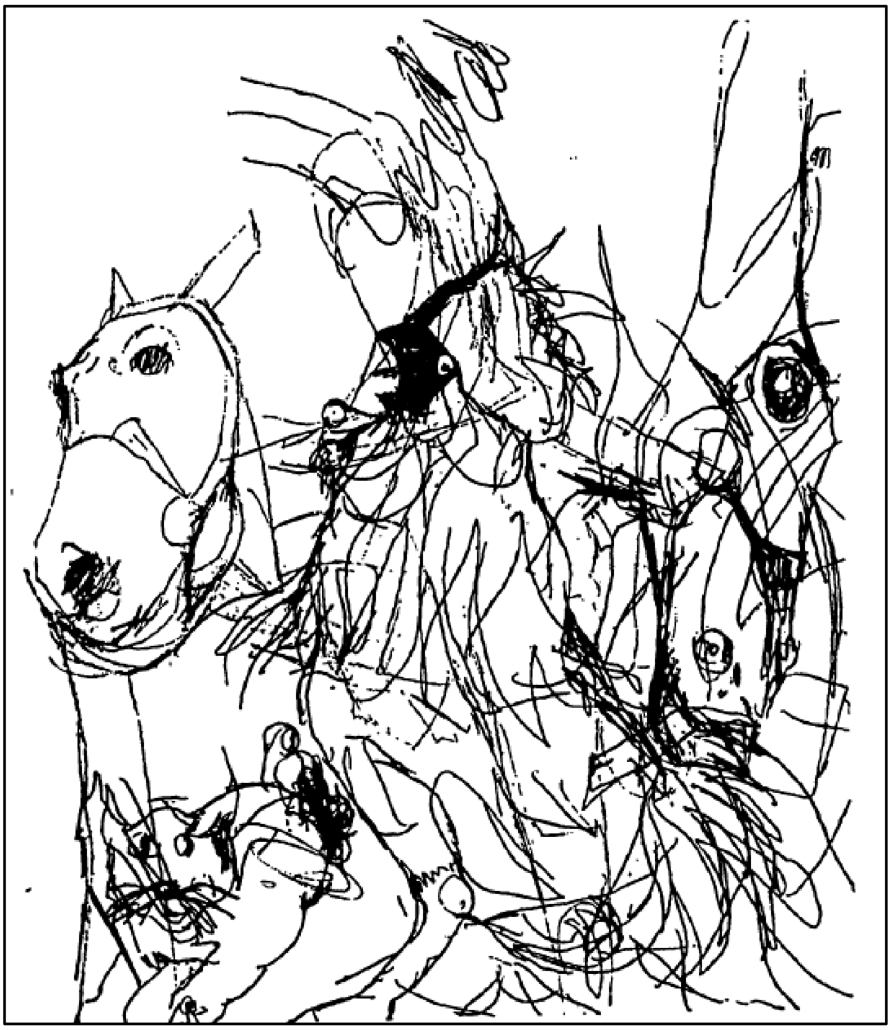
A classic feature of animal depictions on cave walls is that they are often large, seemingly random collections of individual animals, which sometimes belong to the same species, but are also commonly mixed (Bahn & Vertut, 1997). The animals are typically superimposed without a clear order, and without consistently attending to their relative sizes if different species are present. In Halverson's description, "the figures seem to be, for the most part, displayed freely without regard to size or

[63] Graphic naturalism is not necessarily the same as the naturalistic rendition of formal properties of real animals, such as the examples of the horse studies cited before.

position relative to one another or even absolutely. (…) Indifference to size seems to be universal in cave depictions (…). Again, more often than not, where figures are clustered, they lack any visually appropriate relation to one another." (1987, p. 67) Halverson warns for overattributing aesthetic considerations such as composition to these collections of animal representations. Composition should refer to the intentional arrangement of different components into a whole that is either aesthetically pleasing, meaningful, or both, and it should not be taken to refer to "a mere aggregate or cluster of elements (…)." (1987, p. 67)

Humphrey's motivation for describing the same phenomenon came from the comparison with Nadia's drawings that seemingly showed no regard for an overall finished image. From the perspective of autism research, this is supported by the theory of weak central coherence (e.g. Frith, 1989; Frith & Happé, 1994; Happé & Frith, 2006). This theory describes how individuals with autism tend to award excessive attention to small details, often losing sight of the whole. This is especially common in the realm of visuospatial information. In drawings by autistic individuals, smaller elements such as lines and simple shapes dominate the overall image, while individuals with autism also appear to be much better at the task of finding a hidden figure in an existing drawing (e.g. Jolliffe & Baron-Cohen, 1997; Shah & Frith, 1983). In the case of Nadia, this translates into graphic elements such as the superimposition of different shapes, apparently without regard for the figures that were already present, or the creation of composite creatures. As individuals with autism tend to show significant deficits in imagination (e.g. Scott & Baron-Cohen, 1996), the explanation for these cases is rather that there is no intentional depiction of an imaginary animal, but that one animal drawing is started before morphing into another animal. Elements that are already present are not attended to, and visual focus is directed to new formal features.[64] Such composite images are strongly reminiscent of therianthropic imagery in Upper Palaeolithic art.

[64] Some specific formal properties of Upper Palaeolithic cave art have also been interpreted by Hodgson (2008) as the products of hyperimagery, which is an intermediate stage between normal visual perception and hallucination (see also, Helvenston & Hodgson, 2010).



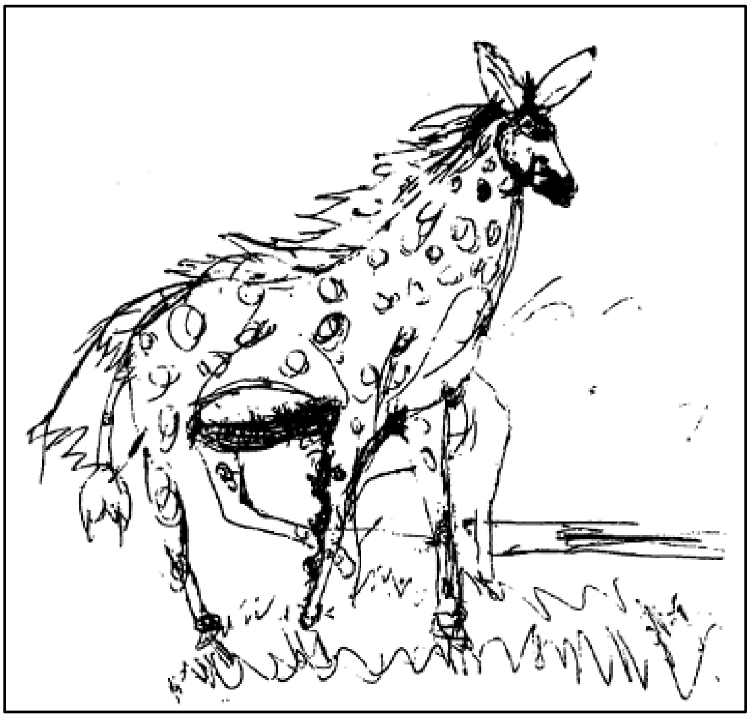


Fig. 69. Superimposition of animals by Nadia in a drawing produced at 6 years and 3 months.

Fig. 70. Composite animal (giraffe and donkey) drawing by Nadia at 6 years old.

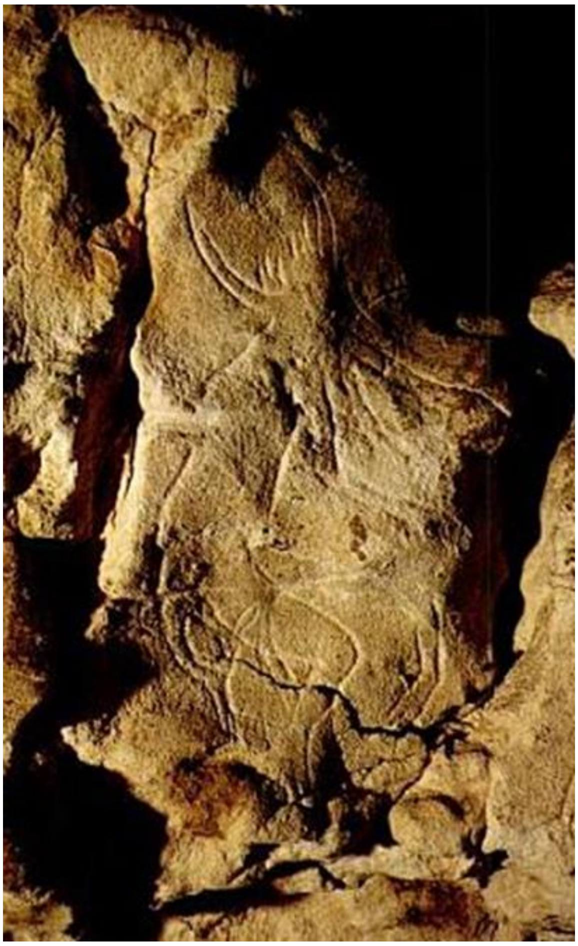


Fig. 71. The oldest known painted image describes as a therianthrope, Fumane Cave, Italy, dated between 32.000 and 34.000 BP.
Fig. 72. Engraved therianthropic image in Gabillou Cave, France, ca. 17.000 BP.
Fig. 73. The 'sorcerer' of Les Trois Frères, France, ca. 13.000 BP.
Fig. 74. Interpretative drawing of the sorcerer by Abbé Breuil.

Therianthropes are images where human and animal features appear to have been combined. They are commonly associated with shamanist religious practices which, according to some, are key to explaining the early figurative record of the Upper Palaeolithic (e.g. Clottes, 1997, 2003; Clottes & Lewis-Williams, 1996; Lewis-Williams, 1997, 2002). Such an image could originate if a shaman in a state of hallucination perceived a mental image combining features of different beings, and then transmitted this onto a rock surface or in a sculpture, such as in the case of the so-called 'Lion Man' of Hohlenstein Stadel. If this explanation holds, the images would be clear instances of the externalization of religious thought, and thus of advanced modern cognition. The older cases of proposed therianthropes are of particular relevance, as they apply to the phase where the current metarepresentational perspective, following Humphrey and Halverson, would presuppose the relative absence of second-order conceptual processing - a cognitive feature that seems necessary for advanced religious thought. If these early cases qualified as therianthropes, explaining the earliest stages of figurative imagery as the onset of conceptualization would probably not hold.

From a cognitive archaeological perspective, Wynn et al. (2009) have attempted to explain the emergence of therianthropic imagery, with the Lion Man as a case study, by referring to the capacity for working memory. This essentially involves that bits of information can be kept in mind for a short time, while other information is processed which can then be joined together with the briefly maintained prior information. According to this view, therianthropic imagery might essentially be a convergence of such information, and notably the folk biological categories of animals and humans. These types of images are seen as evidence of modern cognition, as they reflect an advanced stage of abstract thought. Moreover, Wynn et al. presuppose that the image was "endowed no doubt with many features we cannot see." (2009, p. 80) Technically, this explanation requires no religious framework. An important alternative view comes from Martín-Loeches (2010) and Guthrie (2005). They note how proclaimed mixed images are perhaps instead merely failed representations of either animals or humans by unskilled artists. Indeed, objects such as the 'Lion Man' or the painting from Fumane Cave provide few, if any clear formal details that warrant the uncritical acceptance of a therianthropic explanation. In addition, some identifications of therianthropes may in themselves be based on liberal interpretations of the original images. The famous sorcerer of Les Trois Frères, for instance, is strikingly different in the line drawing by Breuil than in the original depiction on the rock surface. Later examples of therianthropes seem to display more control of formal properties, which might indicate that these were indeed images of an advanced conceptual, religious nature. The possibility that shamanism was present towards the end of the Magdalenian, the archaeological cultural complex during which images such as the proposed therianthrope of Gabillou Cave were made, is supported by the finding of a contemporaneous shaman burial in the southern Levant (Grosman et al., 2008).

In sum, seemingly therianthropic images might have a very profane and elementary explanation in the form of either misinterpretation, or failed animal or human representations, which especially applies to the earlier examples. Theoretically, advanced cognitivist explanations in terms of religion or working memory capacity are not necessary, although evidently, they cannot be excluded with certainty either. Returning to the metarepresentational perspective explored in this chapter, it might even be argued that this failure is framed within the first explorations of conceptualization, and thus testifies to the dawn of abstract thought.

5.6. Discussion

Several of the critiques that were uttered against Humphrey's analysis, were already addressed in the preceding analysis. In response to the original paper, Bahn argued that it was unjustified to use only a singular, exceptional artist savant as comparative material. Other individuals with an autism spectrum disorder rarely possess the same level of skill (McManus in Humphrey, 1998), and the method of using a disability approach would in itself be controversial (Zubrow in Humphrey, 1998). In this chapter, attention was focussed on metarepresentational ability and theory of mind, thereby moving away from the singular comparative analysis with Nadia. Several elements discussed, although only representing a fraction of the possible connections to be made between metarepresentational thought and figurative art, still stand even when the exceptional case of Nadia is ommitted, and provide a foundation that is perhaps stronger, as it is partly based on empirical data from cognitive and developmental psychology.

Within the scope of this chapter, a number of other issues have not been sufficiently explored. In their critiques of Humphrey, Mithen and Tattersall remarked that he might have been lifting the record of early Upper Palaeolithic cave art from its wider archaeological context. This way, relevant information from other types of material artefacts or behavioural patterns may not be integrated sufficiently in the analysis. Similarly, Zubrow noted the possibility of a sampling issue, using only high quality and strikingly naturalistic images. Both of these matters have not been addressed in this chapter to an extent that would identify their potential relevance. This primarily necessitates a systematic study of the imagery present in different phases of cave art, with attention to matters that are of paramount importance for exploring this metarepresentational perspective further. Schematization, for instance, is the cornerstone of Humphrey's inference towards less conceptualization, but clearly a more thorough analysis would be needed to assess this both within a European and a cross-cultural record. While Humphrey connects the trend towards increasing schematization to the onset of modern language and eventually writing, Guthrie (2005) has noted how the eventual end of naturalistic Palaeolithic imagery may have been influenced by a set of social, ecological and climatological changes, which would obviate the need to account for stylistic evolution merely by means of an internal, cognitivist explanation.

Furthermore, the present chapter has implications for the symbolic nature of art. Over the course of the preceding analysis, the art was discussed in terms of the presence or absence of conceptualization, but clearly this is also closely linked to symbolic cognition. Especially when language research is included, which is in itself based on referential symbolism (Chase, 2001), symbols again come to the forefront of the debate. In general, a metarepresentational view, and in particular the proposal that full metarepresentational ability might have been absent during the earlier stages of figurative art, supports the idea that even Upper Palaeolithic figurative art may not be symbolic in nature. As such, it follows up on the previous chapter, which already questioned whether symbolic cognition truly is a prerequisite for art. Joining these two perspectives together, preliminary answers to this question appears to converge on a negative conclusion. Because symbolism and art can, at least theoretically and provisionally be detached, analyses such as the present one do not have consequences for the question whether Upper Palaeolithic imagery qualifies as 'real' art - a point that very few researchers would deny.

The present metarepresentational perspective thus seems to be orthogonally positioned with regard to traditional symbolic explanations, and religious explanations in particular. If conceptualization was indeed only very elementary around 35.000 BP, this appears to exclude religious accounts in their entirety. However, there is no reason why art could not have acquired a particular function, such as a religious one, at some point during its further development. The metarepresentational perspective set out here is primarily concerned with explaining art's origins, although it could, in principle, also inform us about any sequential stages in its development in accordance with cognitive evolution. Halverson (1987, 1992), for instance, noted that the earliest externalization of concepts might have been a catalyst in the further evolution of this capacity. From here, it is a small leap to hypothesize that religion did not only acquire a place in art at a later stage, but additionally, that the two might have co-evolved.

How does this metarepresentational perspective fit within a framework that discusses the evolutionary origins of human behaviour? Several subjects are important here. Research on language evolution, for instance, has until now produced much circumstantial evidence, spanning a considerable length of time, and variously proposing relatively basic or rather very advanced stages of linguistic evolution. Clearly, this subject needs further clarification because of its potential impact on the analysis of prehistoric figurative art in conceptual terms. Migratory patterns of Homo sapiens are also of great relevance. In response to Humphrey (1998), Bloom questioned whether it was perhaps unjustified to place the emergence of fully modern symbolic and advanced concept-based cognition *after* populations that took the route towards Asia and Oceania split off from the lineage that ventured into Europe. The thought behind this is that those who left earlier than the onset of the European Upper Palaeolithic, would have missed out on the biologically based breakthrough of modern cognition. This, in turn, has as an apparent theoretical consequence that Australian Aboriginals would be an essentially premodern population in terms of cognition and behaviour.

Such ideas rely upon the view that behaviour automatically follows from cognition in a linear manner, and that cognition in turn is strongly determined by biologically based capacities and propensities. This view was criticized in the previous chapter for not taking into account other explanatory variables, such as the increase in population size that is thought to have taken place around the time of the Upper Palaeolithic transition, and which may have led to significant cultural innovation and change (e.g. Richerson et al., 1996; Verpooten & Nelissen, 2010). If such variables did indeed play a role in Homo sapiens' migration to and in Europe, it is highly likely that they also did so for other migratory movements. As a consequence, the art of Oceania and Indonesia, for instance, might very well be a case of convergent evolution. This possibility also warrants further exploration in terms of a cross-cultural assessment of subject matter in figurative imagery, as such findings might be explained and understood within a cultural attractors framework. Finally, similar to the fact that non-symbolic and non-metarepresentational accounts for the origins of art do not a priori contradict the later co-opting of artmaking for religious or other symbolic purposes, some evolutionary explanatory hypotheses might also apply. Even if the earliest explorations in iconic imagery had a non-functional motivation and operated in a cognitive manner, it is not unlikely that such practices quickly became adopted within other contexts such as mate advertisement and choice, or that they gained special relevance for establishing and maintaining group identity and social cohesion.

5.7. Concluding remarks

This chapter explored the potential value of applying a metarepresentation-based mind view to the record of figurative cave art. Based on insights from autism research, language evolution, philosophy of mind and archaeology, Humphrey's original 1998 paper was explored with regard to its potential clarificatory value for prehistoric art. The focus was shifted from a mere parallel between prehistoric art and the drawings of Nadia - an artist savant - to the role of metarepresentational ability and theory of mind. The empirical evidence discussed in this chapter confirms notable components of Humphrey's hypothesis, such as the suggestion that impairment in metarepresentation and theory of mind does not affect the complete ability to produce figurative representations, but rather separate components such as imaginative or overall compositional depictions.

Some critical issues, that were already addressed by those sceptical of Humphrey's original hypothesis, still remain. Sperber's mind view has as a premise that language might have co-evolved with metarepresentational ability, but that the latter must have taken precedence in the evolution of human cognition. Research on language evolution is still inconclusive as to what types of language or communication would have been present at which points in time, but clearly, a metarepresentational framework for cave art is partially dependent on this. Furthermore, an exhaustive analysis of what is depicted in which manners over the course of different phases in prehistoric art, would be very enlightening. While Humphrey's hypothesis and the current analysis are based on a few very specific examples, it is not clear to what extent these are truly representative for the entire record. Overall, however, drawing together different strands of evidence yields enough evidence in favour of the maintenance of Humphrey's view as a valuable alternative perspective to religious or symbolic explanations of cave art.

6

Art and modern minds: the Neanderthal challenge

6.1. Introduction

The first two chapters in this section on cognitive archaeology explored parts of the archaeological record that concern the cultural behaviour of anatomically modern humans. One chapter dealt with Middle Stone Age and Middle Palaeolithic engravings in terms of their potential symbolic content, whereas the other focussed on Upper Palaeolithic figurative art, and investigated the potential role of metarepresentational ability. The arguments discussed in both of these chapters converged on the view that central elements of modern cognition were perhaps not at work in these parts of the archaeological record. Because almost no-one would question the artistic status of the figurative depictions of the Upper Palaeolithic, it follows from this that these elements of modern cognition may perhaps not even have been necessary for art.

This short sequel chapter explores this suggestion further by turning to another part of the archaeological record that has not been addressed so far in this dissertation, which is the record associated with Homo neanderthalensis. After briefly introducing Homo neanderthalensis as a species, the sections thereafter provide an overview of the most notable findings of figurative and abstract art, personal ornamentation and ochre use that have been attributed to Neanderthals. These findings are then framed within the wider debate of Homo sapiens' relationship to Homo neanderthalensis, and in particular the presumed differences between both. The chapter concludes with a brief discussion of if and how art and symbolism might be related in the Neanderthal case.

6.2. About Neanderthals

Homo neanderthalensis, or Neanderthals, are thought to have evolved from the earlier species of Homo heidelbergensis, also referred to as archaic humans (Dunbar, 2014). This last term sounds slightly misleading as it appears to denote the earliest kind of humans, which is evidently wrong as heidelbergensis in itself evolved from its African ancestor Homo erectus, who was itself an evolved outcome of Homo habilis. As this species is usually seen as the first to be classified in the genus Homo, its much later descendant Homo heidelbergensis is certainly not the most archaic of humans. The name is instead used to contrast heidelbergensis with later anatomically modern humans: heidelbergensis' brain was about 1100 to 1300 cm^3, which constituted a notable difference from the 900 cm^3 of Homo ergaster. Part of the Homo heidelbergensis population migrated into Europe sometime between 400.000 and 300.000 BP. One branch of this migration took the eastern route and ended up in Siberia, where they probably evolved into the Denisova hominins. This species is unfortunately only known by the very limited fossil evidence of one finger bone and two teeth, but appears to have possessed sufficient genetic differences with anatomically modern humans, heidelbergensis and Neanderthals to classify it as a species in itself (Dunbar, 2014). Another branch of this out of Africa migration settled in Europe, and eventually become known to us as Homo neanderthalensis.

Neanderthals were originally considered to be a subspecies of archaic Homo sapiens, which led to the double terminology of Homo sapiens neanderthalensis and Homo sapiens sapiens, with the latter referring to our own species. Subsequent genetic analysis decided upon the separation of the two in separate species within the genus Homo, also obviating the necessity to identify our own species with the double sapiens denotation. Neanderthals probably originated around 300.000 BP, and their evolution was likely driven by the need to adapt to the new ecological and climatological circumstances of Europe. They are characterized by heavy bodies and relatively short limbs, adaptations that are closely connected to the function of losing as little body heat as possible (Dunbar, 2014). They were large-brained, with a brain volume of on average 1600 cm^3, that exceeded the volume of anatomically modern humans. Brain size is usually inferred from cranial shape, and as a consequence it rarely yields clear insight into internal brain organization. A recently developed method addressed this problem, and elaborately showed how even the mere remains of fossil crania can indeed indirectly inform us about the evolution of brain organization and certain cognitive abilities in species that are long extinct (Pearce et al., 2013). Based on orbit size, which can be derived from fossil crania, the overall size of other parts of the visual cortex can be estimated. An application of this method showed that Neanderthals had comparatively larger visual cortices, but relative to this, a smaller frontal cortex than anatomically modern humans. Consequentially, it can be inferred from this that Neanderthals were perhaps better adapted in the visual realm, but that they were at a comparative disadvantage in terms of social flexibility, a feature that is traditionally connected with the 'thinking' areas of the frontal lobe (2013).

Neanderthals did not leave the evolutionary scene until around 40.000 to 35.000 BP, broadly coinciding with the arrival of anatomically modern humans in Europe from around 45.000 BP. These modern humans were in themselves the descendants of the branch of Homo heidelbergensis that stayed behind in Africa, and current palaeoanthropological data place their emergence in Eastern Africa around 195.000 BP (McDougall et al., 2005; Rightmire, 2009). As such, Neanderthals occupied European and Middle Eastern grounds for around 250.000 BP, and they clearly coincide with the archaeological phase of the Middle Palaeolithic. This is not surprising giving their descent from a species that was already larger brained than its predecessors, which must have corresponded to accompanying cognitive and behavioural innovations.

Proponents of the model of multiregional continuity, which was already briefly addressed in Chapter 4, argue that Neanderthals' wide geographical spread and their long period of existence, which essentially exceeds the time that anatomically modern humans have been around, is indicative of considerable cognitive and behavioural skills that may rival those of Homo sapiens (d'Errico, 2003; d'Errico et al., 1998; Zilhão, 2007; Zilhão & d'Errico, 1999). Modernity, although a difficult theoretical concept in itself, is not thought to be exclusively linked to the biological evolution of Homo sapiens in Africa, arriving in Europe only along with this species' last migratory movement. Straus described this as "(...) the widespread belief (based in typological thinking) that, on the one hand, the Middle Palaeolithic was an essentially unchanging, monolithic entity and, on the other, that the Upper Palaeolithic represented the arrival on the European scene of an entirely new and "better" way of being human, fully developed by modern people outside the continent and imposed as a consequence of migration." (2012, p. 352) Instead, Neanderthals have been reported to possess a wide variety of modern behaviours as well, and were probably characterized by a significant degree of behavioural flexibility (Straus, 2012). d'Errico (2003) has reviewed how many of the elements present in the archaeological record of Middle Stone Age Africa - attributed to early anatomically modern humans - do not appear to differ significantly from the record of Middle Palaeolithic Europe, which can only have been courtesy of Neanderthals. While it was often thought that Neanderthal subsistence strategies were mostly characterized by scavenging, rather than hunting which requires both specialized tools as well as planning, foresight and coordination, evidence accumulates that they were indeed skilled and systematic hunters (e.g. Gaudzinski & Roebroeks, 2000). Marine exploitation also occurred to a limited extent, although according to d'Errico (2003), this does not differ much from patterns found during the Upper Palaeolithic.

In terms of technology, Neanderthals habitually made blades (Bocherens et al., 1999), whereas they were also responsible for the Levallois technique. This technique involves that minor flakes are chipped from a stone core in order to prepare it for a larger blow, intended to produce that intended final flake. This allows for exercising greater control of the shape of the flake, as well as for ensuring that its edges are already sharp. Importantly, the wooden Schöningen spears, found in association with animal remains and dating back to around 400.000 BP, must have been made even by Neanderthals' predecessor, Homo heidelbergensis (Thieme, 1997, 2000). Another trait that is widely cited in trait-wise classifications of behavioural modernity, is the practice of burial. Burial does not absolutely presuppose a religious background, but "at the very least we must assume that the act of deliberate burial implies the existence of some kind of strong social or emotional bonds, which dictated that the remains of relatives or other close kin should be carefully protected and perhaps preserved in some way after death." (Mellars, 1996a, p. 381) Some archaeologists have compellingly argued that Neanderthals indeed practised intentional burial (Bar-Yosef et al., 1992; Belfer-Cohen & Hovers, 1992). Others have been very critical of such claims (e.g. Gargett, 1989), with detailed analyses of specific sites often debunking claims of intentionality by pointing towards taphonomic, geomorphological and animal-related influences. Examples are the 80.000 - 60.000-year-old Shanidar 'flower burial' in Iraq, where flowers close to the skeletons turned out to be due to rodent activity (Sommer, 1999), and the 70.000-year-old child burial from Roc De Marsal, France, where the cavity the skeleton was found in, seemed to be a consequence of unintentional natural causes (Sandgathe et al., 2011). Because burial is often linked to symbolic thought, it is only a small step towards claims pertaining to Neanderthal use of ochre, personal ornamentation and art.

6.3. The case for Neanderthal art

The record of prehistoric art is almost unequivocally associated with Homo sapiens. This is partly derived from the fact that Neanderthals appear to have gone extinct around 35.000 BP, which makes it impossible that they were in any way connected to more recent cultural and technological complexes such as the Magdalenian. But more importantly, this finding is drawn from archaeological associations between prehistoric art and palaeoanthropological remains analyzed to be part of our species, or between associations of prehistoric art and technological artefacts belonging to the Aurignacian complex, which tends to be associated with the earliest migrations of anatomically modern humans into Europe (e.g. Bahn & Vertut, 1997; Guthrie, 2005; Lewis-Williams, 2002). Nonetheless, Neanderthals have at various occasions been endowed with artistic skills or aesthetic and perhaps even symbolic consciousness, based on several notable findings.

If ochre use is said to date back to around 300.000 BP in the African Middle Stone Age (McBrearty & Stringer, 2007), this would be a likely candidate for a behaviour that might also have occurred among Middle Palaeolithic Neanderthals. Despite focussing their analysis on the archaeologically most recent Neanderthal cultural complex, the Châtelperronian industry, Dayet et al. (2014) found evidence of the recurring use of ochre among humans of this period. At the sites of Roc-de-Combe, Le Basté and Bidart, all in the Franco-Cantabrian region of southern France and northern Spain, several lumps of ochre were found that bear traces of scraping and grinding. Based on chronological and geographical information - the area is relatively far away from the location of the earliest known Aurignacian sites in Austria and Germany - the authors conclude that this probably constituted an independent invention. Roebroeks et al. (2014) unearthed evidence of red ochre in association with flint artefacts at the site of Maastricht-Belvédère, the Netherlands. They dated the findings between 250.000 and 200.000 BP, pushing the earliest dates for Neanderthal ochre use significantly further back in time than the Châtelperronian industry. The authors attached no conclusions as to the symbolic nature of this use of pigment. Zilhão et al. (2010), on the other hand, did make such statements. At two sites from around 50.000 BP in Middle Palaeolithic Spain, they found a set of perforated and ochre-stained marine shells, as well as a perforated Pecten shell that was naturally red on the inside, but coloured with an orange goethite and hematite pigment mixed on its normally white outside. This shell was found some 60 kilometers inland, indicating long distance carrying of these materials. Because the 50.000 BP date precedes the arrival of anatomically modern humans in Europe, it is virtually impossible that these findings should not be attributed to Neanderthals. According to the authors, findings such as these shells also have notable implications for the behavioural modernity debate: "our findings therefore support models of the emergence of behavioral modernity as caused by technological progress, demographic increase, and social complexification and show that there is no biunivocal correlation between 'modern' anatomy and 'modern' behavior (...). Where the personal ornaments of the Châtelperronian and coeval 'transitional' cultures of Europe are concerned, a final corollary of our results is that Neandertal authorship is the null hypothesis." (2010, p. 1027-1028)

Other studies have yielded evidence in favour of the claim that Neanderthals also manufactured jewellery. At the site of Krapina,Croatia, eight talons, or eagle claws, were found that bear use-wear marks consistent with these being worn as elements of a necklace or bracelet. They were dated to around 130.000 BP, which also far precedes the arrival of anatomically modern humans in Europe (Radovcic et al., 2015). More recent findings from around 44.000 BP from Fumane Cave, Italy, include wing bones from large raptors and other birds species not usually associated with a common dietary range, displaying marks that are consistent with the intentional removal of feathers. Because marks from lithic tools were found predominantly on wing bones as opposed to the rest of the birds' skeletons, it is unlikely that these marks are merely the result of bird exploitation for food (Peresani, 2011). Findings such as these make us aware that, while the archaeological record usually only maintains strong and resistent materials such as bone, teeth, shells and stone, the actual range of materials used in jewellery or art may have been much broader, including things such as feathers, fibres or wood. The most commonly cited example of Neanderthal jewellery is the Grotte du Renne in Arcy-sur-Cure, France. Here, a set of bone and animal teeth pendants was found, along with bone tools and grinded ochre pieces, dated to around 40.000 BP (see e.g. Caron et al., 2011 for a recent analysis). The attribution of these findings to the Châtelperronian, and thus to Neanderthals, has since been challenged on the grounds that a mix-up of Châtelperronian and Aurignacian layers appears to have taken place (Higham et al., 2010; see also White, 2001). If this were true, the artefacts might instead have to be attributed to early Homo sapiens.

In addition to ochre use and jewellery, some archaeologists have attributed instances of figurative and abstract art to Neanderthals. These claims concern cases that are situated during the last thousands of years when Neanderthals were in existence, but when Homo sapiens had also already arrived in Europe. If there are no clear anatomical remains or other easily dated artefacts found with the art, archaeological dating in itself is the only available method. However, even if reliable dates are achieved, it is still unclear whether the art in question was made by Neanderthals or anatomically modern humans. At several sites in Spain, Pike et al. (2012) provided minimum dates between 40.800 and 35.600 BP for a number of depictions, notably a red disk, a handprint and a claviform shape. The fact that these are more abstract than the figurative depictions present, led the authors to hypothesize that only during later stages of Upper Palaeolithic art, our ancestors became more and more concerned with depicting animals. At El Castillo Cave, an outline of an animal received a minimum date of 22.600 BP, which would indeed suggest that animals appeared later, perhaps during subsequent occupational phases of this cave. The earliest minimum date of 40.800 BP might indicate that the making of this art coincided with the arrival of Homo sapiens in this region of Europe, but because it is a minimum date obtained with caution so as not to affect the images, its actual origin might be earlier, linking it to Neanderthal occupation (2012).

At Gorham's Cave, Gibraltar, excavations yielded a rock engraving that has equally been attributed to Neanderthals (Rodríguez-Vidal, 2014). The engraving consists of a cross-hatching that must have required a great number of repeated strokes with a lithic point in order to increase its depth and visibility. The complete marking covers some 300 cm^2, and received a minimum date of 39.000 BP. Powerful conclusions concerning its significance were drawn: "the engraving at Gorham's Cave represents the first directly demonstrable case in which a technically elaborated, consistently and carefully made nonutilitarian engraved abstract pattern whose production required prolonged and focused actions, is observed on the bedrock of a cave. We conclude that this engraving represents a deliberate design conceived to be seen by its Neanderthal maker and, considering its size and location, by others in the cave as well. It follows that the ability for abstract thought was not exclusive of MHs," with the latter abbreviation referring to anatomically modern humans (2014, p. 13305)

Fig. 75. Perforated marine shells from Cueva de los Aviones, Spain, ca. 50.000 BP.

Fig. 76. Pecten shell with naturally occurring red inside (left) and outside that was coloured with an orange goethite and hematite pigment mixture, Cueva Antón, Spain, ca. 50.000 BP.

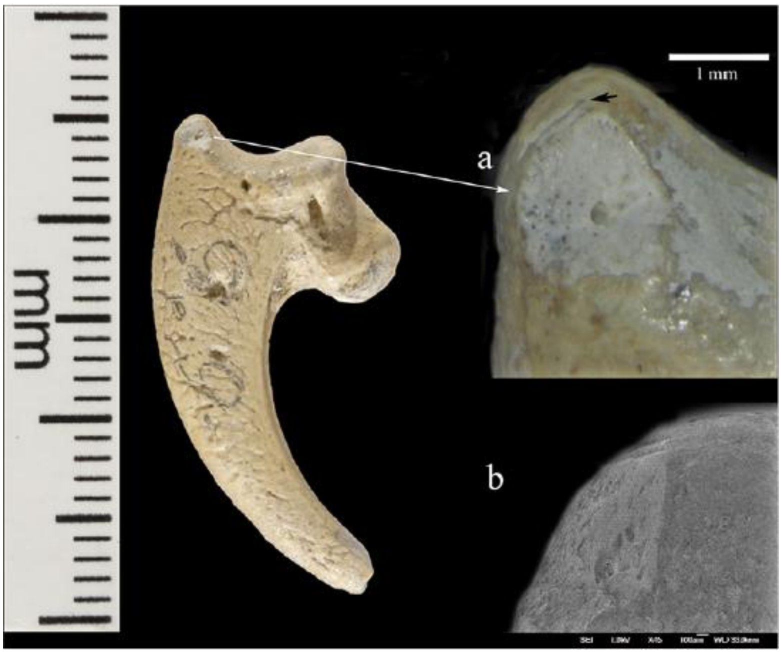
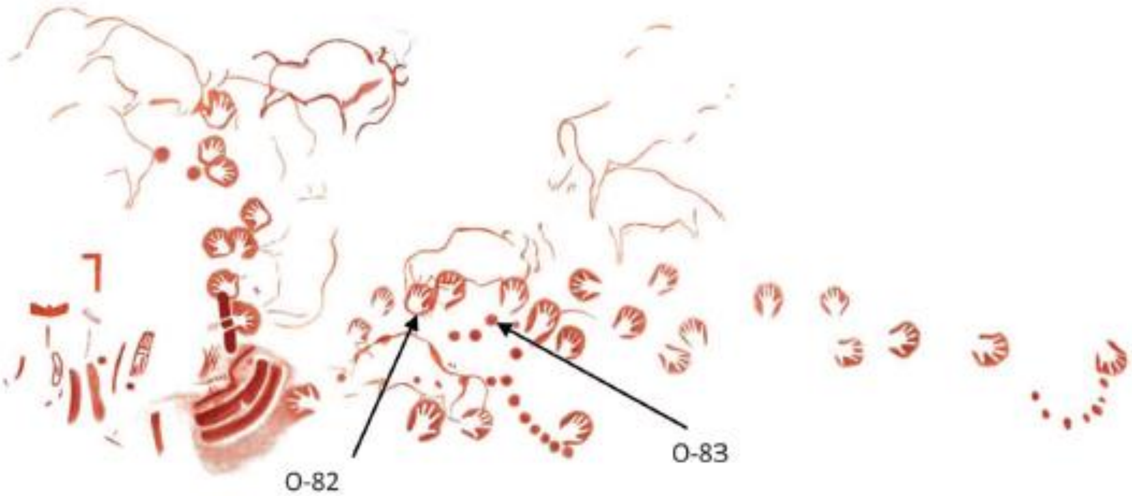


Fig. 77. Example of an eagle talon, Krapina, Croatia, ca. 130.000 BP.

Fig. 78. Pendants from the Grotte du Renne in Arcy-sur-Cure, France, ca. 40.000 BP.



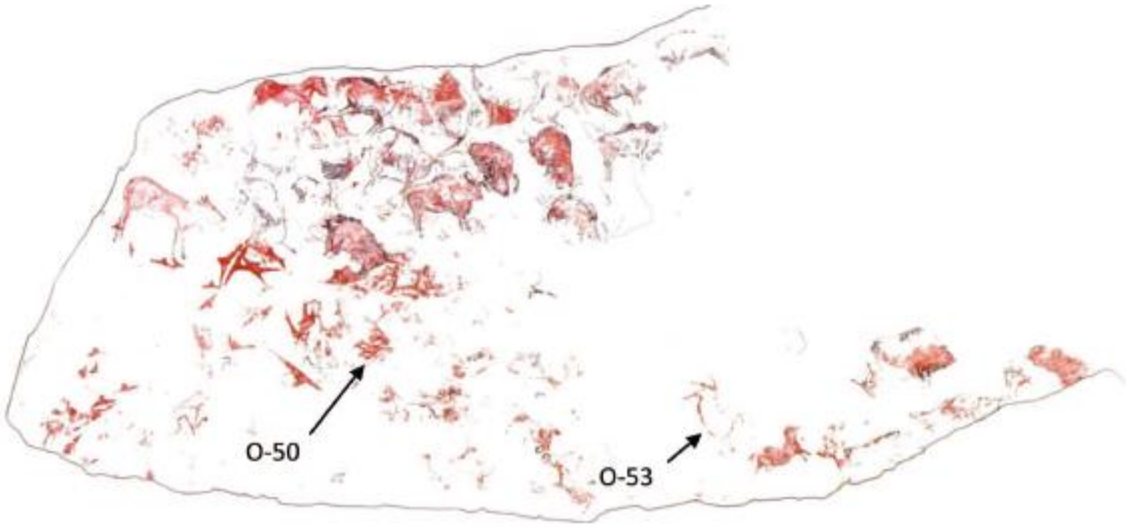


Fig. 79. Panel de las Manos, El Castillo Cave, Spain: handprint (O-82) with minimum age of 37.300 BP, and 40.800 BP for a red disk (O-83).
Fig. 80. Techo de los Políchromes, Altamira Cave, Spain: claviform shape with a minimum age of 35.600 BP (O-50), and 22.000 BP for a horse outline (O-53).

Fig. 81. Images and handprints at El Castillo Cave, Spain, ca. 40.000 BP.
Fig. 82. Close-up of handprints at El Castillo Cave, Spain.

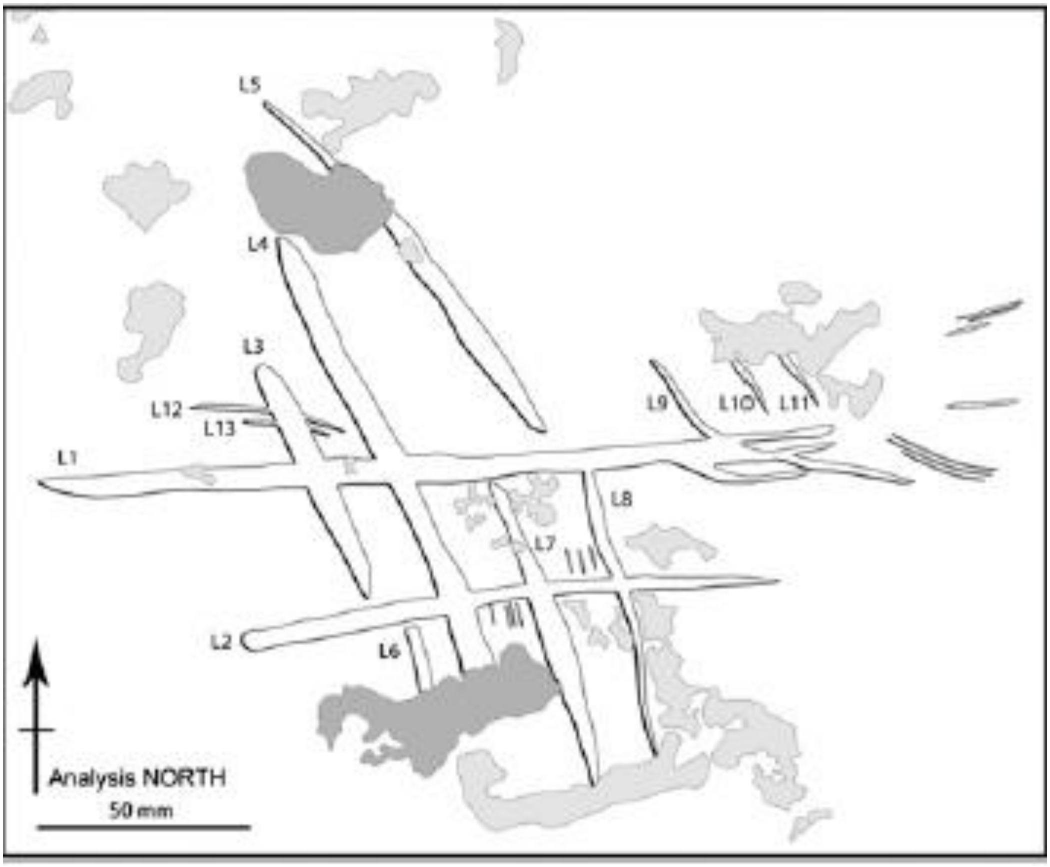


Fig. 83. Cross-hatched engraving at Gorham's Cave, Gibraltar, ca. 39.000 BP.
Fig. 84. Line rendition of the engraving at Gorham's Cave.

Finally, a recent archaeological analysis of an earlier found shell from the site of Trinil in Java, Indonesia, brought to light what appears to be an intentionally engraved zigzag pattern. Sediments in the shells were dated to around 500.000 BP, which would mean that Homo erectus, at this time roaming southeast Asia, was responsible for the engraving (Joordens et al., 2015). The authors determined that the engraving occurred intentionally, a conclusion derived from elements such as the consistency of the grooves, and the fact that no gaps are present between the zigzag lines, perhaps indicating that someone attempted to make the entire pattern all at once with the same tool. Although its meaning, if any, is unclear, the authors nonetheless place this object within the category of the aforementioned Middle Stone Age and Middle Palaeolithic geometrically engraved artefacts: "we predict that it is only a matter of time before comparable evidence is discovered, filling the gap between this early case of shellfish exploitation, shell tool use and engraving, and its later counterparts." (2015, p. 230)

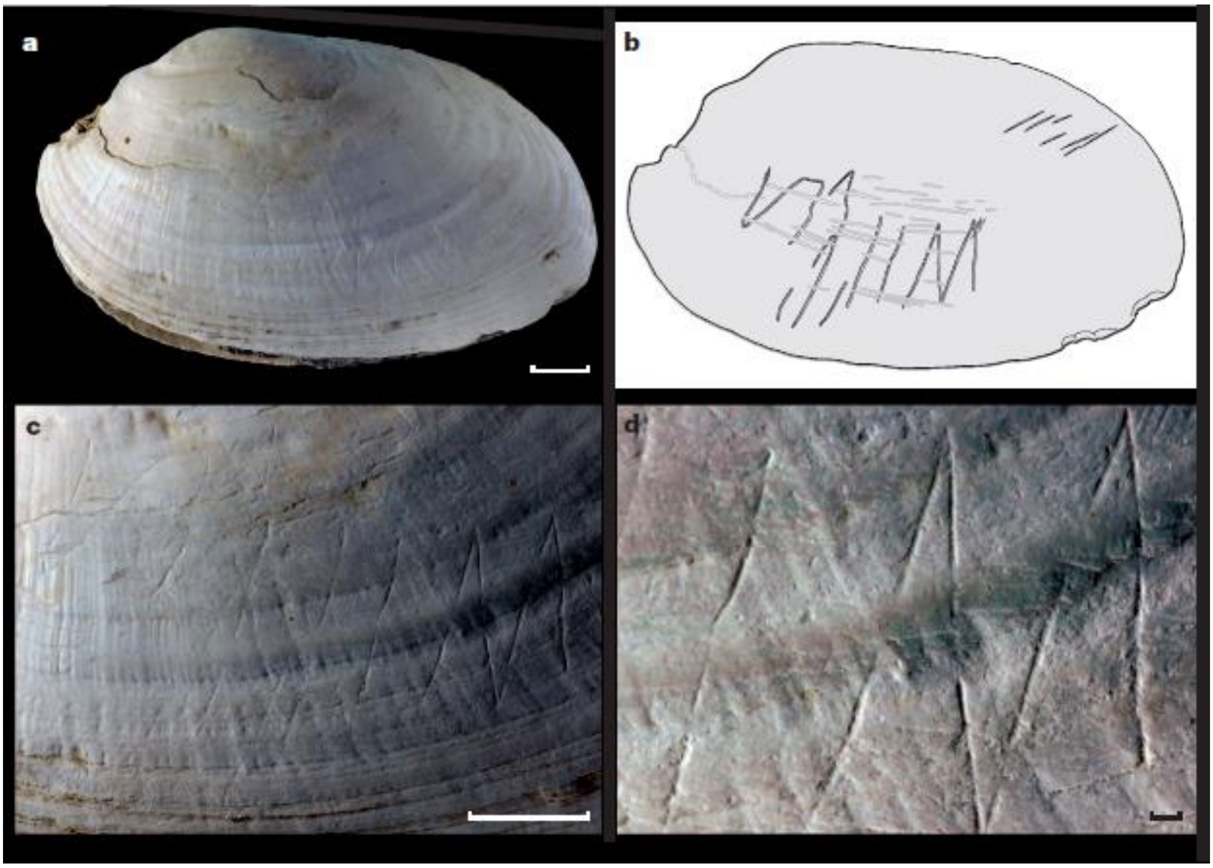


Fig. 85. Zigzag engraving attributed to Homo erectus on a shell found in Trinil, Java, Indonesia, ca. 500.000 BP: (a) image of the shell, (b) line drawing, (c) zoomed in pattern, (d) depiction of the most outspoken zigzag lines.

6.4. A tale of two species

6.4.1. Critical approaches to Neanderthal modernity

Research attributing findings to Neanderthals is often criticized on different grounds. According to some, dates that cluster around 40.000 BP are notoriously hard to connect to a specific species if the archaeological findings are not accompanied by unambiguous palaeoanthropological evidence. This means that theoretically, either one of the two co-existing species could have been responsible. This remark has been made concerning the Gorham's Cave engraving, as it cannot be excluded that Homo sapiens also already roamed these territories around this time (Callaway, 2014). In addition, the fact that many caves were repeatedly occupied over time, sometimes by different species, creates a complex layering where minor errors during excavation, or simply a variety of taphonomic processes, could cause findings from one layer to get mixed up with those from another layer. Clearly, this does not apply for parietal art, but it has been put forward as criticism pertaining to findings such as the Neanderthal nature of the Grotte Du Renne artefacts (Higham et al., 2010; White, 2001). This argument against the presence of modernity among Neanderthals has, in some cases, been turned around again. d'Errico (2003) has noted how in the Grotte du Renne, a set of bone tools should indeed be attributed to the Châtelperronian layers, as their frequency increases as layers are deeper, and thus older. If the objects had ended up in earlier layers from the more recent Aurignacian, this frequency would be expected to drop with the age of the underlying layers.

Moreover, even if it is accepted that some of these findings do indeed have a Neanderthal signature - i.e., this species turns out to be capable of manufacturing jewellery, processing ochre, or making art, in addition to possessing other indicator traits of behavioural modernity - different explanatory models can apply. Critical of the attribution of an independent evolution towards modernity among Neanderthals, Mellars (2005, 2010) notes how apparent innovations among Neanderthals seemingly take place during the exact timeframe of Homo sapiens' arrival in, and spread through Europe. This pattern is so clear that he terms it an "impossible coincidence": the dates of Aurignacian sites become slightly younger as they appear in more western regions of Europe, a logical effect of sapiens' migration taking place from East to West, starting from the Levant (2005, p. 12). Findings such as the Krapina jewellery challenge this, but the overall pattern still stands.

It is quite likely that Neanderthals and anatomically modern humans spent about 50.000 to 60.000 years co-existing in the Middle East, as this was the region where Homo sapiens first emerged from Africa (Mellars, 1991). Contact between these two species is further evidenced by genetic research indicating a degree of interbreeding (1-4%) between Neanderthals and the earliest populations of anatomically modern humans arriving from Africa (Green et al., 2010). If this is true, it seems natural that intercultural influence must have taken place. It is usually thought that this influence mostly occurred from Homo sapiens to Neanderthals, based on the relative absence of an extensive cultural record of artefacts during the Middle Palaeolithic, as opposed to a richer record in Middle Stone Age Africa from the time anatomically modern humans emerged here (but see d'Errico, 2003, for a critique of this assumption). On the other hand, Homo sapiens may have adopted new behavioural practices such as hunting techniques more suitable for the new European environment, that the already present Neanderthals were more skilled at (Mellars, 2005). If cultural influence from sapiens to Neanderthals really did take place, i.e. if the Châtelperronian is largely emulated from the Aurignacian, the question remains whether Neanderthals copied merely the artefacts themselves by means of techniques, or also attached the same significance to them: "the critical issue is whether the production and use of these items carried precisely the same social and cultural *meanings* among the final Neanderthal communities of western Europe as they did among the intrusive populations of biologically and behaviorally modern people." (Mellars, 2005, p. 21, original italics)

Others have proposed a modified version of the acculturation model, noting how innovation among Neanderthals may have been caused precisely because, but not necessarily under the heavy influence of Homo sapiens' culture. This is usually proposed by proponents of the model of multiregional continuity, maintaining that Neanderthals were indeed capable of independent innovation (d'Errico, 2003; Zilhão, 2006, 2007). Personal ornamentation, for instance, might have evolved among Neanderthals as a way of ascertaining and confirming their identity in the light of the influx of a new and different looking species (d'Errico et al., 1998). Moreover, even Mellars recognizes that in the case of imitation, this may have been more complex, and perhaps rooted in Neanderthal sociality: "(...) it may have been precisely the ability to copy the habits or appearance of the new, intrusive groups which conveyed increased social and personal prestige, or even improved mating success, within the local or regional groups." (2005, p. 21) Clearly, such conclusions are difficult to draw from a record that only consists of material artefacts. Critics of

Neanderthal modernity do, however, seldom make clear why symbolic meaning is simply presupposed for certain artefact types or behaviours such as ochre use and jewellery manufacture or art, whereas the same findings, if reliably attributed to Neanderthals, are usually subjected to a much more critical stance as to the presence of any meaning. Based on the artefactual record in itself, there is no a priori reason to claim that inferences concerning meaning or symbolism should be made in a different manner. Some points concerning Neanderthal cognition that have been invoked to support such critical claims, will be briefly addressed below.

Strong proponents of the model of multiregional continuity have additionally emphasized that some findings predate the arrival of anatomically modern humans in Europe, which would imply that they could not have been copied, or have been the result of acculturation. This appears to be true, for instance, for Châtelperronian pigment use, and for the Iberian shells dated to around 50.000 BP (Dayet et al., 2014; Zilhão et al., 2010). There is, however, the additional possibility of a bow wave diffusion effect, i.e. technological or cultural innovation could follow a ripple-like transmission pattern, spreading across Europe before anatomically modern humans arrived in person in regions further away. Theoretically, such a model could be based on the early interaction period in the Middle East, after which innovation originally characteristic of Homo sapiens spread gradually among Neanderthal populations both nearer and further away, for instance if certain techniques or tools of Homo sapiens exceeded those of Neanderthals in terms of functional efficiency (Mellars, 2005). Again, the same issue presents itself: if innovations are uncritically attributed to Homo sapiens, why would the same artefact types or behaviours found in Neanderthal contexts necessitate the additional component of a bow wave diffusion process of cultural tranmission?

At the same time, there is the more general issue of the representativeness of the archaeological record. On the one hand, it is not because Homo sapiens skeletal remains have so far not been found in specified regions in Europe, that they were not there at a certain time. Since Upper Palaeolithic humans do not appear to have spent their daily lives in caves but rather in open-air shelters, it is not surprising that clear anatomical evidence is not always found near to the art, or is not found at all due to poor preservation in more open areas (Guthrie, 2005). On the other hand, if striking archaeological discoveries are dated to the time before Homo sapiens' known arrival, the more parsimonious conclusion is indeed to regard such findings as the behavioural property of Neanderthals, rather than to presuppose based on the prior make-up of the archaeological record that anatomically modern humans were instead likely responsible, but that the latter's skeletal remains have merely not been found in association with the findings.

6.4.2. Neanderthal vs. anatomically modern human cognition

Critical perspectives on research pointing towards the Neanderthal manufacture and practice of seemingly modern artefacts and behaviour often implicitely converges on the idea that the essence of the difference between this species and our own, lies in considerable cognitive differences. Like the behavioural modernity debate that employs a single species approach focussing on anatomically modern humans alone, emphasis is often placed on the capacity for symbolic cognition. This is clear from the fact that the discoveries thought to be the most revolutionary are those that correspond to behavioural traits such as ritual, personal ornamentation and art, all of which might share an underlying symbolic component. Other behavioural domains such as advanced tool types and manufacture are cited in overviews of Neanderthal accomplishments (e.g. d'Errico, 2003), but often seem to be regarded as secondary to the essence of symbolism.[65] Within the context of the 50.000-year-old Iberian shells, Zilhão et al. write that "the symbolic implications of body painting and of the ornamental use of pigment-stained and perforated marine shells are uncontroversial in UP and later prehistoric contexts but, as shown by the evidence from Africa, the Near East and now Iberia, both behaviors first occur in the MP/MSA. Their emergence in two continents, among two different lineages and, in the time scale of human evolution, at about the same time, is inconsistent with cognitive-genetic explanations and implies that these innovations were fulfilling a need - aiding in the personal or social identification of people - that did not exist in the preceding two million years of human evolution." (2010, p. 1027) Like in the case of Upper Palaeolithic art that is attributed to Homo sapiens, the connections between art and symbolism are, here too, unquestioned and implicitely assumed. Discussing the matter of sapiens versus Neanderthal authorship, Pike et al. state that "it cannot be ruled out that the earliest paintings were symbolic expresions of the Neandertals (...)." (2012, p. 1412)

Importantly, claims as to the symbolic nature of Neanderthal ochre use, personal ornamentation or art should be subjected to the same amount of scrutiny as

[65] For a more extensive but critical discussion of symbolism and the Neanderthal mind, see Mellars, 1996b.

those attributed to Homo sapiens. From the discussion of geometrically engraved artefacts in chapter 4, it is clear that this does not always happen in the most rigorous ways, and that symbolic claims for any of these are only as strong as both the supporting evidence and the theoretical framework that is used to sustain them. If Peirce's typology of signs was equally applied here, conclusions would similarly go in the direction that neither ochre use, personal ornamentation or figurative and abstract art are unequivocal examples of symbolic cognition. But if symbolic cognition was indeed a property characteristic of Neanderthals, why did it remain hidden for so long? Even taking archaeological preservation biases into account, early examples of behaviours that might qualify as symbolic, are very scarce. If symbolism really did fulfill important functions in the social sphere, such as the identification of groups or individuals, and if the capacity for this type of thinking was characteristic of this species, why did it not come out more often and more clearly until close to the end of Neanderthal existence? And if Neanderthals were cognitively and behaviourally on a par with anatomically modern humans, why did they perish so soon after the arrival of Homo sapiens (Mellars, 2005)? Would it not have made more sense that Neanderthals were better adapted to the higher-latitude ecological and climatological conditions of Europe after their emergence around 300.000 BP or so, and that if one species had to leave the scene, it would have been Homo sapiens with its adaptations to Africa?

Perhaps there are, after all, crucial differences between Neanderthal and anatomically modern human cognition. Several of the cognitivist models present in the more general debate on the evolution of behavioural and cognitive modernity, have been extended to Neanderthals. Mithen, for instance, compellingly argued that the eventual breakthrough of fully modern behaviour, including many instances of presumed symbolic practices, was the result of a gradual process towards more cognitive fluidity between previously separate, domain-specific intelligences or cognitive domains (e.g. 1996a). According to Mithen, Neanderthals were not necessarily less capable in these separate domains - they could, for instance, have possessed technological skills that rival those of modern humans - but the process of fluidity took place to a much lesser extent than in the case of Homo sapiens (Mithen, 1996c). Lewis-Williams's (2002) interpretation of Upper Palaeolithic art, in turn, is built on the evolution of consciousness. This concept, broadly defined as "a notion, or sensation, created by electrochemical activity in the 'wiring' of the brain," (2002, p. 104), refers to a range of different states of consciousness, one extreme of which is ordinary everyday awareness, whereas the other extreme are either the altered states of consciousness present in shamanist religion in the "intensified trajectory," or complete unconsciousness in the "normal trajectory." (2002, p. 125) In addition, Lewis-Williams disentangles the levels of primary and higher-order consciousness. The first again broadly refers to normal awareness of the outside world and the ability to construct images of the present, whereas the second involves the ability for recognition of the self, and for the projection of present experiences into the past and the future. Those possessing this more advanced kind also gained access to more elaborate and efficient memory, which in turn allowed for cultivating an individual identity. According to Lewis-Williams, anatomically modern humans were capable of this, whereas Neanderthals were not (2002). Wynn and Coolidge (2004) have equally invoked memory as an explanation for species differences. Within their wider cognitive archaeological framework that centers around cognitive advances such as working memory capacity (e.g. Coolidge & Wynn, 2009), they argue that Neanderthal's achievement in this domain was considerably lower than that of Homo sapiens. Rather than the capacity of working memory in itself not having evolved among the former, the amount of information that could be stored would have been lower. As a result, Neanderthals were probably a lot less capable of innovation, whereas it might also have affected their language abilities (Wynn & Coolidge, 2004). All three of these cognitivist perspectives have indirect implications for Neanderthal art, as each of these bears implications for the overall ability for artmaking, even among Homo sapiens. It is unclear, however, to what extent such models are perhaps more useful for theoretically refuting the possibility that Neanderthals were capable of artmaking, rather than for addressing the presently discussed findings in terms of their potential artistic nature.

6.5. Homo neanderthalensis artisticus: the sequel

Like purportedly symbolic behaviours and artefacts from the African Middle Stone Age, the examples cited in this chapter are difficult to interpret with any certainty. In some cases that are not cited here, markings that were thought to be Neanderthal engravings, were later found to be unintentional marks caused by taphonomic processes (Nowell & d'Errico, 2007; see Peresani et al., 2014, for a more debated case). Overall, the number of examples of Neanderthal practices that could either be considered art, such as the Gorham's Cave engraving and the Spanish rock art (Pike et al., 2012; Rodríguez-Vidal et al., 2014), is fairly low compared to the European Upper Palaeolithic that is associated with Homo sapiens, but even to the corresponding timeframe of the Middle Stone Age in Africa, which was also mostly characterized by the presence of anatomically modern humans. According to Langley et al. (2008), claiming the presence of symbolism among Neanderthals necessitates not so much the discovery of specific key artefacts, or a refined rendition of these, but rather an increase in the frequency of a variety of indicator traits for symbolism or of complex behaviours in general, such as pigment use, burial, personal ornamentation use, advanced tool manufacture, etc. Even taking preservation issues into account, the authors note that a gradual increase in the frequency of these combined traits took place starting from around 160.000 BP and ending with Neanderthal's demise around 40.000 - 35.000 BP. Similar patterns are discussed by Burdukiewicz (2014). Overall, the amount of criticism addressed at cases of potential Neanderthal art, ochre use or personal ornamentation might result from the long-standing view that these hominins were of a cognitively considerably more 'primitive' nature than anatomically modern humans - a proposition that in itself is drawn from elements such as their rough and less gracile appearance, as well as their demise upon Homo sapiens' arrival. These and other elements might have fueled the idea that Neanderthals could not possibly have been capable of the same cultural exponents than Homo sapiens, which might, in turn, still be reflected in the ways notable findings are approached today (Moro Abadía & González Morales, 2010).

But what about Neanderthal art in the end? This chapter so far stuck to the common assumption, cited in the abovementioned papers, that Neanderthals must have possessed symbolic cognition in order to be able to produce art and related cultural practices such as personal ornamentation manufacture and ochre use. Yet from the previous two chapters, it should be evident that the connection between art and symbolism is less straightforward than often assumed. Because reasonable doubt exists as to the necessity of symbolic cognition for artmaking, the burden of evidence would appear to lie with those that are convinced of the validity of this prerequisite. As a consequence, both might appear apart from each other, and Neanderthals might have indeed produced the art discussed above, even if some of these cognitivist models are right in asserting that their levels of abstract or symbolic thought were significantly lower than those of anatomically modern humans. Of course, addressing these issues depends on the all important question of what are, in the end, necessary properties in order to speak of art's appearance. If symbolism would not be one of these, than what are? If aesthetic concern is key, for instance, there is again no a priori reason why even the Indonesian Homo erectus engraving would not qualify as one of the very first instances of artmaking.

Secondly, more recent theoretical modifications of the behavioural modernity debate, although usually phrased from a single species model perspective, are also of great relevance for assessing Neanderthal behaviour. The general idea that Neanderthals might not have been capable of 'modern' behaviour such as artmaking, ritual, burial, and so forth, is in itself heavily based on the close connection between biologically based evolved cognition, and the immediate behavioural outcomes of this. If, on the other hand, demographic and palaeoclimatological information is valued to its fullest extent, different explanatory models arise. The ideas of Sterelny (2011) and Straus (2012), for example, are far more detached from the biology-cognition-behaviour equation, and allow for the patchy appearance and disappearance of modern-like traits in the archaeological record, depending on the precise interplay of variables at a certain time, and in a certain space. If such variables are abstracted from the eras or regions for which they have been elaborated with regard to anatomically modern humans, such modified models can also apply to Homo neanderthalensis, and by extension perhaps even to earlier species such as Homo erectus.

Theoretically, the different explanatory models for Homo sapiens versus Homo neanderthalensis behaviour discussed here do not even exclude each other. Perhaps there were indeed cognitive differences between both species, but if a latent potential for symbolic thought was present in the Neanderthal mind, which could come out under the influence of socio-ecological circumstances, the arrival of Homo sapiens in Europe could be one such circumstance. As such, the acculturation or interaction perspective is perhaps partly right in pointing out the influence of anatomically modern humans, but may also unjustly ignore the fact that Neanderthal cognition must have inevitably been already complex in itself. The fact that these hominins succesfully roamed Europe for some 250.000 years excludes the caricatural idea that they were merely our primitive cousins, on a certain route to extinction. At the same time, extinction did occur, so it not yet clear whether findings such as those discussed in this chapter, in addition to other analyses of Neanderthal behaviours, artefacts and culture, fully support the validity of the model of multiregional continuity. Despite similarities between the two species, sapiens and Neanderthals each evolved for several hundreds of thousands of years in separate parts of the world, in different socioecological niches, and with a clearly different outcome in terms of worldwide migration for the first, and demise for the second.

Understanding these and other elements evidently requires many future approaches and analyses far beyond the realm of art.

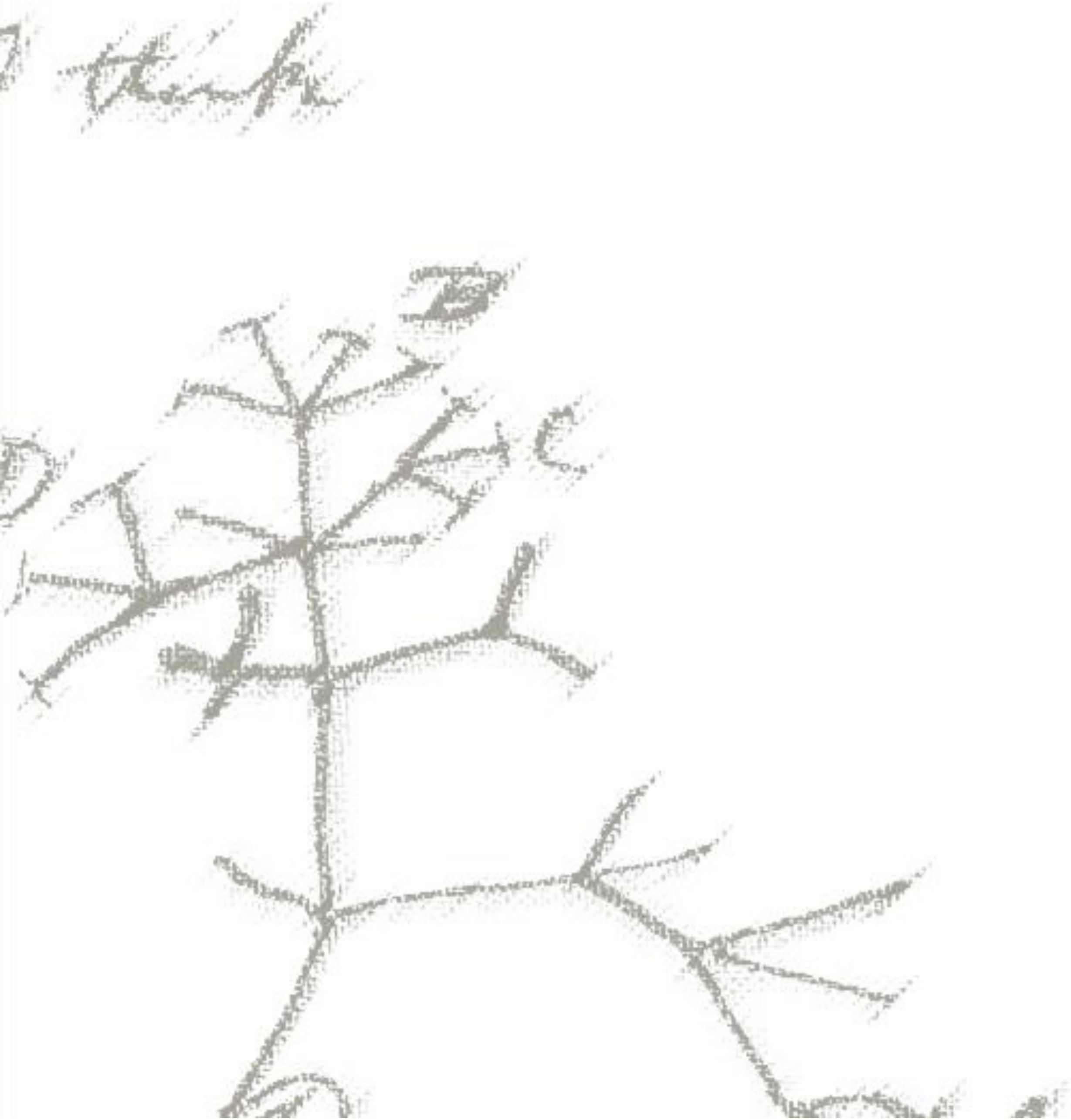
6.6. Concluding remarks

This chapter reviewed notable cases of Neanderthal aesthetic and artistic practices, with the aim of providing an important addition to the usual single species focus of the behavioural modernity debate. Like the Middle Stone Age record of Africa, this Middle Palaeolithic record is equally difficult to interpret. There is, among other things, the additional issue that during the ten millennia in between 45.000 and 35.000 BP, Homo sapiens and Neanderthals co-existed, leading to additional confusion pertaining to the attribution of findings from this period. From the above cited examples, it is clear that support for Neanderthal art is increasing, and that by extension, favourable analyses of their cognitive repertoire are now made more frequently. Gradually, this adjusts the fairly primitivist view that long surrounded the image of this species.

In terms of symbolism and art among Neanderthals, various possibilities still remain. Even if critical cognitivist models are right and there are crucial differences with Homo sapiens' cognition, including the capacity for symbolic thought, this is still not necessarily an issue. Symbolism may not be a prerequisite for art, in which Neanderthals could have practised art even in the absence of symbolic cognition. But even if symbolism is indeed necessary for art - a question that in itself warrants considerably more extensive analysis - theoretical modifications of the behavioural modernity debate still allow for the patchy manifestation of symbolic, or perhaps proto-symbolic behaviours. This of course depends on whether Neanderthals possessed at least a potential for symbolic thought after all, a point that is both considered entirely evident and virtually impossible, depending on particular researchers' perspectives and opinions. Overall, the debate concerning Neanderthal art appears to be at least in part based on dated views of the latter's presumed primitive nature. Claims against art among Neanderthals are then theoretically untenable on two grounds: symbolism might not be necessary for art, and patchy distribution or frequency shifts in the archaeological record far from contradict the advent of modern cognition.

PART III

Evolutionary theory



Introduction to Part III
Evolutionary theory

The final part of this dissertation returns to the foundations of evolutionary theory. Its connections with the origins of art go back to the dawn of Darwinian thought itself. Darwin, along with several others at this time, thought that evolutionary processes could produce much insight into the nature of display among animals, and as a consequence, perhaps also into artmaking among humans. As outlined in the brief historical overview at the beginning of this dissertation, evolutionary ideas did not gain wide recognition and acceptance for a considerable length of time, although various authors of the late 19th and early 20th century did incorporate evolutionary-based ideas in early biological accounts of art, such as mate advertisement and the functions of play. After the slow but steady increase in studies concerning art's emergence during the second half of the 20th century, the subject finally became anchored in different present-day subdisciplines of evolutionary theory. The most common of these are evolutionary psychology and evolutionary ethology, which represent the aesthetic fitness indicator, the cheesecake and the simulation hypothesis, and the artification and ancestress hypothesis respectively. In addition to this, evolutionary biological and evolutionary anthropological thought has found its way towards art, resulting in a variety of current disciplinary approaches and ideas.

Depending on whether evolutionary approaches in general, or rather a specific disciplinary perspective are scrutinized, different kinds of methodological issues arise. Among the general issues is a significant lack of empirical studies testing existing hypotheses. Art's origins are explained by means of functions and non-functional uses that are as far apart as cooperation and group cohesion, individual and collective identification, mate advertisement and choice, signalling and status, and elementary neurocognitive processes of vision and sensory biases. While some of these can be partially supported by making references to empirical evidence in other domains, such as animal behaviour and cognitive neuroscience, direct testing is usually absent. There is no convergence as to the likelihood of a certain functional explanation for the origins of art, nor is there agreement as to whether art was at all functional for our ancestors, or merely constituted a byproduct behaviour.

From the wide range of matters that can be addressed in this regard, this final section discusses two. Chapter 7 briefly reviews the evolutionary psychological study of art, which includes both adaptationist and byproduct perspectives, before outlining a number of methodological issues that are both specific to this discipline, and of relevance more generally. Among the former is the lack of clarity in definitions of mental modules, whereas the latter include the nature of adaptationist thinking on art. The attribution of categories such as 'adaptation' is notoriously difficult for behaviours and psychological phenomena as opposed to the relatively more straightforward analysis of anatomical properties of organisms. Chapter 8 therefore looks at this matter more closely. It departs from the evolutionary psychological framework of Chapter 7, leaving aside the byproduct cheesecake hypothesis that is included in this chapter, and incorporating instead two adaptationist accounts from evolutionary ethology. Issues that will be discussed here are the usefulness of evidentiary standards for adaptationist reasoning, the relationship between adaptations and exaptations as explanatory categories, and the ultimate-proximate distinction for the analysis of evolved traits.

7

The artful mind. A critical review of the evolutionary psychological study of art

7.1. Introduction[66]

During the past decades, the study of art has been increasingly subject to naturalistic approaches such as cognitive science, neuroscience and evolutionary theory. One of these approaches is evolutionary psychology, which developed during the 1980s and integrates evolutionary biology, sociobiology and cognitive science. Evolutionary psychologists consider art to be a universal human behaviour, which comprises various artistic creations, such as visual arts, storytelling and music. This chapter will first briefly address the premises of evolutionary psychology, before describing the main focal points in its literature on art.[67] Evolutionary psychology is here taken to include not only authors at the centre of the discipline, but also others working in fields such as literary Darwinism, whose theoretical framework clearly incorporates

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[66] This chapter was previously published as Seghers, E. (2015). The artful mind: a critical review of the evolutionary psychological study of art. *The British Journal of Aesthetics, 55*, 225-242. The structure and content of the original manuscript has been altered slightly for the purpose of fitting within this dissertation.

[67] The present overview does not include authors like Dissanayake (e.g. 1995) and Mithen (e.g. 2005). While they, and others, incorporate evolutionary psychological ideas in their work, their main disciplinary take (evolutionary ethology and cognitive archaeology respectively) is different from the authors discussed here.

evolutionary psychological ideas. Next, the current state of affairs in the evolutionary psychological study of art is discussed, by looking at several methodological and conceptual issues characteristic of this discipline. With this critical review of ongoing research, the aim is to advance evolutionary research on art by providing more clarity concerning these outstanding issues, as well as some possible approaches towards their solution.

7.2. Evolutionary psychology and the human mind

Evolutionary psychology attempts to explain our current psychological make-up by referring to the evolutionary history of the human species. Researchers in this field look for an adaptive logic behind our cognitive machinery, probing into the relationship between our behaviour and the surrounding environment. Classical evolutionary psychology takes the mind to contain domain-specific, information-processing modules that originated through natural selection, as solutions to environmental problems faced by our human ancestors.[68] These innate reasoning circuits are said to make up our evolved human nature, and will produce behaviour in response to specific environmental cues (Tooby & Cosmides, 1992). Other scholars, also associated with evolutionary psychology, have modified this traditional conceptual framework. They place less emphasis on the presumed modularity of the mind, and advocate the inclusion of processes such as cultural learning (Dunbar & Barrett, 2007). In general, three major categories have been put forward to classify evolved traits: adaptations, byproducts and random effects or noise.

An adaptation is an inherited trait that evolved by natural selection in response to a particular adaptive problem, consequently enhancing the survival and reproduction rates of the organism possessing the trait. In order to be transmissible, the trait requires a genetic basis, but it is also influenced by the surrounding environment through its ontogenetic development (Buss et al., 1998). Byproducts are traits that are non-functional in themselves, but that emerged as side-effects of adaptations. Thirdly, random effects, sometimes referred to as noise, consist of neutral characteristics that, in contrast to byproducts, are not related to an original adaptation. These genetic changes or mutations can persist through evolution on the

[68] For elegant discussions on different views of the mind, see, among others, Fodor, 1983; Pinker, 2002; Slingerland, 2008; Sperber, 1994, and Whitehouse, 2001.

condition that they do not impair the organism's survival and reproductive opportunities (Tooby & Cosmides, 1992).

The causal engine of natural selection is differential reproductive success. If genes are to be transmitted into future generations, organisms need not only to survive at least until reproductive age, but they must also achieve greater reproductive success relative to others (Buss et al., 1998). This can happen either through actual reproduction (direct fitness benefits), or through altruistic behaviour towards other organisms with at least a partly shared genotype (indirect fitness benefits). These together make up inclusive fitness. (Hamilton, 1964). Sexual selection is a specific process of evolution by selection, with regard to traits that play a significant role in mate choice, courtship, and other behaviours immediately relevant for reproduction, rather than survival in itself (Miller, 2001a).

Instead of using philosophical definitions, research into the psychological and evolutionary foundations of art often employs an operational distinction between three major categories (Boyd, 2009; Dutton, 2009; Pinker, 1997). Visual arts include painting, drawing, sculpture, body adornment, decorative applications to existing objects, and so forth. Performance arts encompass a wide variety of time-based arts such as singing, dancing, instrumental music and theatre. Finally, storytelling involves fictional and non-fictional narratives, and poetry in both oral and written forms.[69] Some kinds of art fall within two categories, such as fiction being present in stories as well as in visual arts, or acting being a performative art, as well as bearing important features of storytelling. Some evolutionary hypotheses have been described by Davies as 'general theories of art' (Davies, 2012, p. 121). These are theories that account for all manifestations of art - ranging from visual arts to storytelling and music - by using a general framework such as sexual selection, rather than allowing for different evolutionary trajectories and explanations for various kinds of art.

[69] Evolutionary explanations are not necessarily limited to kinds of art that were prevalent in ancestral times, and can also apply to more modern forms such as architecture in the case of visual arts, and film in the case of storytelling (Dutton, 2009). Evolutionary explanations are however mostly concerned with explaining art's origins, which is why they may be particularly suitable for accounting for ancestral kinds of art.

7.3. Evolutionary psychology and art

7.3.1. Sexual selection

Miller takes an approach that is aligned with sexual selectionist explanations in evolutionary biology, through references to animal behaviour and the biological correlates of aesthetic choices. Artistic behaviour, in Miller's view, is a proper adaptation, with courtship signalling as the causal engine for its evolution (Miller, 1999, 2000, 2001a, 2001b). Similar to physical characteristics, psychological and behavioural traits related to mate choice are often sexually dimorphic, i.e. they differ between male and female organisms within a species. This apparent imbalance is explained by Trivers' parental investment theory (Trivers, 1972). Common examples are the male peacock's tail, and the bowers constructed by male bower birds as a mating device towards females. The latter's preference for elaborate bowers is at the same time a preference for overall health and physical strength, as only the most mature, experienced and physically apt males will produce the most impressive bowers (Borgia, 1997; Madden, 2001). Bower building skills are therefore an honest signal of a male's quality, as well as a costly signal: in many cases, spending vital energy on this or similar behaviours impedes the survival chances of the animal, a paradoxical outcome previously described as the handicap principle (Zahavi & Zahavi, 1999).

According to Miller, we can extend this framework to human behavioural and mental abilities. Intelligence, creativity, art, humour, altruism and music are all thought to play an important role in mate choice, with males being the ones most likely to develop these traits under sexual selectionist pressure (Greengross & Miller, 2011; Miller, 2001a). They are referred to as being part of the extended phenotype, a term coined by Dawkins (1982; Miller, 2001a). In sum, Miller proposes that artmaking acts as an adaptive signalling system, aimed at attracting suitable mates. Aesthetic sensitivity towards art is the human equivalent of the female bowerbird's ability to assess impressive bowers. Miller has applied the same line of reasoning to fictional storytelling, regarding it as a mating device through demonstrating cognitive creativity and higher-level skills such as counterfactual reasoning, but most notably to the origins of music (Miller, 2000). Rhythm is thought to demonstrate cognitive control over complex movement sequences, dance and movement show physical strength, health and coordination, while melodic creativity is evidence of general cognitive fitness. Some components of music might additionally be explained as aesthetic displays, evolved through exploiting existing acoustic preferences. Given an original preference for complex auditory signals, an evolutionary feedback loop can emerge in which the producers create increasingly complex signals, while the receivers evaluate those signals ever more positively. This process is known as runaway sexual selection (Fisher, 1930). Musical features can be both indicator traits - containing features relevant for mate attraction - and aesthetic displays - products of runaway selection. In Miller's view, an adequate evolutionary analysis of music consists of a framework that includes both of these categories.

While not directly based on sexual selection, the evolutionary psychologist Steven Pinker has advocated similar ideas with regard to art fulfilling a social status signalling function. In his account, many traits we consider to be the most unique and striking features that make us human, such as art, religion, philosophy and humour, are in fact byproducts of other cognitive abilities (Pinker, 1997, 2006, 2007). Engaging in visual arts and music might be partly sustained by the fact that their costliness in terms of time, energy and resources signals social status. Moreover, most of the arts make use of exisiting neural reward circuitry that originally evolved for other, functional purposes. Stimuli that were beneficial for survival and reproduction gradually became associated with neural rewards producing positive emotions, whereas the reverse happened with stimuli that were likely to cause harm (Thornhill, 2003). Co-opting these mechanisms enables us to draw pleasure from activities that are not in themselves useful for survival purposes, and one of the most effective ways to do so is through the hyperstimulus called art.

Pinker's ideas are closely related to the idea that our inclination to engage in art is due to the fact that it appeals to our constant need for pattern extraction from other organisms and the external world. Patterns can be generally understood as “order or form in things, actions, ideas or situations.” (Boyd, 2009, p. 87) They can involve visual data such as spatial features or physical characteristics of other individuals, but also more volatile information such as recurrent behaviours, intentions and mental states of conspecifics. The ability for pattern recognition is beneficial to humans due to the emergent potential of predicting future events. It has been argued that higher primates, including humans, have a preference for sophisticated patterns such as symmetrical or rhythmic displays (Boyd, 2009; Gazzaniga, 2008). Works of art could be considered to be supernormal stimuli: they contain a rush of these patterns, at much higher frequency and in greater intensity than we would normally encounter in real life (Boyd, 2009; Ramachandran & Hirstein, 1999).[70]

7.3.2. Elaboration of cognitive and social skills

A second line of reasoning states that art contributes to the development of cognitive and social skills. This perspective generally focuses on fictional art, which is understood to include any kind of non-veridical representation across various kinds of art, such as literature and visual arts, although a focus on storytelling, and fictional stories in particular, is more common (Tooby & Cosmides, 2001). It sometimes tends to look for the roots of art in play behaviour, proposing that human artistic behaviour is a more advanced version of the exploratory behaviour found in a variety of other species (e.g. Boyd, 2009).[71]

The evolutionary psychologists John Tooby and Leda Cosmides' hypothesis involves linking art to the organization of sensory input and knowledge. The enjoyment of art is regarded as an adaptive neurocognitive process, instrumental in the development of the mind. They provide the example of natural phenomena such as stars, landscapes, and the sound of running water, which often capture our attention and are experienced as beautiful. This is because the brain uses their constant properties as a means to finetune its perceptual machinery: 'the brain, because it 'knows' in advance what these cross-generationally invariant signals should be like, can compare the actual input with its innate model of the expected input, and use the difference as a corrective feedback signal.' (Tooby & Cosmides, 2001, p. 17) The specific contribution of fictional art and non-veridical imagery is that it increases our mental catalogue of representations to such a significant extent that it greatly enhances our ability to venture into imagined worlds. Fiction therefore implies 'simulated or imagined experience': it allows for processes like

[70] This last paper, and the hyperstimulus conception of art in general, have been criticized for its rather limited scope of what art is. See e.g. comments by Gombrich and others in *Journal of Consciousness Studies* vol. 6 (1999) and 7 (2000), and a critical discussion of the peak shift principle in Hyman (2010).

[71] Among the crucial differences between human artistic and animal exploratory behaviour are shared attention in the former, as well as a variety of abilities such as language and relevant motor skills that enable particular kinds of art such as storytelling and drawing, while not doing so in non-human animals. It is possible, however, that art and play behaviour are phylogenetically linked; see, for example, Dissanayake (1995). Common elements are, among other things, creativity, imagination and intelligence (Davies, 2012).

mental time travel, engaging in imaginary social interactions or conversations, mapping out different action strategies in response to a potential real life situation or threat, and so forth (2001, p. 23). This enables the practice of skills necessary for everyday life, while at the same time avoiding the risk of having such practice take place amid the perils of Pleistocene life.

Several authors extend the more general idea that art enables cognitive elaboration into the domain of social skills. According to the literary scholar Brian Boyd, art can be regarded as a form of cognitive play saturated with pattern. He considers both art in general and fictional storytelling in particular to be adaptations. The latter provides us with patterns of strategic social information relevant for immediate action, as well as with general principles concerning character traits, and reasoning tools for grasping the depth of social interaction. Fiction also endows us with the abilities to contemplate social situations from different perspectives, to make mental shifts between characters, and to increase the speed of social information processing by stocking our memory with a range of compelling examples (Boyd, 2009).

Pinker similarly argues that stories allow for a form of case-based reasoning, as generic strategies are less useful in specific circumstances. Contrary to visual arts and music, he considers fiction to be a combination of an adaptation - realized through its instructive function - and a byproduct - referring to its pleasurable effects. Its main function is that it provides us with a virtual reality where thought experiments can be done so as to explore different options in social interaction. In addition, stories where complex social scenarios are absent can help us to acquire sociocultural norms (Pinker, 2007; Mar & Oatley, 2008).

The literary scholar Joseph Carroll states that literature and the arts in general 'fulfill the specifically and uniquely human need to produce an emotionally and aesthetically saturated cognitive order'. (Carroll, 2005, p. 938; Carroll, 2011).[72] Elsewhere, he argues that 'the primary adaptive function of art is to provide the mind with subjectively weighted models of reality in such a way as to help organize

[72] While the achievement of cognitive order in the surrounding environment is likely not exclusive to humans, the vast social complexity in the latter's groups and societies does warrant a more refined understanding of such order and structures, which, in Carroll's view, can be achieved through the simulation mechanisms present in storytelling. In the specific cases where animal societies rival humans' in their complexity, the absence of art (but the common presence of play), may be due to the corresponding absence of relevant psychological and behavioural adaptations involved in human artmaking.

the complex human motivational system. [...] It provides an emotionally saturated simulation of experience'. (Carroll, 2005, p. 940). This enables those who engage in art to be immersed in particular emotions while at the same time keeping cognitive distance.

Aside from increasing our social skills, stories have also been said to elevate our moral consciousness (Boyd, 2009; Gottschall, 2012; Wilson, 2005). Moral emotions, dilemmas and choices make up a considerable part of the content of stories worldwide, and repeatedly experiencing and contemplating them is thought to help us make good moral choices, and to develop prosocial behaviour as well as feelings of empathy towards others. According to the literary scholar Jonathan Gottschall, this is particularly evident in nationalist and religious stories, whose aims are to boost cooperation and diminish the importance of individual benefit seeking. The medium of fiction, often characterized by emotionally saturated content and unexpected twists and turns, is particularly successful in capturing and maintaining attention, and eventually in altering our cognitive and neural make-up (Gottschall, 2012). This means that fictional content, rather than, for example, a fact-based historical narrative, is much more effective in achieving goals such as moral education and cooperation. Similarly, religious teachings would probably be far less compelling if their content was merely listed as a set of guidelines, rather than being cast in elaborate stories of a mythological or imaginative nature.

7.4. Methodological issues in the evolutionary psychological study of art

Since its establishment as a scientific discipline in the early 1990s, evolutionary psychology has received a significant amount of criticism from outsiders to the evolutionary study of human behaviour, who argue that evolution holds little relevance for understanding modern behaviour and culture, given how different these are from the hunting and gathering conditions thought to be characteristic of human ancestors. In addition to this, insiders to this framework have criticized evolutionary psychology in favour of other perspectives such as gene-culture co-evolution and human behavioural ecology (Laland & Brown, 2002). Within evolutionary psychology, art has been studied to a relatively small extent, and its limited representation in this scientific literature makes for considerable gaps and methodological issues. While accepting evolutionary psychology as a valid approach for studying art, I will address four issues: the complex debate on adaptationism and how it is reflected in research on art, the current scarcity of empirical studies testing existing hypotheses, disagreement on the nature of modules or psychological mechanisms, and evolutionary psychology's one-directional perspective on culture. The first two matters concern the current theoretical and empirical setup of this literature, whereas the third comment involves an issue that is of a more conceptual nature, specific to evolutionary psychology. The last remark discusses how this discipline might expand its methodological framework in relation to other evolutionary perspectives on human behaviour.

7.4.1. The adaptationist-byproduct debate

The matter of defining adaptations is in itself the subject of numerous publications in fields such as evolutionary biology and ethology, where it has incited complex meta-discussions. The evolutionary psychologist David Buss has argued that three important questions need to be asked, and should receive an affirmative answer, for a trait to be designated as an adaptation:

> "Does the mechanism regularly develop in most or all members of the species across all 'normal' environments, and perform dependably in the contexts in which it is designed to function (reliability)? Does the mechanism solve a particular adaptive problem well (efficiency)? Does the mechanism solve the adaptive problem without extorting huge costs from the organism (economy)?" (Buss, 2008, p. 16)

Most importantly, these features must be unified in a particular trait through special design: "The decision as to the purpose of a mechanism must be based on an examination of the machinery and an argument as to the appropriateness of the means to the end." (Williams, 1966, p. 12) Confusion concerning the evolutionary origins of art often stems from a misunderstanding between adaptive function and function in general. Art has been credited with many different benefits, such as providing us with comfort and consolation, with insight into the human psyche, or with an increased appreciation of nature (Dutton, 2009). However, it does not suffice to claim that art is an adaptation, for example because it unites people, even though such a beneficial effect may have been demonstrated empirically. Unless an adaptive problem can be identified and linked to the trait as its solution evolved through natural selection, the label of adaptation is not to be attributed. This touches upon a common issue in adaptationist explanations of art: as the available empirical studies show, evidence often supports different explanations. With regard to music, for example, links have been established with its value as an instrument for mate attraction and assessment, but other research points towards its cooperative and prosocial effects. Different functions for one behavioural trait are not mutually exclusive, as such a trait may have originated for one particular effect and may have later taken on another function. As Davies notes, this possibly applies to some of the functional explanations that are now put forward as reflecting selection pressures. Mating display, for instance, is a strong candidate for explaining several kinds of art, but may comprise a secondary, co-opted function, rather than a primary adaptive one (Davies, 2012, p. 125). In order to trace the evolutionary roots of music as a possible adaptation, one should be able to identify an ultimate function that yielded survival value, rather than merely raising a number of different uses. This requires further thought on what constitutes an adaptation in the context of art.[73]

Several approaches have been enlisted to demonstrate that adaptation is a suitable category for explaining various kinds of art.[74] Adaptationist claims are sometimes substantiated by referring to a number of characteristics that, taken together, point in the direction of functional, adaptive value. For example, with regard to visual arts, Miller argues first that art is universal in time and space (2001a, 2001b). While this is presumably true, this does not automatically constitute proof for an adaptation. The fact that artistic behaviour appears to be species-specific and universal merely warrants us to consider it as a stable feature of human nature, which makes evolution an obvious candidate for its explanation (Donald, 2006). Conversely, a trait does not even have to be universal in order to be adaptive, such as in the case of negative frequency dependent selection, where fitness increase derived from this trait depends on it *not* being a property of all individuals in a population (Davies, 2012). Next, Miller points out that art provides pleasure. However, Pinker's

[73] This subject is extensively discussed in the next chapter and overlaps at some points, but the general discussion of this issue is maintained here for reasons of clarity and completion.

[74] Categorizing art as an adaptation in principle requires the assumption that it has a genetic basis. However, the current state of research does not allow for much speculation about these genetics, as there is very little clarity about which traits are supposedly adaptive. Different kinds of art such as fictional storytelling might be instruments in adaptive traits such as social learning mechanisms. This would allow for a strongly cultural explanation of storytelling in itself, with genetic analysis focussing on the basis of these mechanisms. In addition, mechanisms such as social and cultural learning often play an important role, contradicting the idea that a behaviour such as art is predominantly determined by genes. Understanding the level of heritability in artmaking is nonetheless important for investigating interindividual variation in this trait. See, e.g. Davies, 2012, p. 49-50.

byproduct account also succeeds in explaining the pleasurable effects of art and its aesthetic features by arguing that we might be enjoying the separate components of art, such as visual primitives and symmetrical patterns, while it appears to our conscious experience that we draw pleasure from art as a whole. The argument of art's costliness does appear to be supported by Zahavi's aforementioned handicap principle, which states that a costly signalling trait is positively correlated with higher fitness levels, indicating that costliness does indeed point towards adaptiveness. Miller's last remark that artistic skill is a typical human trait that we can acquire relatively easily, mainly points out that art is part of the cultural niche of humans: it evolved as a species-specific trait through the unique interaction of human ancestors with their physical and social environment, which does not equal adaptive function. A similar argument to Miller's, also including the complex cognitive processing engaged by art and its apparent necessity for individual and cultural identification, has been put forward by Carroll (2005).

An approach such as this one attempts to address the burden of evidence for an adaptationist explanation, but lacks further elaboration as to whether art is uniquely suited to fulfill its various proclaimed functions, such as its being a mating device shaped and sustained via sexual selection. According to Davies, this is a significant deficit of the aforementioned general theories of art: "art-general theories should identify an evolutionarily significant function performed not only by *all* the arts but also by *only* the arts." (Davies, 2012, p. 123, original italics)

Several issues arise here: using one explanation for all kinds of art, ranging from fictional storytelling to body decoration and from individual crafting to collective song and dance, surpasses the immense complexity of these different practices. Furthermore, as is evident from Davies's remark, using a general explanation such as sexual selection also leaves unanswered the question whether art is truly unique in fulfilling this function. If works of art are considered parts of the extended phenotype reflecting highly elaborate cognition, as is argued by Miller, one might question whether it is in fact the mating mind itself, rather than its products such as art, that should be the central focus of this adaptationist explanation (Davies, 2012; Miller, 2001a). In order to preserve the focus on art, it seems that sufficient support should be gathered in evidence of any exceptional or unique properties of this behaviour that are much more efficient in communicating mental abilities than other parts of the extended phenotype as it is mapped by Miller, such as humour (Davies, 2012; Greengross & Miller, 2011). This would make art, in Carroll's words, a 'primary adaptation', and would attribute an irreducible adaptive function that is different from the associated benefits argued for in 'secondary adaptation' explanations (Carroll, 2005, p. 939).

A promising approach that corresponds more to the evolutionary biologist George Williams's plea for mapping the evolutionary history of a trait through connecting its structural properties to a particular evolutionary function, is reverse engineering. Critical of the common tendency in the evolutionary study of art in general to attribute the label of adaptation to art, Pinker claims that

> "(...) one has to show - *independently of anything we know about the human behavior in question* - that X, by its intrinsic design, is capable of causing a reproduction-enhancing outcome in an environment like the one in which humans evolved. This analysis can't be a kind of psychology; it must be a kind of engineering (...). With these design specs in hand, one can then compare the specs against the facts of the human drive or talent we are trying to explain. The closer the design specs match the empirical facts about human beings, the more confidence we have that the trait in question is an adaptation." (Pinker, 2007, p. 170; original emphasis)

This approach has not been thoroughly explored with regard to art. Sugiyama (2005) has pointed out that reverse engineering - 'that is, inferring the function of the whole by examining the operation of its parts' - might be a useful avenue for explaining the origins of narrative. This analysis consists of identifying the structural properties of narrative, such as action, character and conflict, and subsequently of explaining why these features might be relevant. According to Sugiyama, narrative is an information storage and transmission system that enables the simulation of actual experiences. However, as she rightly argues, this reverse engineering approach only clarifies that narrative appears to meet the adaptationist criterion of special design, but does not allow for integrating narrative, adaptive cognition and functional value, nor for determining whether narrative might have increased the survival and reproduction opportunities of those who practised it. In order to determine whether narrative or other kinds of art are adaptations, more extensive analysis along the lines of Pinker's suggestion is necessary.[75]

Insufficient support for the adaptationist claims often made does not, however, validate a byproduct account. For example, if Pinker is right in arguing that art increases social status, it is likely that this effect entails differential reproductive success, favouring those possessing artistic skills or abundant resources

[75] Many of the points discussed in the preceding paragraphs will be taken up again in the next chapter.

to invest in art. This violates the non-functional nature of byproducts, but more importantly, designating art as linked to signalling implies that artmaking will be accompanied by costs to the individual that engages in this behaviour. Several authors have argued that these costs would have caused non-functional traits that didn't yield any benefits, such as the creation of music and visual arts according to Pinker, to be selected against and quickly removed from the behavioural repertoire of human ancestors (Carroll, 1998; Boyd, 2009; Levitin, 2006).

According to Davies, this critique does not allow for the possibility that byproducts can indeed be costly traits, and points out that there might not be a comparative disadvantage towards other individuals. If music making, for example, is a universal behaviour imposing costs on everybody, this erases the relative disadvantage of individuals that devote their time, energy and resources to a non-functional occupation (Davies, 2012). However, this remark does not take into account that music making would probably never have become a universal behaviour if it entailed costs that surpassed any benefits stemming from its practice. As a consequence, its mere universality either suggests the relative absence of costs, or their compensation by benefits such as increased social status. Whether this argument is sufficient to gravitate towards an adaptationist explanation remains an important point of debate. It again raises the aforementioned issue that art might be a secondary means for communicating, in this case, a notable social status, rather than being the primary locus of selection.

Davies has rightly pointed out that a byproduct explanation should not be regarded as an easy way out of the apparent demands of more complex argumentation needed when attempting to characterize a trait as a true adaptation. Stating that a trait is a byproduct, requires identifying one or more adaptations the trait makes use of, as well as how they gave rise to the byproduct itself (Davies, 2012, p. 139). Moreover, Davies argues that it is unlikely that a newly arising behaviour, even though it might have originally been non-functional, would remain a byproduct if it contains signalling potential. If engaging in art and expressing views of expertise about its quality are costly signals, these behaviours will soon start playing a role in our assessment of other individuals in terms of their mate quality, and will therefore increase differential reproductive success (Davies, 2010, 2012). The foundation of this idea is the fact that evolution can only construct new traits out of building blocks that are already present. Adaptations too cannot simply emerge out of nowhere, so linking a new trait to previously existing adaptations should therefore not equate its categorization as a byproduct (Davies, 2010, 2012).

In this regard, it might be useful to extend the adaptationist-byproduct debate to include other categories such as exaptation and secondary adaptation. While an adaptation emerges through a history of selection in order to solve an adaptive problem, an exaptation corresponds to an already present adaptation and gains a new function without subsequent selection. A secondary adaptation is characterized as the result of a primary adaptation undergoing additional phenotypic modification for a new, fitness-enhancing effect (Andrews et al., 2002; Gould & Lewontin, 1979; Gould & Vrba, 1982). Based on this conceptual distinction, it might be useful to regard the eventual adaptationist outcome proposed by Davies as a secondary one, in order to maintain analytic distinction with other authors that have developed their hypotheses as primary adaptive explanations.

7.4.2. Insufficient empirical support

While theoretical reasoning is necessary to develop a hypothesis, no research programme on human behaviour is complete without rigorous empirical testing, so as to avoid the conjectural reasoning characteristic of 'just so stories' (Tooby & Cosmides, 1989). Evolutionary psychological research on art currently lacks a sufficient body of empirical research that thoroughly scrutinizes the existing hypotheses, and as a consequence, only a limited and inconclusive set of data are available.

In order to support his concept of the psychology of aesthetics, Pinker argues that we enjoy certain figurative representations, such as 'safe, food-rich, explorable, learnable habitats, and fertile, healthy dates, mates, and babies', because they are artificial signals of 'adaptively valuable objects' (1997, p. 526). Such ideas have been addressed in applied environmental aesthetics research, where it is proposed that the search for an adequate habitat was one of the major adaptive problems faced by human ancestors (Appleton, 1990; Kaplan, 1987; Orians & Heerwagen, 1992; Orians, 2001). This allows for predictions as to what features of habitats we find attractive in landscape painting, as has been empirically investigated (Heerwagen & Orians, 1993). Yet the remaining claims about aesthetic preferences for content elements remain hypothetical. The pleasure buttons Pinker refers to can perhaps be more easily activated by abstract and geometric patterns that correspond to the structure of the visual cortex. So-called 'graphic or visual primitives' can be indications of artificial or natural structures and thus regularity and predictability in the environment, recognition of which was beneficial for our ancestors (Hodgson, 2005; Pinker, 1997).

Clear patterns and vivid colours also ease information processing, which explains the persistent preference for these elements still characteristic of present-day humans (Ramachandran & Hirstein, 1999; Ramachandran, 2003). The psychologist Nicholas Humphrey similarly remarks: "Beautiful 'structures' in nature or art are those which facilitate the task of classification by presenting evidence of the 'taxonomic' relations between things in a way which is informative and easy to grasp." (1973a, p. 432) But despite cognitive neuroscientific evidence in its favour, the psychology of aesthetics does not appear to be suitable for clarifying the full range of our aesthetic preferences in art.

In other instances, experimental studies are present, but they often remain inconclusive. This is the case for the courtship hypothesis by Miller (Clegg et al., 2011). Proponents of sexual selectionist explanations often draw evidence from animal examples, acknowledging that humans are animals occupying an extraordinary cognitive, social and cultural niche. Experimental support has additionally been produced for creativity being a good genes indicator, through an investigation of female preferences for short-term and long-term mating in relation to creative capacities (Haselton & Miller, 2005). A more general study by Miller analyzed production demographics of items of culture such as paintings, music albums and books, and found that these patterns correspond to predictions made by the courtship model: male output is on average ten times bigger than the amount of female cultural products - in accordance with the idea that males must compete for female attention - and their production peaks during young adulthood, the period when sexual competition is strongest (Miller, 1999).[76]

The cultural courtship model does not state that female cultural production should be absent, but that it will be exercised in a less public manner, most often following the establishment of a relationship in order to maintain the pairbond. Furthermore, while cultural production equally indicates desirable qualities such as creativity and overall fitness in women, public advertisement during mate choice could comprise risks in the form of harassment by males, also explaining its less outspoken appearance. While creativity is thought to be only moderately heritable

[76] A similar pattern of age distribution was found for the career peaks of scientists. Not only were the majority of scientists male, in accordance with the sexual dimorphism expected for courtship traits, their productivity was also greatest during early and middle adulthood, consistent with the pattern predicted by Miller. If science is regarded as an expression of cognitive creativity, these results can be interpreted as supporting the courtship hypothesis (Kanazawa, 2000).

(Davies, 2012; Miller, 2001a), the potential genetic correlates of this and other capacities involved in artmaking, such as imagination, manual skill, etc., suggest that female offspring of highly talented males may possess a similar array of artistic abilities. Its proposed relative absence in display contexts therefore doesn't necessarily imply the overall absence of the relevant talents and skills in females.

Findings such as the reported male bias in cultural demographic patterns have been criticized for not adequately taking into account the social and historical influences that have created a male bias in different canons of art, or products of creativity in general (see for example Mithen, 2005). Two studies by McManus and Furnham (2006, 2011) attempted to map the potential influence of education, personality, social class, age and sex on the involvement in artistic activities from a broad consumer perspective. The results did not yield a bias towards greater participation in the arts by males, nor was the pattern of male artistic engagement of a more active nature than that of females, contradicting what might be expected based on Miller's work. Differences do appear when particular kinds of artistic activity are compared across the sexes, with females overall being more interested in watching and taking part in different kinds of dance, listening to classical music, reading novels and poetry, and drawing and painting, while males tend to incline towards photography and cinema, reading non-fiction, and going to pop concerts. Overall, personality traits do not account for these differences. As the current state of research remains inconclusive, additional research, and cross-cultural testing in particular, is sorely needed.

Studies such as those undertaken by McManus and Furnham illustrate an important point not commonly addressed in evolutionary research. Considering historical and social influences on artmaking raises the question to what extent the art currently discussed in evolutionary psychological writings involves 'high art', which will naturally show up in some anthologies used as sources of empirical data, such as the cultural demographics datasets. Miller has countered this, with music as an example, by referring to research indicating that the demographics of extremely creative, cultural production appear to correspond to patterns found in ordinary cultural production, which suggests that we can make inferences from the first to discuss the second (Miller, 2000). Yet the consumer perspective of McManus and Furnham indicates that artistic behaviour as a human universal is much broader than the mere production of, for example, visual arts within a mating context. This has also been noted by Davies, who points out that adequately investigating the link between art and evolution requires first and foremost considering the width of the subject matter. While art in itself should be thought of as "encompassing domestic, folk, decorative, popular, and mass art," it is additionally suggested that "art-behavioral competence" rather than mere artmaking should be the unit of analysis (Davies, 2012, p. 51, 52). Given how much time and mental investment goes into experiencing different kinds of art, and how many individuals worldwide frequently engage and acquire competence in one or more art forms, it seems sensible to regard artistry not as the possession of a small, highly trained elite: "Most people are expert in sub-forms of art - think how knowledgeable many people are about movies or popular music - and most people plainly reach a medium level of competence in many of their culture's art forms. Moreover, so extensive is the active participation of amateurs in art-creative behaviors that many achieve executive low-level competence in their favored art form and can be counted as artists to that extent." (Davies, 2012, p. 54)

Naturally, modifying the concept of art discussed also affects the extent to which the proposed hypotheses correspond to their subject. A view of art that also includes practices such as, for example, domestic applications of decorative patterns on utility objects when considering visual art, invites questions concerning the nature of its makers, and thus the nature of the proposed explanations.[77] The aesthetic fitness indicator hypothesis, for instance, is heavily dependent on a particular conception of art, and the proposed strong bias towards males in artistic production should be revised in accordance with both western popular culture and ethnographic findings, such as the common presence of female artists, especially when 'art-behavioral competence' is said to include the most daily and worldly kinds of art.

As for music, it has been argued that the courtship hypothesis does not sufficiently explain the apparent fact that music was, and still is a typical group activity (Hagen & Bryant, 2003). Indeed, empirical evidence for the sexual selectionist explanation is scarce. Some authors suggest that rhythm might play a role in assessing mate quality, while others have found that hunter-gatherer females prefer lower pitched voices - correlated with higher testosterone levels - when seeking mates, and higher pitched voices - associated with less testosterone, and thus with paternal investment behaviour and resource provision - when infants are cared

[77] This objection has been raised from the evolutionary ethological perspective of both Dissanayake (1995) and Coe (2003), who, interestingly, both make extensive use of ethnographic data.

for (van den Broeck & Todd, 2009; Apicella & Feinberg, 2009).[78] A study investigating a possible female preference for musical complexity as indicative of male quality did find an overall liking for complex acoustic displays, but apparently not in relation to current states of fertility, opposing the sexual selectionist idea that a bias towards higher complexity might be present around ovulation (Charlton et al., 2012).

Clearer empirical evidence has been produced in favour of hypotheses that link the emergence of music to the importance of in- or between-group cooperation. For example, Hagen discusses music as a reliable signal of group cohesion and quality, relevant for the establishment of intergroup coalitions, while others have proposed causal effects of music for cooperation, prosociality and social bonding (Hagen & Bryant, 2003; Hagen & Hammerstein, 2009; Roederer, 1984). Group singing appears to increase both levels of trust and the tendency to cooperate, compared to passive listening or engaging in other kinds of art (Anshel & Kipper, 1988). A significant increase in prosocial behaviour and cooperation was also found among four-year-old children after joint singing and dancing, which led the authors to hypothesize that these activities help envision collective goals (Kirschner & Tomasello, 2010).

More comprehensive evidence seems to be available for hypotheses such as the proposal that fictional art might contribute to our cognitive development or the elaboration of social skills. Long term acting classes, compared to other kinds of arts training, have been shown to increase empathy scores in children and both empathy and theory of mind in adults (Goldstein & Winner, 2012). Children with more sophisticated pretend play and imaginative skills also perform better on theory of mind tasks, with general verbal intelligence controlled for (Taylor & Carlson, 1997). A study analyzing the different effects of reading narrative fiction and expository non-fiction - the main difference being that fictional stories depict the actual world with agents operating in it - found that reading fiction was positively correlated with social abilities and empathy, while a negative correlation was observed for non-fiction (Mar et al., 2006). A follow-up study clarified that individual differences in personality traits that might explain readers' attraction to fiction do not account for the enhanced social skills measure compared to non-fiction readers, suggesting that there might indeed be a formative effect of fiction (Mar et al., 2009). Applying fiction to visual representations, Scott and Baron-Cohen (1996) found that,

[78] The latter study does not immediately apply to music, so the evidence is circumstantial.

compared to matched controls, children with impaired theory of mind abilities due to autism were significantly less able to introduce unreal, imagined features into their drawings, or even to produce fictional images upon specific instruction.

Emotional and moral content in stories, put forward as a crucial feature of storytelling by authors such as Gottschall, has been the subject of a large-scale empirical study, testing reader's attitudes to various characters in a sample of Victorian novels. Among the findings were the attribution of clear agonistic structures when perceiving and classifying individual characters as protagonists, antagonists or associates of either one. Protagonists were generally judged as being of a cooperative nature, whereas antagonists were often rated to display dominance behaviour that threatened social stability. The authors regard novels as reservoirs of prosocial norms and conventions, the adoption and maintenance of which will eventually benefit all those engaging in storytelling (Carroll et al., 2012a, 2012b; Johnson et al., 2008).

While the abovementioned studies provide convincing support for the link between imaginative abilities and theory of mind, numerous questions still remain unanswered. Mar and colleagues broadly equate fiction with narrative that deals with social situations, and non-fiction with an expository style (Mar et al., 2009). This distinction fails to address non-fictional content that is also phrased in a narrative style, and contains socially relevant themes. Do the characteristics of fiction make these stories instrumental, or rather the features of narrative style? What are the cognitive implications of fictional narratives that do not contain socially relevant information?

The moral influence that supposedly radiates from stories is supported by a positive influence on empathy skills, as well as by the commonly addressed subject of group values and norms. However, this does not equate normative power. While religious stories are often taken as a clear example of this, additional enforcement mechanisms of religion, such as supernatural punishment, might be overlooked. This means that some, rather than all stories, can exert a normative influence. Still other questions arise when the concept of fiction is extended to include other kinds of art, such as visual art. Do the same laws of social elaboration apply when the medium of literary narrative is absent?

In addition to the specific issues concerning the abovementioned studies, a gap remains between the empirical support often found for various functions, and discussions of whether these functions were adaptive, and therefore crucial for these traits to evolve (Davies, 2012). According to Carroll, the hypothesis that fictional storytelling aids in the development of cognitive and social skills is the sole example of a primary adaptationist explanation, which refers to properties of stories that are uniquely suited to fulfill this proclaimed function. However, neither of the abovementioned studies provides empirical support that exceeds the ascribed function, lacking a foundation for the adaptationist claim itself. The possibility that the elaboration of social skills is achieved in other ways can therefore not be excluded, nor should the option be overlooked that our mechanisms for social learning might be the true adaptations, in which case storytelling would solely be a means towards this end. Additionally, the aforementioned studies rarely if ever address the question whether advanced cognitive and social skills such as empathy and theory of mind are not already necessary for storytelling to become possible in the first place (Davies, 2012). Yet this should not be a major pitfall of these studies, given that the authors concerned do not state that stories are responsible for the emergence of these capacities, but rather for their practice and further development.

One approach to the issue would be to elaborate empirical studies so as to incorporate the question whether the behaviour discussed enhances the differential reproductive success of those who practise it. Interestingly, the aforementioned study by Haselton and Miller takes steps in this direction. The possession of creative intelligence is a preferred trait in short-term mates over the ability for resource provision, which means that males possessing the former trait will achieve greater reproductive success. Not only do males receive fitness benefits, females choosing these males will increase their chances, through the assocation with good genes, of offspring survival (Haselton & Miller, 2005).

7.4.3. The nature of psychological mechanisms

Evolutionary psychologists tend to focus on our psychological make-up, which ties our brains and behaviour together (Cosmides & Tooby, 1987). Our evolved psychology is thought to be constructed of a range of modules or psychological mechanisms, but significant disagreement exists as to what is meant by this. Authors such as Tooby and Cosmides argue that the mind is to be regarded as a collection of special-purpose or domain-specific modules or mechanisms. These modules are supposed to have evolved in response to adaptive pressures, and together constitute human nature: '[...] the evolved, reliably developing, species-typical computational and neural architecture of the human mind and brain'. (Cosmides & Tooby, 2000a).

While Cosmides and Tooby maintain a strong focus on the internal organization of the mind, therein echoed by Pinker, Buss presents a broader concept of modules being context-specific predispositions and emotions (Cosmides & Tooby, 2000a; Pinker, 1997; Buss, 2008). According to him, the mind must possess hundreds or even thousands of mechanisms to solve problems ranging from survival and mating to parenting, kin investments, and social mapping. Miller has argued that we should consider art as a module in itself, and along with other human capacities such as language and music it supposedly makes up the set of adaptations or modules that together constitute human culture. Despite being interrelated, each of these modules can have a different evolutionary history, a different life history development, different contributions to human survival and reproductive success, as well as being built upon different psychological principles (Miller, 1999).

These various views have considerable implications for applying the evolutionary psychological focus on the level of cognition to the study of art. One possibility, endorsed by Miller, is that artistic behaviour is centered in one mechanism or module. Other views suggest that it would be more feasible to look for a number of different cognitive abilities that together enable artmaking and the aesthetic appreciation of its emerging results. For example, Pinker (1997) employs the mental toolbox metaphor to indicate that the mind contains numerous building blocks that can be variously assembled in order to obtain different behavioural outcomes. This argument is sometimes supported by referring to cognitive neuroscience, where an increasing amount of studies shows that mental features incorporated in artistic behaviour are scattered across the brain. Even the basics of visual art in itself, such as areas responsible for processing formal properties and content features, are widely distributed (Augustin et al., 2011; Jacobsen et al., 2006; Kawabata & Zeki, 2004; Kirk et al., 2009; Zeki, 1999).

Neuroimaging studies on different kinds of art also seem to suggest that they should not be regarded as psychological primitives in themselves, i.e. they are not reducible to a particular neurocognitive pattern that is activated across a wide range of tasks (De Smedt & De Cruz, 2010). Instead, art seems to make use of various other psychological primitives such as theory of mind, with those primitives being more basic building blocks of human cognition. Assuming current research does indeed point in the direction of several abilities being co-opted by art, this seems to support the idea that we are dealing with a byproduct, rather than an adaptation. Nevertheless, the question still remains which mental capacities or neural networks make for a cognitive blueprint of art. A limited number of attempts to elaborate on this have been made (Boyd, 2009; De Smedt & De Cruz, 2011a). The variety in these replies, ranging from symbol-mindedness and metarepresentational ability to different memory systems and an intuitive design stance, is indicative of the indistinctness surrounding psychological mechanisms or modules. Moreover, questions have been raised as to whether neuroimaging research can be used as support for the modular nature of cognitive abilities proposed by many evolutionary psychologists. Properties located in the mind do not necessarily correspond to well-defined areas in the brain, but even if this were so, it is unlikely that they would be static features, given the constant interaction between organisms and their environment (Davies, 2012).[79]

Aside from the amount of ongoing discussion about the nature of psychological mechanisms, criticism has been levelled against these mechanisms being the primary and sometimes only concern of evolutionary psychology. For example, in his analysis of music, Miller writes:

> "Adaptationist analysis does not worry very much about origins, precursors, or stages of evolutionary development; it worries much more about the current design features of a biological trait, its fitness costs and benefits, and its manifest biological function. This is good news for theories of music evolution. It is just not very important whether music evolved two hundred thousand years ago or two million years ago, or whether language evolved as a precursor to music. The adaptationist's job is to look at the adaptation as it is now, to document its features and distribution within and across species, and to test hypotheses concerning its biological function against this evidence." (Miller, 2000, p. 337)

Miller's statement that it doesn't matter very much when music evolved, eliminates a range of other relevant perspectives that might shed light on the origins of music, or art in general. Relevant archaeological findings often generate new ideas and hypotheses on, for example, the cognitive machinery that must have been necessary to make a particular artefact, while research into the relation between music and language might help identify the particular evolutionary pathways, relevant neural networks, and the eventual structural outcome of music (Mithen, 1996, 2005; Wynn, 2002).

Furthermore, Miller's approach only partially meets the four questions framework famously argued for by the ethologist Niko Tinbergen, developed with the aim of gaining a complete understanding of the nature and evolution of

[79] For a critical discussion of these and other subjects, see e.g. Bolhuis et al., 2011.

behavioural traits. In his view, behaviour is to be understood by means of four dimensions, clustered into two levels of explanation. The proximate level - the how-questions - includes the ontogenetic development of an individual (1), and the immediate mechanisms responsible for the manifestation of a trait (2), such as social and cultural influence. The ultimate level - the why-questions - involves both phylogenetic structures (3) - the relationships between various species - and adaptive explanations for why a trait originated, focusing on its function (4) (Tinbergen, 1963). Although Miller is right in stating that adaptationist explanations are mostly concerned with the fourth of these explanatory dimensions, disregarding the relevance of evolutionary precursors such as language in relation to music, or the timeframes during which various kinds of art developed, will fragment a full evolutionary understanding of art.

7.4.4. A one-directional perspective on culture

Evolutionary psychology tends to regard culture as an outcome of psychological evolution, although opinions differ as to which level of autonomy should be attributed to culture (Dunbar & Barrett, 2007). Culture in this sense is not understood to be limited to behaviours such as artmaking, but is often conceptualized in a broad anthropological sense as "information capable of affecting individuals' behavior that they acquire from other members of their species through teaching, imitation, and other forms of social transmission." (Richerson & Boyd, 2005, p. 5) If the basic, traditional premise of evolutionary psychology is taken into account - evolution produces an adapted mind with domain-specific psychological mechanisms neatly suited to solve specific environmental problems - this means culture must be subject to this process as well, and be the product of evolved, innate cognitive machinery. In line with this, Pinker has written:

> "A complex meme does not arise from the retention of copying errors. It arises because some person knuckles down, racks his brain, musters his ingenuity, and composes or writes or paints or invents something. Granted the fabricator is influenced by ideas in the air, and may polish draft after draft, but neither projection is like natural selection." (1997, p. 209)

In his view, something like a work of art does not arise because an artist has been through a process of ever new attempts at creating a painting or sculpture while retaining and further elaborating on the best ones, which would be the process predicted by cultural evolution parallel to natural selection on genes. Instead, Pinker states that improvements and changes originate from the mind's computational power to redirect inventions: 'the striking features of cultural products, namely their ingenuity, beauty, and truth (analogous to organisms's complex adaptive design), come from mental computations that 'direct' - that is, invent - the 'mutations,' and that 'acquire' - that is, understand - the 'characteristics'' (1997, p. 209).

As Richerson and Boyd argue, this reasoning assigns culture to the proximate level, as it is not thought to be an evolutionary driving force in itself. The perspective of gene-culture co-evolution, notably elaborated and developed by Richerson and Boyd (1985, 2005), attempts to modify this view by recognizing that culture can be an ultimate cause in itself: it can significantly alter the evolutionary path of individuals, and more importantly, social groups, as many cultural traits are located at group level. Proponents of this view propose that genes and culture develop throughout evolutionary history in a constant feedback loop. Evolutionary psychology has been criticized for failing to take into account the importance of culture as a solid, powerful and at least a partly autonomous feature in human evolution, and for not considering that cultural behaviours such as art might significantly influence their own evolutionary trajectory.

Richerson and Boyd have themselves explored the possibility that such a co-evolutionary process occurred during the evolution of art. They make use of the aforementioned process of runaway selection, except that this time the process involves cultural traits rather than phenotypic traits and corresponding preferences (Fisher, 1930). Culture is transmitted in various ways, notably through social learning, but also through transmission biases such as indirect bias (Boyd & Richerson, 1985). This means that successful individuals will be imitated more than others because those who imitate might draw fitness benefits from copying a relevant indicator trait that signals prestige or status. Boyd and Richerson provide the example of colourful versus plain clothes. An existing preference for colourful clothes, even though these might be less practical, will influence the prevalence of these clothes in a population, which in turn influences the frequency of people with this preference, as they will likely adopt the colourful clothing style. A model such as this one explores the possibility that art and aesthetic displays might have evolved as products of a co-evolutionary process, rather than as one-directional outcomes of psychological evolution.

Considering the potential of an active role for art in human evolution seems particularly relevant in the light of suggestions already made in this direction, such as Brian Boyd's proposal that recurrent engagement with art can significantly reconfigure our neural wiring and improve perceptual skills and social cognition, or the finding that neurocognitive structures can be altered through exposure to music and visual arts (Gaser & Schlaug, 2003; Kirk et al., 2009, see also Verpooten, 2013). Although ontogenetic changes in individuals should not be assumed to be heritable, cultural processes in themselves can spark large-scale changes, including at a genetic level. This suggests that culture merits to be taken out of the proximate realm in order to be integrated among the ultimate causes of art's evolution.

7.5. Concluding remarks

This paper reviewed present evolutionary psychological research into art, and provided critical remarks on its current state of progress. Within a broader movement of applying naturalist perspectives to humanities subjects, art - ranging from visual arts to storytelling and music - has been tackled by authors either working at the epicentre of evolutionary psychology, or in related fields such as literary Darwinism.

Among the issues explored here is a lack of empirical studies. Further research in this direction is needed to test existing hypotheses, as well as to address the problem that the current state of research does not provide an answer as to whether art is an adaptation. In order to provide support for an adaptive value, empirical studies should not only demonstrate a particular function for art, but also added survival or reproductive opportunities for an organism, which would indicate the value of art for differential reproductive success. The debate on any adaptive functions associated with art in turn should be deepened by considering categories such as secondary adaptation and exaptation, and other evolutionary processes such as cultural evolution.

Other issues are to be found at the level of evolutionary psychology's conceptual framework, such as the nature of psychological mechanisms. Although a focus on these mechanisms is one of the hallmark features of evolutionary psychology, significant differences of opinion exist as to their precise nature, which in turn complicates attempts to produce a comprehensive overview of the mechanisms at the basis of art. As for the relative role of culture in human evolution, several ideas in this direction are already being explored with regard to art, which underlines the importance of considering this possibility. It also suggests that evolutionary psychology in general might benefit from doing so as well.

Despite the criticism put forward here, evolutionary psychology has many merits. It has drawn attention to the evolved psychological foundations of human behaviour in general and art in particular, and has made clear that universal patterns underlie what seems to be boundless cultural variation. Nevertheless, only a thorough exploration of these and other methodological issues, as well as a full integration with other fields such as cognitive neuroscience, archaeology, and developmental psychology, will thoroughly reform our evolutionary thinking on art.

8

Adaptationist thinking on art: the search for a functional account of origins

8.1. Introduction[80]

Current research on the evolutionary origins of visual art consists of a number of different disciplinary approaches, various ascribed functions, and vivid debates on the question whether artmaking should at all be regarded as a functional behaviour. Alternative proposals include art as a byproduct and as an outcome of gene-culture co-evolution, but few authors converge on a most likely evolutionary account for art's origins. Even among those agreeing about art's presumed adaptive nature, significant disagreement arises when its precise adaptive function is at stake.

This paper looks at the argumentative structure of these adaptationist hypotheses, i.e. the soundness of the arguments put forward in favour of artmaking as an evolved functional trait in the light of general literature on adaptationism and how to substantiate adaptationist claims adequately. It discusses two major analytical issues in the evolutionary study of art, the importance of which is not always recognized in current hypotheses. These are the potential use of alternative categories to adaptation, such as exaptation, and the distinction between ultimate

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[80] Part of this chapter was previously presented at the International Society for Human Ethology (ISHE) 5th Summer Institute in Athens, in May 2015.

and proximate levels of explanation. These issues are framed within more general debates such as Gould's critique of panadaptationism, and the discussion of art as a replicable unit. The focus will be on the potential adaptive nature of visual artmaking, but elements will be drawn from discussions of adaptivity of various other subjects such as narrative, music and religion, where they prove to be insightful for the present discussion. The chapter concludes with a brief discussion of several methodological matters any adaptationist account of art should take into consideration.

8.2. What is an adaptation?

Before outlining the main adaptationist hypotheses of art's evolution, this chapter commences with a brief, general view of the concept of an adaptation. 'Adaptation' can refer to both an evolutionary process where a trait is refined over multiple generations in order to achieve an optimal solution to a particular problem presented by the environment of an organism, as well as to the outcome of such a process (Andrews et al., 2002), in which case it can be defined as "an inherited and reliably developing characteristic that came into existence as a feature of a species through natural selection because it helped to directly or indirectly facilitate reproduction during the period of its evolution." (Buss et al., 1998, p. 535; Williams, 1966) An adaptation - following the second part of the above definition - is traditionally seen as the outcome of a process of natural selection, but can also be linked to sexual selection. Depending on whether sexual selection in itself is regarded as a particular kind of natural selection, or rather as a process parallel to the latter, a trait can be said to be adapted specifically through a process of sexual selection because it increased the reproductive success of the organism concerned through things like advertising its apparent mate quality (e.g. Miller, 2001a). Adaptations are typically said to have a genetic basis, as they would not be able to be transmitted into future generations if they were beneficial but merely acquired characteristics.[81] An adaptation primarily originates from a mutation that takes

[81] Alternatively, an adaptation can result from cultural evolution. A process of cultural adaptation with its corresponding adaptive output can then be seen as the selective retainment of cultural traits that create a better fit between the environment and the organism possessing such traits (Boyd, 2007; Boyd & Richerson, 1985; Richerson & Boyd, 2005). Adaptationist accounts of art tend to explore the arts in general, or different kinds of art in particular, as adaptations evolved through natural or sexual selection. Processes of cultural inheritance are further discussed in the following chapter.

place at the genetic level, and that becomes caught in a selective process because it offers a relative advantage to the organism involved, in comparison with other organisms in the same population that do not possess the variant of a trait that is - often only slightly - better suited to fit a particular environmental problem. This means that an adaptation does not necessarily make an organism perfectly fit for the corresponding environmental problem - many adaptations show suboptimal design - but it does put this organism in an advantageous position relative to conspecifics who do not possess the trait in question, or a beneficial variant of it.

8.3. Adaptationist hypotheses of art and their argumentative structure

8.3.1. Adaptationist hypotheses of art

Several authors on the evolution of art converge on its presumed adaptivity, while differing in opinion concerning its particular function. The current section looks at four main adaptationist hypotheses of art, which are the artification hypothesis (Dissanayake, 1988, 1995, 2000, 2008, 2009), the ancestress hypothesis (Aiken & Coe, 2004; Coe, 1992, 2003, 2010), the aesthetic fitness indicator hypothesis (Miller, 1999, 2000, 2001a, 2001b) and the simulation hypothesis (Boyd, 2009; Carroll, 2005; Tooby & Cosmides, 2001). Each hypothesis is briefly outlined before the relevant authors' main arguments in favour of art as an adaptation are mentioned. Critically assessing these arguments is necessary for an important reason. Even if empirical support was provided in favour of a particular function, this would not consequentially demonstrate that this function was adaptive, i.e. that it was the driving force in art's evolution. Theoretical considerations, such as evidentiary standards, might partly mediate this issue.

The artification hypothesis (Dissanayake, 1988, 1995, 2000, 2008, 2009) involves an ethological assessment of the universal human propensity for artifying ordinary reality, a practice often referred to as 'making special' (e.g. 1995). Such artification may variously consist of applying visual motives to objects and human bodies, adding elements such as rhythm and melody to ordinary speech in order to turn it into song, and introducing narrative patterns and rhyme into factual, verbal accounts of events, turning them into storytelling of an often elaborate nature. It regards artmaking as an evolved behavioural propensity that has its roots in practices such as ritual and play, and in socio-emotional patterns such as mother-infant interaction. The arts share with ritual and play elements such as make-believe and metaphor, and have ritualized, communicative and emotional effects in common with motherese, the specific communicative system used by mothers to address infants. Coe (Aiken & Coe, 2004; Coe, 1992, 2003) equally adopts an ethological, cultural anthropologically-inspired framework when proposing that visual art is closely intertwined with maternal lines of descent. Art, broadly defined as the application of colour, form and pattern to objects or bodies, aids in identifying conspecifics who are codescendants, i.e. who are offspring of the same maternal ancestor. This ancestor may be in a distant past, or may even be metaphorical, such as in the case of an ancestor conceptualized within a religious framework of myths of origin. Art's ultimate function is to identify relatedness with conspecifics and to establish cooperative bonds, sometimes through the specific presence in art of messages that indicate desirable prosocial behaviour.

In addition to the ethological perspective, art has been described as an adaptation from an evolutionary psychological point of view. The aesthetic fitness indicator hypothesis (Miller, 1999, 2000, 2001a, 2001b) proposes that artmaking evolved through sexual selection as a signaling trait of males, advertising their mate quality to females by means of the creation of high-cost aesthetic displays. Because making such displays requires a lot of skill and resources, those males who engage in artmaking are hypothesized to be in possession of various fitness indicators, and to gain a significant advantage over other males in terms of attracting and sustaining female attention and eventually achieving female choice in their favour, perpetuating their genetic material into future generations. The aesthetic fitness indicator hypothesis has received empirical support from larger-scale analyses of cultural production and demographic patterns (Miller 1999), as well as from more specific empirical set-ups (Clegg et al., 2011; Haselton & Miller, 2006). Finally, evolutionary psychology has also produced a simulation perspective on the evolution of art. The simulation hypothesis can be regarded as an overarching term for a variety of evolutionary perspectives on art, mostly focussed on fictional storytelling, that propose that we evolved this and similar behaviours because they provide us with a functional means to develop our cognitive make-up and social cognition abilities. This in turn allows for aiding our daily interactions with others, and for several advanced cognitive processes such as mental time travel, anticipating future events, weighing different alternative actions, and so forth. Among the authors who have endorsed such views with regard to the emergence of storytelling are Gottschall (2012), Carroll (1995, 2004, 2005, 2011) and Boyd (2009), while Boyd and Carroll, in addition to Tooby and Cosmides (2001) have also developed insights that look at the arts more generally. The latter describe fictional art as an operational practice that will help, by means of the capacity for decoupling external and imagined representations, to gain insight into the minds of others. The imagined worlds of fiction also aid in envisaging alternative scenarios and options for future action, increasing one's own behavioural and mental catalogue. Boyd (2009, p. 15) has stated that the arts are to be understood as a type of "cognitive play with pattern." The arts in general, and fiction in particular, provide a training ground where the human mind can acquire and develop perceptual, cognitive and expressive skills, such as vision, movement, and social cognition. Carroll (2005), finally, endorses a similar perspective in arguing that the arts provide an emotionally saturated set of models for determining appropriate behaviour and for learning to assess the behaviour of others.

8.3.2. Adaptationist arguments for art

While some authors suggest that art, including but not limited to visual art, is a byproduct of other evolved behavioural and cognitive abilities (e.g. Pinker, 1997; Verpooten & Nelissen, 2010, 2012), the above described hypotheses all regard art as an adaptation. While some of these functions have been empirically tested and at least partially supported (e.g. Griskevicius et al., 2006; Haselton & Miller, 2006), the argumentation to support the assertation that these functions are indeed adaptive, is limited. Most hypotheses support the adaptationist claim by reference to properties of artistic behaviour that are also thought to be characteristic of behavioural or cognitive adaptations in general. As examples of such properties of the arts, Dissanayake (2008, p. 243) writes that "[t]hey are observable cross-culturally in all members of all known societies regardless of their degree of economic or technological development. Their traces are evident in our ancestral past, as we find from at least 100.000 years ago with the use of red ochre (...) and subsequent material artefacts." In addition, the arts also contain important psychological components that may be indicative of an adaptive nature: "[t]heir rudiments are detectable and easily fostered in the behavior of young children (...). They are generally attractants and sources of pleasure, like other adaptive behaviors such as mating, parenting, resting, or being with familiars in warm and safe surroundings." (2008, p. 243-244) Finally, certain contextual elements may point in the same direction: "[t]hey occur under appropriate and adaptive conditions or circumstances - that is, they are typically "about" important life concerns, as in ceremonies that mark stages of life or that concern prosperity, safety, and subsistence. They are costly: large amounts of time, physical and psychological effort, thought, and material resources are devoted to the arts as to other biologically-important activities." (2008, p. 244) Similar arguments can be found in Miller's aesthetic fitness indicator account of visual art. He describes its worldwide and transhistorical ubiquity, associated pleasurable experiences, the vast amounts of time and energy costs that are often involved, the effort and skill required from practitioners of the arts, the overall human predisposition to do so, and the apparent fact that artmaking involves easily learnt skills, and to some extent spontaneous emergence (2001b).[82]

Yet others, such as Boyd, adopt a similar outlook. With regard to fiction in particular, he argues that it is a cognitive adaptation because of its ability to produce rich conceptual output from limited perceptual input, our inability to suppress our emotional responses to plots and characters, and the apparent presence of specialized cognition, which becomes evident from those instances where such mechanisms are impaired (2009, p. 189-190). Carroll (2005), targeting both the arts in general and narrative in particular, similarly writes that the adaptive nature of each is asserted by their universality, the costliness of materials and effort involved, the complex cognitive processes at their basis, and the apparent fact that they are closely linked to personal development and cultural identification. Yet another instance of the same outlook on art's presumed adaptive nature can be found with Tooby and Cosmides, who note that

> "Involvement in fictional, imagined worlds appears to be a cross-culturally universal, species-typical phenomenon. (...) Second, involvement in the imaginative arts appears to be an intrinsically rewarding activity, without apparent utilitarian payoff. (...) Third, although fiction seems to be processed as surrogate experience, some psychological subsystems reliably react to it as if it were real, while others reliably do not. In particular, fictional worlds engage emotion systems while disengaging others. (...) Fourth, it appears as if humans have evolved specialized cognitive machinery that allows us to enter and participate in imagined worlds." (Tooby & Cosmides, 2001, p. 7-9)

The fact that humans possess the ability for decoupling true and imagined representations, safeguarding the former for corruption, is particularly suggestive of

[82] Criteria for sexually selected adaptations, such art in Miller's hypothesis, do not necessarily fit completely with criteria for more general adaptations (see, e.g., Miller, 2000b).

an adaptive explanation. The presence of such a mechanism in our standard cognitive repertoire appears to imply that there was a beneficial effect associated with engaging in fiction (Tooby & Cosmides, 2001). Coe, finally, equally thinks that art's presumed adaptive nature can be demonstrated by referring to its main properties: "[a]s art is a universal and ancient cultural behavior, which has persisted despite costs that can be quite high, it quite possibly is an adaptation that, at least in the past, must have been important to humans." (1992, p. 217-218)

8.3.3. The arguments assessed

In sum, the most common method in current adaptationist hypotheses of art's evolution consists of pointing out a number of features thought to be properties of art, while at the same time being indicative of the adaptive nature of any trait under consideration, such as its universality, costliness, and spontaneous ontogenetic development. Employing several of these features as demonstrating art's adaptive nature can be debated, not because they are erroneously attributed to art - few will question that art, especially during ancestral times, would have been accompanied by significant costs to its maker, or that it appears to be a stable, universal component of human nature - but because such features do not automatically translate into its interpretation as an adaptation.

One of the most outspoken arguments in favour of art's adaptive nature is its universality. As was addressed in the beginning of this dissertation, art's universal occurrence, though often expressed as part of a wide range of culturally variable utterances and circumstances, is thought to reflect roots in an evolved human nature which can in turn be interpreted from a biological point of view. This way, universality can indeed be suggestive of adaptivity. Yet a trait can be adaptive without being universal, such as in the case of negative frequency dependent selection, where fitness increase derived from this trait depends on its *not* being a property of all individuals in a population. Conversely, a trait can be universal, but not adaptive. This occurs, for example, when a particular behavioural outcome is a byproduct of one or more adaptive features of human cognition and behaviour. If such features were indeed both adaptive and universal, it is possible that a byproduct reliably results from this in different times and spaces. This has been advocated by Verpooten and Nelissen (2010, 2012) with regard to aesthetic elaborations of the surrounding environment, including the emergence of figurative art, as cultural byproducts of certain adaptive types of sensory biases. Additionally, cultural practices such as reading and writing become more and more universal as literacy rates increase around the world, but they should therefore not be regarded as adaptations since they were not selected, but are based on presumably adaptive characteristics of our ancestors such as language ability (Verpooten, 2013). In sum, universal occurrence can be an indication of the adaptive nature of the trait concerned (Davies, 2012; Donald, 2006), but should parsimoniously be regarded as suggestive of being closely linked to evolved properties of human nature. The same goes for species-specificness: not all behaviours that are unique to a species are therefore adaptations of this species. Humans possess a vast array of unique behaviours, cultural practices, and anatomical characteristics that are not the outcome of a process of natural selection for functional benefits.

Adaptationist proposals for art's evolution have also been supported by referring to the involvement of complex cognitive processes. Yet these too, while they may be adaptive in themselves, can be co-opted in non-functional ways for a variety of, what Pinker would call, "Sunday afternoon projects." (1997, p. 524) Byproduct theorists such as Pinker and others would then argue that the arts are such an instance where complex cognition undeniably plays an important role, but where the behavioural outcome was not selected for a fitness-enhancing function (Pinker, 1997, 2006, 2007; Verpooten, 2013; Verpooten & Nelissen, 2010, 2012). Pleasurable experience is another feature commonly invoked in support of adaptationist explanations, as it could be indicative of the role of psychological adaptations (Miller, 2001b). But there is no a priori reason why adaptations would elicit pleasure, and byproducts would not. Pinker has compellingly argued that visual arts and music are practised around the world because they push our "pleasure buttons," i.e. they activate neural reward circuits that evolved and are engaged in other, functional behaviours or cognitive processes, without having beneficial, functional effects in themselves (1997, 525).

The spontaneous emergence of art-like practices among young children, and the apparent ease observed when members of cultures not familiar with figurative representations of humans can recognize produce these (Deregowski et al., 1972; Martlew & Connolly, 1996), has also been taken as proof that a process of adaptation was involved. In the case of fictional storytelling, proponents of the simulation hypothesis have argued that the expected emergence of pretend play and theory of mind among children between three and four years is closely linked to the later practice of fiction as an adaptive behaviour (e.g. Boyd, 2009). However, increasing evidence points towards the role of teaching and social learning in the development of these traits, which might mean that their emergence is a lot less spontaneous than often assumed, and perhaps does not immediatly reflect virtually automatic processes of ontogenetic cognitive development (Rakoczy et al., 2005; Striano et al., 2001; Verpooten, 2013).

Among the characteristics mentioned here and in the adaptationist hypotheses of art, the property of costliness appears to be the clearest indicator that a process of adaptation through natural or sexual selection might have been involved. Based on theories such as Zahavi's handicap principle (Zahavi, 1975; Zahavi & Zahavi, 1997), large costs involved in a behavioural trait such as artmaking can be hypothesized to be compensated by significantly bigger benefits. Miller's sexual selectionist account of art's evolution provides such a perspective: despite considerable investments of time, vital energy and resources in artmaking, usually characteristic of males (Miller, 1999), this behaviour nonetheless persists, perhaps precisely because its large costs signal mate quality and thus brings about reproductive benefits for those engaging in it. The costs that are clearly involved in artmaking suggest that it may be a fitness indicator, in turn indicative of adaptation.

There are multiple issues with the approach of matching characteristics of art with theoretical properties of adaptations. The burden of evidence for substantiating an adaptationist explanation is placed with the trait itself, in this case art. This is at odds with the recommended use of evidentiary standards in evolutionary biology, which will be discussed below. Because such standards are left aside in favour of theoretical criteria for adaptations, this approach does not allow for excluding other explanatory categories for evolved traits, which too, will be treated more at length in the following sections. This means that even if features such as universality and species-specificness were clear indications of adaptations, as well as obvious properties of art, it would still not be possible to exclude the option that art belonged in a different explanatory category, such as byproducts and exaptations (Verpooten, 2013). Importantly, this approach also appears to assume a singular view of art, where features such as universality, costliness and reliable development can be clearly assessed. This assumes that 'art' can be regarded as a neatly discernable trait, which is at odds with its vast complexity and cultural variability. These points, and as a consequence the validity of this adaptationist argument, therefore cannot be assessed properly without taking a closer look at how to identify art as a replicable unit, i.e. how to conceptualize art in such a way that it can become subject to evolutionary analysis invoking the principles of natural or sexual selection. This, however, first requires a more general perspective on the nature of traits, and the categories that have been, and according to some, should be invoked to account for their existence. In sum, the present, and only available approach for analyzing art as an adaptation, should parsimoniously be regarded as an indication of art's roots in human nature, and its connections with evolved psychology (e.g. Boyd, 2009). Whether the practice of artmaking is in itself an adaptation, must remain a question mark for now.

8.4. On adaptations, traits and replicable units

8.4.1. Debating adaptationism

The concept of an adaptation was described above as an inherited trait that usually evolved through natural or sexual selection in response to a specific environmental problem, and that carries benefits in terms of differential reproductive success for the organism possessing the trait. This view refers to the standard account of adaptation used in Darwinian evolutionary biology, and does not take into account the variety of other ways in which the same concept can be, and has been used (Gould & Lewontin, 1979; Gould & Vrba, 1982). In a general sense, outside of evolutionary biology, the term adaptation refers to design aimed at a particular task the feature concerned should perform:

> "(...) the word adaptation has several meanings all consistent with the etymology of *ad + aptus*, or towards a fit (for a particular role). When we adapt a tool for a new role, we change its design consciously so that it will work well in its appointed task. When creationists before Darwin spoke of adaptation - for the term long precedes evolutionary thought - they referred to God's intelligent action in designing organisms *for* definite roles. When physiologists claim that larger lungs of Andean mountain peoples are adapted to local climates, they specify directed change for better function. In short, all these meanings refer to historical processes of change or creation for definite functions. The "adaptation" is designed specifically for the task it performs." (Gould & Vrba, 1982, p. 4)

Within evolutionary biology, the matter becomes more complex. As was already mentioned before, adaptation can be used as a term both for a process of phenotypic modification through natural selection, and for the outcome of this process, i.e. a functional trait or characteristic of an organism (Andrews et al., 2002). If the focus is on the outcome, as it tends to be when evolutionary biologists attempt to account for the features of an organism through reference to selective processes, two differential views present themselves. The classic account of Williams (1966) describes an adaptation solely as a trait designed by natural selection for a functional effect. Alternatively, an adaptation has been seen as any feature of an organism that enhances the organism's current fitness, regardless of whether the feature evolved through natural selection for this fitness-enhancing effect (Bock & von Wahlert, 1965; Bock, 1979, 1980). The crucial difference, then, lies in whether an observed trait, in each case resulting in a fitness increase, was specifically selected for this purpose. Adaptation, according to Williams, "is often recognized in purely fortuitous effects, and natural selection is invoked to resolve problems that do not exist." (1966, p. 4) In order to avoid this, we should adhere to a "ground rule," which is that "adaptation is a special and onerous concept that should be used only where it is really necessary. When it must be recognized, it should be attributed to no higher a level of organization than is demanded by the evidence." (1966, p. 4-5)

The cautionary remarks of Williams have not always been acknowledged, and the use of the concept of adaptation is prevalent in evolutionary biology and related disciplines such as evolutionary psychology, to the extent that some have wondered whether it is perhaps overused. In a famous critique of what they refer to as an adaptationist programme, Gould and Lewontin (1979) formulated several remarks with regard to the use of adaptation, and provided a potential alternative conceptual framework (Gould & Lewontin, 1979; Gould & Vrba, 1982). The adaptationist programme, they argue, is a line of thinking characteristic of Anglo-American evolutionary biology, and involves a combination of atomization of organisms into neatly separable traits, in combination with a strong belief in optimal outcomes of natural selection - both of which they deem to be untenable. Since Gould's critique, it has been repeatedly pointed out that adaptationism does not so much consist of an attempt to describe all evolved traits as adaptations, but that it is rather a research method aimed at distinguishing selected traits from those that are incidental or co-opted outcomes (e.g. Thornhill, 2007). The critiques, however, stuck, and they do address recurring issues that prove to be relevant for studying art.

Atomizing organisms in traits occurs when organisms are analytically structured as a combination of many different, neatly discernable elements which in themselves can become subject to evolutionary analysis. According to Gould and Lewontin, regarding organisms as collections of discrete characteristics brings along the risk of overexplanation. Spandrel-type features, which do not have a function in themselves but tend to accompany adaptive traits that are the outcome of evolutionary processes of selection, may appear observable as separate units, but should not be explained as such. The spandrel metaphor is drawn from architecture, where round arches that meet at a right angle and are covered by a dome inevitably produce a tapering triangular surface, referred to as a spandrel. While this surface in itself can be secondarily used for decorative purposes, it is non-functional in itself and is a necessary outcome of functional, structural properties such as the arches and the dome.

Fig. 86. Decorated spandrels in the Basilica San Marco, Venice. The architectural combination of adjoining arches covered by a dome creates tapering triangular spaces, which have been co-opted for decorative purposes.

Aside from the excessive categorization of observed characteristics as adaptations, Gould and Lewontin (1979) argue that natural selection is often regarded as a process towards optimal design: "This [adaptationist] programme regards natural selection as so powerful and the constraints upon it so few that direct production of adaptation through its operation becomes the primary cause of nearly all organic form, function, and behaviour." (1979, p. 584-585). Constraints are recognized to a limited extent, but are usually incorporated in the idea op overall optimal design of an organism: "interaction is acknowledged via the dictum that an organism cannot optimize each part without imposing expenses on others. The notion of 'trade-off' is introduced, and organisms are interpreted as best compromises among competing demands." (1979, p. 585) This does not mean that all features of an organism are necessarily optimally evolved and structured, but "suboptimality of a part is explained as its contribution to the best possible design for the whole."[83] (1979, p. 585)

According to Gould and Lewontin (1979) and discussed again later (Gould & Vrba, 1982; Gould, 1997), evolutionary biology is in need of an extension of conceptual categories for clarifying evolved traits. Rather than atomization of organisms into traits, this alternative perspective proposes to look at organisms as integrated wholes, where different features are very often heavily dependent upon one another. In this view, an organism follows a *Bauplan*: "the basic body plans of organisms are so integrated and so replete with constraints upon adaptation (...) that conventional styles of selective arguments can explain little of interest about them." While natural selection can, and does operate in an adaptive manner, "constraints restrict possible paths and modes of change so strongly that the constraints themselves become much the most interesting aspect of evolution." (1979, p. 594) Evolutionary constraints generally refer to the circumstances where already existing features pose significant limitations on the course of evolution that natural selection for beneficial effects might otherwise take. In the case of art, the presumed presence of constraints may be an indication that it is unlikely that additional selection occurred for beneficial effects produced by art. In the case of storytelling, for example, a range of functional, thought to be adaptive behaviours are clearly involved, such as agent detection and tracking, and mental time travel. Because we can expect strong selection pressures to operate on these abilities for their own functional purpose, it becomes less likely that natural selection can additionally modify them to a significant extent, for any new function associated with storytelling. According to Verpooten (2013), this suggests that storytelling and related practices are therefore probably not adaptive. Constraints, however, can indeed be present for, in this case, functional cognitive abilities, but this does not mean that selection could not operate on them. If storytelling did carry benefits in terms of differential reproductive success, i.e. if it had the potential to develop as an adaptation, it could still co-opt these abilities without imposing negative selective pressures on them. If any evolutionary change was made to these abilities, it would most likely be in an increasing way, which, theoretically, could only enhance the functional value of capacities such as mental time travel and agent detecting and tracking, or the understanding of conspecifics' actions and intentions. As such,

[83] The term "Panglossian paradigm" is mostly based on the idea that natural selection strives to optimality. It is drawn from the Dr. Pangloss character in Candide's Voltaire, who thought of all observable features as being the best possible components of the best of all possible worlds.

constraints, even if present, do not necessarily contradict an adaptationist explanation.

Gould's perhaps most well-known contribution to evolutionary biology is the introduction of the concept of exaptation. The distinction between both can be traced to Williams (1966), who pointed out that 'adaptation' is not to be applied unless the reported beneficial effect has been produced by natural selection. Gould's critique of panadaptationism addresses just this: perhaps evolutionary biologists too readily speak of adaptation, when a fortuitous effect is merely the outcome of the co-optation of existing traits, functional or non-functional. The term exaptation is advisable in instances where traits "are fit for their current role, hence *aptus,* but they were not designed for it, and are therefore not *ad aptus*, or pushed towards fitness. They owe their fitness to features present for other reasons, and are therefore *fit* (*aptus*) *by reason of (ex)* their form, or *ex aptus*." (Gould & Vrba, 1982, p. 6) He proposes to use the term "aptation" to refer to "[t]he general, static phenomenon of being fit" (Gould & Vrba, 1982, p. 6) Adaptation and exaptation are then related as follows:

TABLE 1. A taxonomy of fitness.

Process	Character		Usage
Natural selection shapes the character for a current use—adaptation	adaptation		function
A character, previously shaped by natural selection for a particular function (an adaptation), is coopted for a new use—cooptation	exaptation	aptation	effect
A character whose origin cannot be ascribed to the direct action of natural selection (a nonaptation), is coopted for a current use—cooptation			

Fig. 87. "A taxonomy of fitness", distinguishing adaptation and exaptation as co-opted adaptation or co-opted byproduct. "Aptation" refers to the "general, static phenomenon of being fit", and is preferred over adaptation in order not to use a broad definition of "adaptation."

One way to gain clarity concerning the concepts of adaptations and exaptations can consist of establishing a comparative framework with other explanatory categories for evolved traits, such as byproducts and secondary adaptations. Yet those concepts have in turn not always been clearly identified and described unambiguously, often leading to persistent disagreement as to where the boundaries between the different categories lie. This in turn ignites debates such as the abovementioned one concerning panadaptationism. If concepts such as 'adaptation' are defined inadequately or too general, it not only becomes a risk that this category is unjustly applied to a particular trait - a main worry of those advocating caution in attributing adaptationist labels - it can also result in mixing up categories such as 'adaptation' with similar, yet structurally different ones such as 'exaptation' and 'secondary adaptation'. Buss et al. (1998) provide the following overview of explanatory categories.

Table 2
Conceptual and Evidentiary Criteria for Evaluating the Core Concepts of Adaptations, Exaptations, Spandrels, and Functionless By-products

Differentiation criteria	Adaptation	Exaptation: Co-opted adaptation	Co-opted spandrel	Functionless by-product
Origin and maintenance	History of selection	Selection operating on previous adaptation	Selection operating on previous by-product	History of selection for mechanism that produced by-product
Role of fitness	Correlated with fitness in past during period of its evolution	Currently correlated with fitness	Currently correlated with fitness	Not directly related to fitness
Critical features	Solved adaptive problem in past	Has new function	Has new function	No previous or current function

Note. *Exaptations* and *spandrels* are used here according to Gould's (1991) primary meanings, that is, as features co-opted for new current functions; *functionless by-product* is the term used for Gould's other and less common usages of exaptations and spandrels, that is, as incidental, nonfunctional consequences of other characteristics. In the evolutionary literature, these are usually called "by-products." In Gould's usage, "currently enhances fitness" presumably refers to the period of evolutionary time during which selection transformed a previous adaptation or by-product into a new function. Note also that Gould sometimes used the term *exaptation* to cover both co-opted adaptations and co-opted spandrels; we treat these separately.

Fig. 88. Conceptual and evidentiary criteria for evaluating the core concepts of adaptations, exaptations, spandrels, and functionless byproducts.

Here, an *adaptation* is defined as a trait with a history of selection in response to an adaptive, environmental problem, because it had fitness enhancing outcomes for those who possessed the trait during the period of its evolution. It is distinguished from an *exaptation*, understood to be a trait resulting from additional selection on a previous adaptation, that currently has a fitness increasing effect and a newly acquired function different from the one associated with the pre-existing adaptation. As such, Buss et al. (1998) argue, an exaptation can also be termed a *co-opted adaptation*. It differs from a *co-opted spandrel* in its origin: the latter is the outcome of selection on a pre-existing byproduct, but otherwise shares the same characteristics. Finally, the authors list a *functionless byproduct* as a trait springing from one or more adaptations that were selected for in themselves, but not leading to a fitness increase for an organism involved, nor containing a particular function.

This overview has been criticized by Andrews et al. (2002), who specifically objected to the assumption made that an exaptation also undergoes selection, and thus phenotypic modification, for its new effect, in the same way as an adaptation does for its primary effect. As opposed to this, they argue that "if a trait undergoes a process of structural modification to facilitate a new beneficial effect, it has undergone a process of adaptation and the resultant structural changes are referred to as adaptations." (2002, p. 491) In this regard, it appears relevant to follow Gould and Vrba (1982) in conceptually taking into account the added specification that an exaptation is a *primary* trait, i.e. it acquires its new effect *before* any additional selection takes place. Such additional selection is evidently possible, but will result in a *secondary adaptation* rather than an exaptation, i.e. it is referred to as secondary because of preceding stages of primary adaptation and primary exaptation in the trait's evolutionary history.

Adding the category of secondary adaptation is also useful for addressing critiques that have been expressed towards the concept of an exaptation as being not significantly different from an adaptation as both are built upon previously existing structures, and therefore not conceptually necessary. Dennett, for example, writes that "according to orthodox Darwinism, every adaptation is one sort of exaptation or the other - this is trivial, since no function is eternal; if you go back far enough, you will find that every adaptation has developed out of predecessor structures each of which either had some other use or no use at all." (1995, p. 281). In response to this, and arguing for the maintenance of the two categories, Buss et al. (1998) write that "granted, the distinction may end up being more a matter of degree than an absolute distinction because exaptations themselves often involve further adaptations (...) The concepts differ, however, in that adaptations are characteristics that spread through the population because they were selected for some functional effect, whereas exaptations are structures that already exist in the population and continue to exist, albeit sometimes in modified form, for functional reasons different from the ones for which they were originally selected." (p. 542) Neither of these two cases fully acknowledges the distinction endorsed by Andrews et al. (2002), where an exaptation does not involve phenotypic modification through selection for a new function, whereas an adaptation does. In order to acknowledge this, it might be fruitful to adopt a different terminology, following Williams:

> "Whenever I believe that an effect is produced as the function of an adaptation perfected by natural selection to serve that function, I will use terms appropriate to human artifice and conscious design. The designation of something as the *means* or *mechanism* for a certain *goal* or *function* or *purpose* will imply that the machinery involved was fashioned by selection for the goal attributed to it. When I do not believe that such a relationship exists, I will avoid such terms and use words appropriate to fortuitous relationships such as *cause* and *effect*." (1966, p. 9, original italics)

Taking into account these considerations, a more complete table looks as follows:

Differentiation criteria	**Adaptation**	**Byproduct (spandrel)**	**Exaptation 1: co-opted adaptation**	**Exaptation 2: co-opted byproduct**	**Secondary adaptation**
Origin and maintenance	History of selection for a functional effect	History of selection on adaptive trait(s) that yielded the byproduct	No additional selection on a (primary) adaptation[84]	No additional selection on a byproduct	History of selection for a functional effect on an exaptation
Role of fitness	Correlated with fitness during the period of the trait's evolution, but not necessarily at the present moment[85]	Not previously or currently correlated with fitness	Currently correlated with fitness[86]	Currently correlated with fitness	Correlated with fitness during the period of the trait's evolution
Critical features	Solved an adaptive problem present during the period of the trait's evolution: has a functional effect	No previous or current function	Acquires a new beneficial effect, but no function, as the effect did not contribute to the trait's evolution	Acquires a new beneficial effect, but no function, as the effect did not contribute to the trait's evolution	Solved an adaptive problem present during the period of the trait's evolution: has a functional effect

Fig. 89. Categorization of evolved traits.

Evidently, it is often difficult to ascertain in which category an observed trait belongs, even if the choice would merely be between adaptation and exaptation.

[84] The same process could theoretically take place with a secondary adaptation as the point of departure.
85 An adaptation that originally conferred fitness benefits upon an organism, but that lost its functional effect afterwards, can also be referred to as an evolutionary vestige.
[86] The proposition that an exaptation is currently correlated with fitness may sound confusing as it appears to suggest that the trait that is categorized as an exaptation must still carry its beneficial effect at the present moment. This is however not necessary: a trait under consideration can be regarded as an exaptation if it is the outcome of a process of co-opting, even though the effect may have faded since then (Buss et al., 1998).

Complex features of an organism may not even be suitable for only one category. Structural complexity of a trait tends to reflect similar complexity in its evolutionary emergence, and such features may be, according to Gould and Vrba (1982) combinations of exaptations and primary and secondary adaptations. This is particularly relevant when considering Gould and Lewontin's earlier remark that atomization into discernable traits with neat adaptationist explanations is unadvisable in order to understand the overall unity of an organism. One such a complex feature of the human organism is art, raising the obvious question how, if at all, this could be approached as a replicable unit subject to evolutionary processes.

8.4.2. Art as a replicable unit

An important reason for why it appears very difficult to ascertain whether artmaking is or is not an adaptive behaviour, is the unclear nature of the subject of analysis. While art in itself is notoriously difficult to define, different authors often endorse diverging views of what precisely is being explained in an evolutionary manner. While Dissanayake, for example, describes art explicitely as a behaviour, rather than its product (e.g. 1980, 1995, 2008), evolutionary psychologists such as Miller are inclined to regard it as a psychological feature where the unit of analysis may be a distinct module, or a combination of several of such cognitive elements (Miller, 1999, 2001a, 2001b). Yet the importance of achieving a well delineated concept of art can hardly be underestimated (Coe, 1992). Without such a view of art as a replicable unit, adaptationist hypotheses are hard to substantiate as they require the identification of a particular trait to be explained by means of an adaptationist process, and to be linked to fitness increase and differential reproductive success for those possessing the trait. At the same time, keeping in mind Gould's critique of unjustly atomizing organisms in traits (Gould & Lewontin, 1979), one should tread carefully in order not to make artificial distinctions between presumably separate traits, with accordingly mistaken adaptationist explanations as a consequence.

In the chapter on defining art in evolutionary research, a trait was cited as being "any aspect of the phenotype that can be discriminated on the basis of any criterion - its causes, its effects, its appearance, and so on - and would include dispositional traits (e.g., the disposition to develop callouses with friction)." Adaptive traits are then a subclass of traits with the added specification that such a trait must have a functional effect that was produced by natural or sexual selection. When developing an adaptationist hypothesis about a morphological trait, fitting the explanation to the subject is facilitated by the close biological correlate found in, for example, the palaeoanthropological record. Behaviour and cognition, on the other hand, prove to be a lot more difficult in establishing the trait identification process preceding the development of an adaptationist expanation. According to Andrews et al. (2002, p. 490), "[t]hey are not traits in and of themselves because they are not constructed from genes or their products. Rather, they are effects of components of the nervous system interacting with each other (e.g., emotional experience), or effects of the nervous system interacting with the muscular-skeletal system (e.g., behaviors)." Yet behaviours and psychological processes can indeed be regarded as traits, "in that they produce effects of their own (e.g. the movement of a hand that shapes the environment to create a tool), and these effects are often functional." (2002, p. 490-491). Trainor (2006, p. 106) similarly argues that "complex behaviors emerge through experience-dependent wiring of neural circuits in interaction with architectural genetic constraints." As such, explaining art as a trait does not only involve regarding it as a behavioural practice, but also considering its psychological features, in turn based on a neural substrate. Genetic elements must be involved, but they are likely situated at the level of these psychological features of behavioural propensities, rather than, as criticized before, there being one 'art gene'.

As was also addressed in the chapter on art's definitions, art within evolutionary research should perhaps pragmatically be approached as an evolved complex, not unlike the proposal for a cluster account of art (e.g. Dutton, 2006, 2009). Such an attempt has been undertaken by Sosis with regard to religion (Alcorta & Sosis, 2005; Sosis, 2009). Like art, religion is a highly intricate cluster of different behaviours, psychological processes and cultural practices, which makes it equally difficult to provide a succinct definition that can subsequently be used to develop evolutionary hypotheses. Approaching it in a cluster-like manner (e.g. Boyer, 2003; Whitehouse, 2008), similar to the aforementioned cluster account of art, has many benefits, such as the ability to recognize that some constituent features of what we call 'religion', such as ritual practice and belief in supernatural agents, probably evolved independently at different times in evolutionary history. While some theorists take this as one argument towards a byproduct explanation of religion (e.g. Atran, 2002; Barrett, 2000; Baumard & Boyer, 2013; Boyer, 2001, 2003), Sosis argues that an additional layer of explanation is needed. Specifically, different composite features of religion are united in an evolved complex consisting of cognitive, affective, behavioural and developmental elements, which may be the primary replicable units, rather than religion as a whole. The following elements are highlighted as being of paramount importance in understanding religion, based on cross-cultural occurrence and overall salience: belief in supernatural agents and in counterintuitive concepts (cognitive component), collective participation in rituals that are often costly for those engaging in them (behavioural component), the separation of the realms of the sacred and the profane (affective component) and the importance of adolescence as a crucial phase for the transmission of religious beliefs and values (developmental component) (Alcorta & Sosis, 2005; Sosis, 2009). Because a variety of components were involved, it may not be right to ask *when* religion evolved, because "it assumes that at some point in our evolutionary history religion 'appeared.'" (Sosis, 2009, p. 320) A better inquiry may be to ask when the features of religion *coalesced*, i.e. when separately evolved elements apparently were joined in the complex we now refer to as religion, seeing that this process appears to have taken place in a similar way across a wide range of cultures (2009). The question whether religion is or is not an adaptation then becomes a double undertaking. The constituent features of religion can be studied in themselves, and have often been described as byproducts of regular cognitive functioning (e.g. Boyer, 2003), but in addition to this one should assess to what extent selective pressures were involved in their coalescence. According to Sosis, the complex of religion may either be an adaptation or an exaptation, with its beneficial effect being the establishment of large scale cooperative and communicative networks, through the integration of emotionally salient symbolic markers of commitment, in turn reinforced by ritual. While there are group benefits associated with religion, individuals also thrive through the positive psychological and immunological effects of engaging in religious ritual (Alcorta & Sosis, 2005; Sosis, 2009). In sum, "the critical issue of the adaptationist-byproduct debate is therefore whether or not the cognitive and emotional mechanisms exapted by the religious system have been adaptively modified by the new socioecological niche created by religion." (2009, p. 324) This clearly echoes Gould's distinction between adaptation and exaptation, with the crucial difference being phenotypic modification through selection in the first, but not the second instance.

Art may be a very similar case. Like religion, art is notoriously difficult to define, and consists of an interplay of behavioural, psychological and environmental - including cultural - features. The chapter on art's definitions proposed to investigate the evolutionary trajectories of different kinds of art in themselves, rather than providing an overall explanation for all the arts (e.g. Dissanayake, 1995, 2008; Hodgson & Verpooten, 2014). It then becomes possible to hypothesize and empirically test constituent features for different kinds of art. As these features might be seen as units of selection in themselves, a particular kind of art can contain elements that are adaptive, whereas others are non-functional, or byproducts. Following Sosis, the overall evolved complex, e.g. the complex of visual art, might then be either an exaptation or an adaptation, or alternatively, a byproduct. In the case of exaptation, visual artmaking might be a co-opting of several unit-like composite features such as aesthetic judgement of visual stimuli and imagination, producing a beneficial effect such as increased social cohesion, without undergoing additional selection for this effect. If visual art was an adaptation, this would have to have had occurred. Initial co-optation would have to confer such a significant amount of benefits for the members of a group, that natural selection operated in order to strengthen the effect, which then becomes a selected function.

Though not explicitly arguing for an evolved complex approach of fictional storytelling, Pinker (2007) has made a suggestion along these lines. In his view, storytelling contains an adaptive component, i.e. its instructive function, generally operating with social cognition as its subject matter, as well as a non-functional pleasure component.[87]

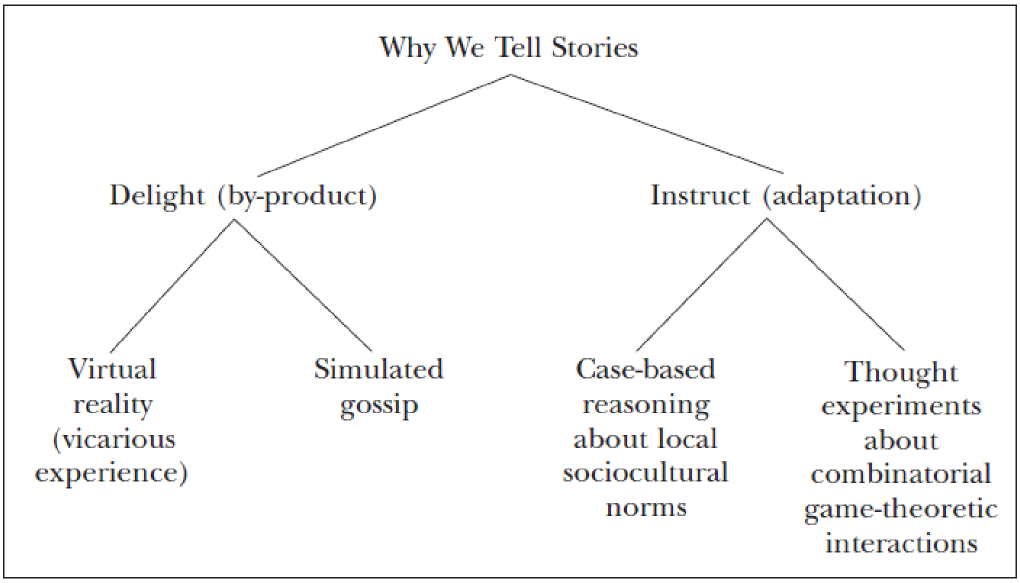

Fig. 90. The evolution of storytelling as a combination of adaptation and byproduct.

[87] It is not clear, however, to what extent the pleasure component is necessary as a motivational mechanism so as to acquire the benefits of fiction's instructive function.

A similar point - different elements of a kind of artistic practice might be adaptations and byproducts - was made with regard to music by McDermott and Hauser (2005), although they do not determine whether the outcome of music itself would then be an adaptation, a byproduct, or an exaptation. Studying art as an evolved complex can thus be interpreted within the work of Williams, who wrote that 'adaptation' "should be attributed to no higher a level of organization than is demanded by the evidence." (1966, p. 4-5) The question of interest is, of course, what such evidence may consist of. One answer might be in the use of evidentiary standards.

8.5. Standards of evidence

In order to assess whether artmaking is an adaptive trait, it is first and foremost necessary to determine which argumentative path will be taken. Current adaptationist hypotheses generally proclaim art's adaptive nature by referring to properties of art that are also thought to be characteristic of behavioural and cognitive adaptations, making 'adaptation' the null hypothesis category. Attempts at endorsing a byproduct or an exaptationist explanation then need to depart from the adaptationist argument already provided, in order to point out where such arguments may be insufficient and might have to be replaced with categories that do not impose the same functional demands on the trait under consideration. Conversely, the other argumentative path is to regard adaptation as a last resort, taking a non-functional account as a baseline explanation, and only attributing the label of adaptation after carefully considering and following up on one or more evidentiary standards of adaptationist reasoning. This follows some of the key references in the adaptationist debate (e.g. Williams, 1966), and is in line with the more general remarks uttered by Gould and others (Gould & Lewontin, 1979; Gould & Vrba, 1982; Gould, 1997) indicating a potential overuse of the term 'adaptation'. The quintessential question is then, of course, what such standards of evidence are composed of, and additionally, how they apply to the vast complexity of evolved behavioural and psychological phenomena.

Hodgson and Verpooten (2015, p. 78-79) approach the matter of determining the most suitable conceptual category for artmaking as an evolved trait by asking two questions: "[f]irst, are the arts evolutionarily beneficial (i.e., do they increase reproductive success of those that engage in the arts)?", followed by - depending on whether the answer is yes - "have the underlying motivation and capacities for art behavior been selectively altered genetically for a beneficial effect?" If the answer to the first question was no - art does not entail beneficial effects on differential reproductive success - art can provisionally be classified as a byproduct. If it did bring about such effects, the additional question whether this was the oucome of particular processes of selection, establishes the difference between adaptation and exaptation. As was evident from the above comparative perspective on these two analytical catogories, a process of exaptation should not imply additional selection for a beneficial effect. The authors additionally propose that the arts may have been culturally evolved, rather than relying primarily on a genetic substrate of capacities and motivations, although such genetically based elements will no doubt always remain relevant for any evolutionary discussion of art, even if it focusses on cultural inheritance systems. They conclude that the arts may eventually turn out to be a primary adaptation, a byproduct or an exaptation, where the last two categories can be regarded as either biologically or culturally driven. For example, a byproduct is mainly biologically based if it can be linked to one or several adaptive characteristics, such as a set of cognitive capacities that are linked to artmaking. It is, on the other hand, mostly culturally driven if its manifestation is influenced by one or more environmental, social or cultural characteristics, such as population density increase (Verpooten & Nelissen, 2010, 2012).

Evidently, these two basic questions are too general to be able to determine directly whether a trait such as artmaking is an adaptation. Whether the arts, or one kind of art, are evolutionarily beneficial is in itself a complex question that requires empirically testing any beneficial functions or effects that are proposed, whereas the additional question concerning selective processes involved cannot be answered but by reference to conceptual tools that have been developed especially for the purpose of answering such questions. These tools, or standards of evidence, have been succinctly summarized by Andrews et al. (2002). Listing a total of six methods, they outline how theoretical arguments can contribute to the support of adaptationist hypotheses, to various degrees and with particular relevance for specific research questions.

Phylogenetic comparison (1) involves gathering correlational data across a wide range of species about variation in a particular trait and specific environmental circumstances, in a way that could be predicted based on selective forces (Andrews et al., 2002). If, for instance, a consistent correlation was found between trait variants and the environment, this could be an indication that selection moulds the trait in fitness enhancing ways according to specific pressures presented by surrounding circumstances. This does not, however, allow for inferring that within a specific species, the precise variant of the trait is therefore the result of correspondingly specific selection pressures. The comparative method is also rather limited in use when the subject of analysis is a trait found only within one species (2002). If art was regarded as a uniquely human features, this means that phylogenetic comparison about art's practice in other species and the relation with this species' environment is evidently not a useful method. However, the evolved complex approach for art as a replicable unit does provide a way in which cross-species comparison may be relevant. In their discussion of animal studies of music, McDermott and Hauser (2005) address how empirical evidence in favour of the presence of perceptual effects of music in animals points towards their non-adaptive nature, considering the fact that non-human animals have not been recorded to engage in music making in the wild. For example, if distinguishing consonance and dissonance is found to occur in non-human animals, as it has been (Izumi, 2000), than this is unlikely to be an adaptation, considering the fact that only humans actively practice music-making and thus act upon the distinction between both. Because the same auditory effect surfaces in human music, this element was probably co-opted in music-making, rather than having evolved as an adaptive feature.[88]

Two additional evidentiary standards are the analysis of fitness maximization (2), and studying a trait's beneficial effects (3). The first of these would argue that "an adaptation is a trait that, among a suite of variants, maximizes fitness in a particular environment." (Andrews et al., 2002) Fitness is of course a concept that is difficult to measure in itself, especially because fitness maximization refers to a process that runs over a considerable length of time, and that it is not always clear in what type of unit fitness should be measured. In addition, the phase that is of crucial importance is the phase encompassing the environmental circumstances during which the trait evolved. These may not correspond to the current environment - a point very commonly made within standard evolutionary psychology, and often referred to as a mismatch, or by the statement that "our modern skulls house a stone age mind." (Cosmides & Tooby, 1997). As such, a trait or variant may look like it does not confer considerable fitness benefits, thereby not maximizing an organism's fitness in a particular environment, but such an impression could simply be due to its observation in the 'wrong' environment. With regard to art, both composite features and the final artistic outcome could be assessed in terms of their ability to maximize fitness, but this would inevitably be complicated by the issue that

[88] For a similar remark, see Hodgson and Verpooten (2015).

environments - seen as a statistical composite of selection pressures rather than a concrete physical environment (Tooby & Cosmides, 1992) - may have shifted. If, for example, extensive artistic creativity and skill and its low opposite were pragmatically regarded as two variants of the same trait, it would first be necessary to operationalize and empirically test the ways in, and the extent to which the high quality variant conferred clear relative fitness benefits and could therefore be an adaptation. Second, however, we would have to be able to determine that this was indeed true in the period and environment of the trait's evolution, an argument much more difficult to substantiate, as tests in a current environment may suffer from the aforementioned potential mismatch. The third evidentiary standard - pointing out beneficial effects - is clearly very limited as it follows up on the much more broader, and unadvisable notion of 'adaptation', which states that an adaptation is any trait conferring beneficial effects on an organism (Bock & von Wahlert, 1965; Bock, 1979, 1980). It is very likely that a variety of such effects of art can be empirically demonstrated, but this does not inform us about the selective history of the trait - a necessary precondition for the stricter use of the term of 'adaptation' (Williams, 1966).

Given the considerable limitations of these first three, additional methods have been developed, that attempt to connect a trait's structure with its selective history. Optimization models (4) involve making comparisons between a trait's actual structure, and predictions about how selective forces would have moulded it to fulfill its proposed function in an optimal manner. They "presuppose that selection builds traits in the same way that an engineer would design a piece of machinery to perform a task." (Andrews et al., 2002, p. 494) The predictions are matched against the trait's structure, after which "[a] reasonable fit with these expectations is taken as evidence that selection designed the trait to solve the problem." (2002, p. 494) Optimization models can be atomistic, i.e. targeting one singular trait, or co-evolutionary, in which a trait is seen in conjunction with other traits and features of an organism, such as constraints. An outcome would then not be optimal in an absolute manner, but would be optimal relative to all other outcomes that were possible, considering how the trait is embedded within an entire organism (2002). Both of these types of models suffer from a similar set of issues. As Gould and Lewontin (1979) extensively argued, natural selection does not operate with evolutionary foresight towards optimal solutions for adaptive problems. The reverse engineering approach characteristic of optimization models is therefore at odds with the fact that natural selection can only incrementally increase relatively advantageous variants, always constrained by the existing genome, many parts of which will possess clear functionality, perhaps resisting modification for new purposes. The same principle - a complete absence of foresight and the use of already present genes and mechanisms - goes for sexual selection (e.g. Miller, 2001a). In the case of co-evolutionary modelling, the additional issue arises that it is often largely unkown how many and which variables interact with each other in the emergence of a new trait. Building optimization models for the evolution of art appears unsuitable: if the complex-type structure of art is maintained, the primary analysis should be concerned with how art's constituent features may or may not be optimal solutions, but this would of course provide little insight into the overall structure and function of art. Since, as stated before, there is no single 'art gene', and artmaking cannot be atomized as a single, separate trait, it is consequently almost impossible to assess the extent to which art as a whole is constrained by an organism's or species' genome.

The final evidentiary standards discussed by Andrews et al. (2002) are the establishment of a tight fit between a trait's structure and its use (5) and the apparent presence of special design (6). Looking for a tight fit might indeed be indicative of an adaptation - a trait would, to some extent, be engineered to fulfill a particular function. However, it is not always clear whether the trait evolved to fit its function, or whether the environment was modulated to fit existing traits (2002). In such instances, tight fit would result from the exaptation, or co-optation in general, of already present traits. Additionally, especially when applied to behavioural practices, a tight fit might result from learning mechanisms: such mechanisms evolved for the purpose of flexibly adapting to new environments, but are often employed for acquiring new, non-adaptive skills. Andrews et al. (2002) provide the example of driving a car: while clearly a learnt skill, it is definitely not an adaptation and merely co-opts existing learning mechanisms. The method of looking for special design takes the presence of a tight fit one step further: according to this standard, a fit between a trait's structure and its function within a given environment would have to result from very specific selection processes that moulded the trait towards a state that, for present-day observers, appears to be an optimal solution.

Williams (1966) aimed at advocating an informal standard of special design by arguing that a trait must possess features such as efficiency, economy, precision, reliable development, complexity and functionality (see also Buss et al., 1998). A very similar point was made by Buss (2008), who argued that a trait must provide an affirmative answer to the previously cited questions, asking whether the trait in question reliably develops among the members of a species in a normal environment (reliability), whether it solves the proposed adaptive function well (efficiency), and whether its benefit is not accompanied by a disadvantageous amount of costs to the organism (economy). If a trait answers to these criteria, it is possible that it qualifies as an adaptation, as it appears to indicate that the trait is too well-designed to not be selected for a proposed function. Yet precisely these selection pressures are not specified by applying criteria such as efficiency and economy, leaving the option that the trait concerned already existed, and that the environment has been modified so as to make full use of it - a point already made when discussing the criterion of tight fit (Andrews et al., 2002). This issue is also addressed by Williams, when he writes that "the decision as to the purpose of a mechanism must be based on an examination of the machinery and an argument as to the appropriateness of the means to the end." (1966, p. 12) Several partial solutions have been proposed in order to substantiate a presumption of special design (2002). One can investigate whether a trait appears to be biased outcome of a specific learning mechanism - in which case it becomes evident that the learning mechanism is closely linked to a particular functional outcome - or whether the trait fits particularly well in an ancestral environment, and less so in a modern environment - an imbalance that can be predicted if the trait evolved in ancestral time rather than being a modern co-optation. If different lines of evidence converge, and are additionally supported by empirical evidence in favour of a proposed function, the case for an adaptationist explanation becomes increasingly strong.

If special design were to be applied to art, this would not necessarily require establishing special design for each of its composite features. As explained before, it is theoretically possible that these features evolved independently at different times and for different reasons over the course of evolution, before being co-opted in artmaking by means of either adaptation, exaptation, or byproduct. As such, special design would have to apply only to artmaking as such, in order to qualify art as an adaptation. It has previously been suggested that in order to be an adaptation, art should have a functional effect that is not only specially designed, but also unique to art (e.g. Davies, 2012).[89] This immediately poses a significant issue to those theories that propose a function that has been attributed to a variety of other behaviours. By means of the artification hypothesis, Dissanayake (e.g. 1988, 1995, 2000, 2008, 2009) explains the arts as a vehicle for establishing increased social cohesion and

[89] "(...) an evolutionarily significant function performed not only by *all* the arts but also by *only* the arts

cooperation through attracting attention to community relevant information and messages. Strong within-group cohesion, with prosocial and cooperative behaviour among group members as a consequence, is arguably a beneficial circumstance in which individuals can greatly enhance their own safety and survival prospects. Empirical evidence has indeed been produced for various types of art being involved in this function (Anshel & Kipper, 1988; Kirschner & Tomasello, 2010; Seghers & De Smet, 2014b; Wiltermuth & Heath, 2009). The same effect has, however, been attributed to practices such as engaging in collective or extreme ritual (Fischer et al., 2013; Xygalatas et al., 2013), joint laughing (Dezecache & Dunbar, 2012), grooming (Lehmann et al., 2007), language (Dunbar, 1993), synchronous movement and action (Hove & Risen, 2009; Reddish et al., 2013), and adopting specific religious belief systems (Alcorta & Sosis, 2005; Bulbulia, 2004; Richerson & Boyd, 1998, Rossano, 2007; Wilson, 2002), with many of these practices having additional, mutually strengthening effects (e.g. Cohen et al., 2013).

A similar point has been made by Davies (2012) with regard to Miller's aesthetic fitness indicator hypothesis. The mate advertisement and choice function attributed to visual art similarly applies to music, humour, storytelling and other feats of cognitive creativity such as scientific production, and a variety of ornamental and sex-specific body characteristics (Kanazawa, 2000; Miller, 1999, 2001a, 2001b), which appears to suggests that the mating mind in itself is the adaptation through sexual selection rather than its behavioural and cognitive outcomes which, according to Davies (2012), are not necessarily the primary locus of selection. Davies continues in stating that, in order to maintain a specific explanatory focus on the arts, it should be demonstrated that "art is a more effective form of sexual advertisement than most non-art behaviors, including displays of social competence, intelligence, charm, sporting prowess, wealth, prestige, and status, along with overt bodily signs of beauty, fertility, and health." (2012, p. 126) The proposal that art is an adaptation for mate advertisement and choice, similar to how many other features fulfill the same function, does appear to be at odds with the evidentiary standard of special design. At the same time, while it is an *a priori* condition of the standard of special design that a trait must display a selected structure closely fitting its function, this does not imply that a particular function must be limited to one specific trait. In some instances, this will be true, such as when bird feathers are shown to have evolved for thermoregulation, before being co-opted for flight (Gould & Vrba, 1982). It is unlikely that the exapted effect of flight, or the primary adaptationist effect of thermoregulation could be fulfilled by other traits than a bird's feathers. Yet beneficial effects such as social cohesion, which may be adaptive functions if the traits that produce them are selected for this purpose, can be established and maintained through a variety of means, which do not exclude each other. It is theoretically possible that a similar function is fulfilled by several traits, which might then be adaptations for the same function. Since evolution is a blind process, it will not take into account the possibility that a particular beneficial outcome is already ensured by an existing trait, and it will merely retain fitness enhancing variants of any trait over less advantageous ones. As a consequence, different phenotypic outcomes may fulfill the same function. Sharing a basic function across traits might, moreover, even be an indication of the separate traits' adaptive nature (Simpson & Campbell, 2005).

Evidentiary standards for adaptationist hypotheses have not been applied sufficiently to the subject of art's evolution. In one example, Sugiyama (2005) analyzed the structural properties of narrative by means of reverse engineering. This method, customary in evolutionary psychology, involves analyzing the structural properties, or the design of a trait, in order to determine what function the trait might have evolved for (Dennett, 1995). The use of engineering was phrased by Pinker as follows: "one has to show - *independently of anything we know about the human behavior in question* - that X, by its intrinsic design, is capable of causing a reproduction-enhancing outcome in an environment like the one in which humans evolved." (2007, p. 170) Sugiyama's application to narrative involves identifying the main constituent properties of narrative, such as characters, actions, events and conflicts, in order to connect these to an ultimate function narrative might have fulfilled for our ancestors. Generally, this function "would appear to be the representation of the problems humans encounter in their lives and the constraints individuals struggle against in their efforts to solve them." (Sugiyama, 2005, p. 186) More specifically, narrative provides insight in the social environment, improves our understanding of human nature, and provides a catalogue of behavioural examples (2005). As Sugiyama recognizes, findings from reverse engineering do not directly prove an adaptive origin, as this method largely corresponds to the evidentiary standards of tight fit and optimal design modelling. An adaptationist explanation would be further supported if narrative also displayed evidence of special design, which, in Sugiyama's line of thinking, should mean that it is uniquely suited to fulfill its proposed function. She states this is the case, since other art forms, such as visual arts, are a lot less capable of representing character's mental lives in considerable detail. Evidently, the proposed function for narrative could be fulfilled by other cognitive or behavioural traits that are not different kinds of art - an option unmentioned by Sugiyama (2005). The main issue, however, is that special design does not necessitate a *unique* function for a trait. As a consequence, eliminating non-adaptationist possibilities by reference to a purportedly unique, specially designed function for narrative, appears insufficient.

8.6. Issues with adaptationist thinking on art

8.6.1. Adaptation and exaptation

Presently, no hypothesis on the origin of visual art endorses an exaptationist explanation along the lines of how this category is conceptually set out in comparison with adaptation, i.e. as a co-opted use of an existing trait, yielding a beneficial effect that is not the outcome of selective processes of phenotypic modification. This does not mean, however, that the explanatory category of exaptation is not relevant for evolutionary discussions on art's origins. On a definitional level, when discussing art as an evolved complex, the category of exaptation allows for assessing whether constituent features coalesced in a process of additional selection, qualifying art as an adaptation, or whether such selection was absent, qualifying art as an exaptation (Sosis, 2009). This would, however, additionally necessitate a demonstration that the evolved complex of art is not in itself a byproduct, and does in fact confer fitness benefits on the individuals that engage in it. The possibility that the evolved complex of art is an exaptation, rather than an adaptation, also points out that even though some constituent features are quite clearly adaptations, this does not automatically translate into art's overall adaptivity. This is sometimes not sufficiently recognized. Boyd (2009), for example, argues that fiction appears to be an adaptation because of the involvement of cognitive abilities that are perhaps adaptations, such as theory of mind. Theory of mind is sometimes seen as a central, innate, domain-specific and adaptive feature of social cognition (e.g. Baron-Cohen, 1995), but has also been more conservatively described as a consequence of domain general cognition (e.g. Gerrans, 2002). Independent of whether theory of mind qualifies as a proper adaptation, its own categorization does not necessarily influence the analysis of other traits that make use of this capacity. This would, however, change, if engaging in fiction was found to be the only way in which the capacity for theory of mind played a role. In this case, theory of mind would seem to be specifically evolved to enable the practice of storytelling, which then gains more credibility as an adaptation (Verpooten, 2012). Clearly, this does not correspond to the finding that theory of mind is significantly involved in everyday social cognition, admittedly with strong indications that its impairment also affects engagement in, and understanding of fiction (Goldstein & Winner, 2012; Mar et al., 2006, 2009; Scott & Baron-Cohen, 1996). This, however, primarily indicates consistency with the proposition that social cognition in general is closely linked to fiction, and not so much with a specially selected role of theory of mind within fiction. The available evidence, if considered parsimoniously, therefore supports the option that fiction is an exaptation or a byproduct, co-opting existing, but non-specific cognitive machinery (e.g. Verpooten, 2013). Examples such as this one show that the category of exaptation can significantly extend the common notion that debating art's origins merely goes between adaptation and byproduct (e.g. Davies, 2012).

As argued before, adaptations and exaptations crucially differ in the respective presence or absence of selection for a functional effect. The uses of the concept of 'function' in research on art are often diverse and confusing, such as when the practice of artmaking within a society is linked to individuals' wellbeing, or to the fact that it unites group members (Dutton, 2009). In such instances, one merely refers to the concrete motivation for engaging in art, and not necessarily to its ultimate reason for existence, if any. Anthropologists may interpret function in a similar way, e.g. when the role of art within a culture is thought to be structurally relevant, and linked to other elements of this society (e.g. Hodgson & Verpooten, 2014). If 'function' is interpreted in an evolutionary manner, its use again becomes confusing if it is narrowly defined as being subservient to survival purposes. Sexual selectionist explanations too, rightly make use of functional explanations, even though in such instances the functional explanation at stake is aimed at reproductive opportunities, and may contradict survival prospects (Richerson et al., 1996). In general, confusion is best avoided by maintaining Williams' terminology, where function is only associated with adaptive traits that arose through natural (or sexual) selection, whereas all other beneficial outcomes should be referred to as fortuitous effects (1966). This means that any empirically demonstrated effect must additionally undergo analysis as to its selective history in order to qualify as an adaptation.

Not clearly defining concepts such as function might lead to confusion as to proposed adaptationist explanations for art. In a discussion of the various existing hypotheses for art's evolution, Carroll (2005) distinguishes two different kinds of adaptationist explanations: “those who argue that the arts have no intrinsic adaptive function peculiar to their own nature,” implying that the arts “provide subsidiary service only to some other, more general adaptive function, such as information distribution, kin recognition, or social cohesion” (2005, p. 939), and secondly, “those who argue that the arts fulfill a primary and irreducible adaptive function - that they satisfy needs that are not satisfied by any other activity.” (2005, p. 939) In Carroll’s view, his version of the simulation hypothesis - art provides a model of reality with an emphasis on social information, and silences uncertainty and confusion that might arise as a consequence of our large brains after its detachment from purely instinctive responses - is the only primary adaptationist explanation for the arts (2005). Secondary adaptationist explanations are, according to Carroll, those hypotheses where the arts serve another purpose, such as social cohesion or mate attraction. Unfortunately, he uses these categories not in the way they have been established and repeatedly been used in evolutionary research, i.e. to address those traits that originally evolved for a specific function, and those traits that acquired a function after having undergone additional selection (e.g. Andrews et al., 2002). Instead, Carroll appears to endorse a distinction between primary adaptations that evolved through special design either for a unique function - citing the simulation hypothesis as the only one in this category - or for a function shared with other traits. As noted above, the latter does not contradict evolution as a primary adaptation displaying special design, which, in addition to highlighting Carroll’s interpretative use of conceptual categories, eliminates the distinction he makes between different adaptationist hypotheses.

Some authors indeed endorse an adaptive function for art that is shared with other behavioural and cognitive phenomena, such as social cohesion and cooperation for Dissanayake (e.g. 1995, 2008, 2009) and Coe (2003; Aiken & Coe, 2004; Coe et al., 2010), or sexual advertisement for Miller (1999, 2001a, 2001b). Although Davies (2012) argued that an evolutionary explanation for the arts in general should succeed in explaining them by virtue of a *unique* function, the evidentiary standard of special design does not require this. Theoretically, a single adaptive function can be fulfilled by multiple trait-wise, adaptive solutions. But can the reverse also occur, i.e. can a single trait fulfill multiple adaptive functions? In his discussion of the arts, Boyd (2009) proposed precisely this. While art is said to be a kind of cognitive playground where cognitive, behavioural and motor skills are extensively practised for later application in the real world, it is also a means for engendering overall creativity, which in turn can produce advantageous types of thinking such as mental time travel. Moreover, the arts can enhance an individual's reproductive success because being a skilled artist will enhance one's social status. Finally, the arts establish shared attention, which in turn fosters cooperation that will eventually benefit individual group members.[90] According to Boyd, an adaptation can have multiple functions, as the same trait could have acquired additional functions over time. This assumption sits uncomfortably with theoretical reasoning about adaptations, as well as with evidentiary standards. Williams (1966) wrote that adaptive functions are often confused with mere fortuitous effect, and that it is of paramount importance to distinguish the two. This suggests that if the arts were adaptive, as Boyd proposes, only one of the aforementioned functions - or an additional one not yet explored - could have sparked its initial emergence. Secondary uses are evidently possible, but are either, as Williams remarks, fortuitous effects, or, as Gould would argue, exaptations through the co-opting of the primary adaptation - provided that the effects in question also prove to be fitness-enhancing. The argument that the arts are an adaptation with a multitude of functions also does not match the requirement of special design, which basically states that the process of engineering towards a trait's form must reflect specific selection pressures associated with a particular environmental problem, resulting in structural properties of the trait that closely match both the engineering process and the nature of the selection pressures that gave rise to it.

Independent of these considerations, it is not impossible that art does indeed have multiple evolutionary functions, yet this would have to be explained differently than by stating that artmaking merely is an adaptation for different functional outcomes. Gould & Vrba (1982) suggested that complex adaptive traits are very likely evolutionary outcomes of a long and intricate trajectory that combines both adaptation and exaptation, with the additional option that the trait reflects both primary and secondary adaptive elements brought about by multiple phases of selection. As such, they would be a product of mixed design. This refers to those traits where different selection pressures operated on a trait over the course of its evolution, perhaps in combination with co-opting in the form of exaptation or byproduct, which will eventually result in a trait with a history of multiple design phases. The possibility that many complex traits display a history of mixed design warrants a reconsideration of the concept of reverse engineering. Previously

[90] Not explicitely phrased as adaptive functions, Boyd (2009) additionally argues that narrative offers patterns of social information that can be used to guide immediate or future action. Even without specific information present, narrative provides practice in cognitive tools for reasoning about action, such as explanation and analogy.

described as a method for estimating a trait's function by studying its composite parts, it should perhaps instead be termed "reverse tinkering." (Andrews et al., 2002; Gangestad & Simpson, 2007) This alternative is proposed based on the fact that evolution does not construct each single trait from scratch on a blank slate, as Gould and Lewontin (1979) also noted. As such, a trait is unlikely to be engineered as neatly as an actual engineer would conceptually develop an artefact.

Given the vast complexity of the arts, it is quite possible that such a trajectory of mixed design, primary and secondary adaptation, and exaptation took place. In addition, the evolved complex of art may contain several byproduct features, as was outlined by Pinker with regard to fiction (2007). Proposals such as Boyd's should then be reconsidered in the light of the fact that reliably reconstructing art's evolutionary history takes more than setting out the various functions it may fulfill, even though each of these functions may receive empirical evidence in its favour, if this were to be thoroughly investigated. Clearly, undertaking this reconstruction is - similar to reconstructing the mind itself - "depressingly difficult." (Andrews, 2007) A combination of rigorous empirical inquiry and applicable evidentiary standards should, however, set us on our way. If one proposed adaptive function displayed considerably more signs of special design, and if there was, for instance, archaeological evidence in its favour that would provide an indicative date which could in turn be connected to other, known selection pressures, this could be an indication of a primary adaptive function. One such an example is the aesthetic fitness indicator hypothesis of visual art (Miller, 1999, 2001a, 2001b), which has been matched with the archaeological record of handaxe production showing aesthetic concern in both symmetrical execution and, sometimes, the noticeable choice of rare or less functional material (Currie, 2011).

In sum, if art was indeed a product of mixed design, this means that it could have acquired new functions over the course of its emergence and development, although these are then, all but one, non-primary adaptationist explanations. Evolutionary explanations are traditionally concerned with ancestral selection pressures which gave rise to a behaviour, or, within an evolutionary psychological framework, to its underlying psychological mechanisms. Some researchers have stated that hence, interest is not so much focussed on a trait's current function - if any (e.g. Buss et al., 1998). From this perspective, even a trait that does not at present have a function, should still be classified as an adaptation if it emerged for a functional effect. Conversely, a present function is thought to be of limited interest for explaining a trait's structure:

> "[a]ll evolutionary explanations of the existence of species-wide mechanisms are to this extent explanations in terms of the past fitness effects of that kind of mechanism that led to the current existence of the mechanism in the species. The fact that a mechanism currently enhances fitness, by itself, cannot explain why the mechanism exists or how it is structured. (...) There are good reasons to think that it is not scientifically illuminating to demonstrate a feature's current correlation with fitness (...) unless such correlations reveal longer term, past selective pressures. It is not clear that such correlations shed any light on the mechanism's design or status as an adaptation." (1998, p. 540; see also e.g. Symons, 1990, 1992; Thornhill, 1990; Tooby & Cosmides, 1990; for a discussion, see Borgerhoff Mulder, 2007)

Yet extensively focussing on ancestral selection pressures and a single original function may draw attention away from complex evolutionary trajectories such as instances of mixed design, and may shed confusion as to how various possible functions are related. The aesthetic fitness indicator hypothesis, for example, has at several occasions been deemed unlikely to be a primary adaptationist explanation for art. Coe (2003) argues that male competitiveness and an emphasis on individual creativity, characteristic of this hypothesis, is at odds with abundant ethnographic information showing that art is often practised by women rather than men, and in communal circumstances aimed at establishing and maintaining traditions, rather than being intended for innovation. Boyd similarly questions the hypothesis, assuming that it would predict that "we would engage in art overwhelmingly in our fertile years, and only so long as fertile individuals of the opposite sex were among their audience." (2009, p. 84) In reality, however, we find persistent engagement in the arts in "[a]n infant's delight in hearing nursery rhymes or lullabies, a mother's in crooning them, a grandmother's pride in weaving designs in flax, wool, or cotton, anyone's silent reading of fiction or keen interest in the work of long-dead artists," which, according to Boyd, "would be impossible to explain." (2009, p. 85) Such points of view suggest that a proposed function could not be art's original function because it does not appear to correspond to how art is most commonly practised and used at the present moment. This should not be an issue - and consequentially, the aesthetic fitness indicator hypothesis does not lose legitimacy for this reason - if possibilities such as mixed design and the acquisition of new functions over the course of evolution are fully acknowledged. Recognizing mixed design might, however, be methodologically difficult: if a trait underwent selection or was co-opted in different directions, special design for a primary or any secondary functions established through a process of adaptation might be obscured (Gangestad

& Simpson, 2007). Special design can additionally be affected if, for example, an evolutionary trade-off with another trait occurred (Simpson & Campbell, 2005).

8.6.2. Ultimate and proximate levels of explanation

Evolutionary psychology, in particular the Santa Barbara school that produced the landmark volume *The Adapted Mind* (Barkow et al., 1992), is often said to focus heavily on functional explanations for why cognitive mechanisms and their behavioural outcomes emerged during human evolutionary history.[91] Many researchers point out that merely identifying a trait's function - *why* did it evolve? - is not going to provide a complete picture (e.g. Boyd & Richerson, 1985; Mithen, 2005; Verpooten, 2013). Often, they follow up on Tinbergen's four questions, arguing that an evolved trait can only be understood by teasing apart the different levels of its explanation. Merely pinpointing an adaptive function, or identifying the proximate mechanisms for its manifestation will not provide us with full insight into the trait's nature and evolutionary trajectory. Instead, a two-tiered structure should be applied, taking into account both different levels of explanation, as well as different features of the trait being studied (Tinbergen, 1963). The structure involves a distinction between a dynamic and static view in order to define the objects of explanation. The dynamic view describes how the trait develops over time, for example as a sequence of developmental stages. The static view, in turn, refers to the single form of the mechanism or function involved. Horizontally, the table teases apart a proximate and ultimate level of explanation. Proximate explanations describe how the trait works, e.g. *how* it develops in an individual, or which cognitive, hormonal or other mechanisms are responsible for its manifestation. The ultimate level is concerned with analyzing the evolutionary trajectory and ultimate function of the trait, i.e. how it evolved on a larger scale, i.e. phylogenetically, and *why* it functions as it does. Phrased differently, "proximate mechanisms are behavior generators, whereas ultimate functions explain why those behaviors are favored." (Scott-Phillips et al., 2011)

[91] For example, "the human mind is a collection of biological adaptations, and an evolutionary theory of the mind must, above all, explain what selection pressures constructed those adaptations. Chronology is of limited use, because knowing when an adaptation arose is often not very informative about why it arose." (Miller, 2001a, p. 22)

		OBJECTS OF EXPLANATION	
		Dynamic view - developmental/historical process towards current form - explanation of a trait in terms of a sequence	**Static view** - single/current form - explanation of a trait as it currently manifests itself in a species
LEVELS OF EXPLANATION	**Proximate level: how** does the trait work in an organism? - Explains the development of the trait by referring to immediate, observable and/or measurable influences and mechanisms, as well as their ontogeny	**ONTOGENY** "How does the trait develop in individuals?" → Descriptions of the trait's forms at sequential life stages, and the mechanisms that control development.	**MECHANISM** "What is the structure of the trait; how does it work?" → Description of the trait's anatomy, physiology, regulation, and how the trait works to accomplish a function.
LEVELS OF EXPLANATION	**Ultimate level: why** does a particular species possess the trait? - Explains the current form of the trait by referring to a historical sequence of predecessors of the trait (across species), as well as influences on the trait's development of selection and other evolutionary processes.	**PHYLOGENY** "What is the phylogenetic history of the trait?" → Description of the history of the trait as reconstructed from its phenotype and genotype precursors.	**ADAPTATION** "How have variations in the trait interacted with environments to influence fitness in ways that help to explain the trait's form?" → Description of how variations in the trait have influenced fitness.

Fig. 91. Tinbergen's four questions: areas of explanation in biology.

A table containing Tinbergen's four questions, mapping a trait theoretically as if it were an adaptation, can be a valuable tool for materializing hypothesized ideas about art as an evolved complex. In his discussion of religion, Sosis (2009; Alcorta & Sosis, 2005) made use of a cognitive, affective, behavioural and developmental component. This does not correspond entirely, but has parallels with Tinbergen's four questions. As such, the above scheme can provide a starting point for more detailed discussions of art as an evolved complex. Phylogenetic features of art might be precursors of artistic behaviour such as play, or crude animal versions of human components of art, such as aesthetic sensitivity (e.g. Boyd, 2009; Dissanayake, 1974; Seghers, 2014a). Under 'adaptation', art may correspond to any of the proposed functions, such as its being a fitness indicator, a tool for social bonding or group identification, or a means for cognitive enhancement. On the proximate level, ontogenetic development includes the emergence of drawing among young children, and the presence of cross-cultural regularities in these patterns. The mechanisms involved in art can be anything ranging from imagination, learning, relevant emotions, aesthetic perception and judgement, and a wide variety of culture-specific experiental features, all of which would contribute to the eventual manifestation of the trait of artmaking.

This above described mapping of art's properties is how current adaptationist hypotheses are structured, but may not correspond to some views of the ultimate-proximate distinction. The example of cooperation is especially insightful, as it is closely connected to the Dissanayake's artification hypothesis (1988, 2000, 1995, 2008, 2009) and Coe's ancestress hypothesis (1992, 2003; Aiken & Coe, 2004). As mentioned before, Coe outlines art's ultimate function as the identification of close and distant kin and the advertisement of prosocial values and behaviour, both of which should elicit increased levels of cooperation (Coe, 1992, 2003; Aiken & Coe, 2004). Its proximate mechanisms are the workings of the human perceptual and nervous system, and in particular the processing of colours, forms and patterns, and hormones and other bonding mechanisms responsible for the attachment of mothers and other caretakers to infants, which were subsequently co-opted in forming affiliative bonds between conspecifics. Elsewhere, Coe somewhat confusingly talks about a "proximate or immediate *effect*," (1992, p. 219, emphasis added) and describes this effect as objects becoming more noticeable through the addition of color, form and/or pattern.

According to Scott-Phillips et al. (2011), researchers commonly, but erroneously attribute an ultimate explanation to a wide variety of behavioural inclinations that are thought to lie at the heart of cooperative interactions. Like art in the aforementioned hypotheses, religion, for instance, is often said to elicit cooperation, among other things through enforcement mechanisms such as a belief in supernatural punishment if expectations of prosocial or otherwise desirable behaviour are violated (Watts et al., 2015). While religion is for this reason often regarded as an adaptation (e.g. Alcorta & Sosis, 2005; Bulbulia, 2004), Scott-Phillips et al. (2011) point out that this is not necessarily true. In their view, religion should not be seen as an adaptation in itself, with as its ultimate function the establishment and maintenance of cooperation. Rather, cooperation in itself is the primary behaviour to be explained. Even if religion was empirically shown to fulfill this goal, this would still not explain why cooperation manifested itself in the first place (Scott-Phillips et al., 2011). In order to explain cooperation in itself, previously described insights such as inclusive fitness are necessary. Inclusive fitness theory generally explains how some behaviours that appear altruistic may in fact benefit the proliferation of one's own genetic material, corresponding to a genecentric view of natural selection (Hamilton, 1964).

Precisely this point proves to be challenging to Coe's ancestress hypothesis. According to Coe, common explanations of cooperation, such as kin selection theory, reciprocal altruism and cultural group selection, fall short in accounting for cooperative bonds and actions in complex societies. Instead advocating an ultimate explanation for artistic traditions, she claims that visual art is particularly suitable to achieve this as it can culturally connect individuals that are only very distantly related. Hamilton's rule, on the other hand, predicts a positive correlation between cooperative investment and genetic relatedness between a donor and his beneficiary, as cooperative action would otherwise been selected against due to its deleterious effect on the donor's gene propagation (Hamilton, 1964). In order to accommodate this issue, Coe and colleagues developed an "ancestor-descendant conflict," seen as a multigenerational extension of Trivers' parent-offspring conflict (Coe et al., 2010; Trivers, 1974).[92] Instead of parental investment, ancestors' investment in their offspring's cooperative behaviour towards each other is here developed over multiple generations, sustained by traditions such as visual artmaking.

[92] Parent-offspring conflict refers to the fact that statistically, each parent shares half of its genetic material with each of its offspring, whereas each of these offspring shares a hundred percent of its genes with itself, but only half of those genes with every sibling. This predicts that according to standard evolutionary biology, each offspring should attempt to elicit as much parental investment as possible, even if this is to the detriment of its siblings' survival opportunities. The parent, however, benefits more from not diverting all investment towards one offspring, because even though this might increase its survival chances, it overall diminishes the parent's reproductive success. As such, an offspring and both of its parents have conflicting interests in terms of parental investment. Natural selection is then expected to favour parental strategies that can manipulate their offspring into behaving equally altruistic towards each other - despite being only on average fifty percent related - instead of being merely concerned with oneself.

Although ancestor-descendant conflict does provide an extension of parent-offspring conflict, it still does not mediate the issue that gene-based natural selection should act against the genes involved in behavioural propensities that put a donor at a significant disadvantage. Coe then introduces a second modification of standard, gene-centric evolutionary biology by replacing genes by traits as the units of analysis. The traits in question are traditions, defined as "culturally inherited traits that persist, transmitted from parent to child," (2003, p. 158) and reproductive success needs to be measured over multiple generations: "(...) the aim of behavior, evolutionarily speaking, was not to promote the survival and reproductive success of an individual, but of a lineage of individuals descending from a common ancestor. (...) the measurement of the success is in the number of descendants over generations, not immediate offspring." (2004, p. 7) She substantiates this shift by arguing that selection operates on phenotypes, maintaining those variants that have gene-propagating effects. Theoretically, this is possible, and it has repeatedly been argued that the phenotype is the relevant level of analysis, rather than the genotype (for a discussion, see Huneman, 2007). Cultural traits in particular have also been described as potential units of analysis (e.g. O'Brien et al., 2010). Yet sustaining such a point of view raises the question whether natural selection remains an advisable framework for understanding art's evolution from an ancestress point of view. Perhaps mechanisms such as cultural transmission are instead the key to understanding the emergence and development of traditions as traits. Scott-Phillips et al. (2011) describe cultural transmission in itself as a proximate mechanism, which would lend further support to the possibility that the ancestress hypothesis is located at the proximate level.[93]

Of course the option theoretically remains that the arts, or visual art in particular, might be an adaptation for identifying kin and eliciting cooperative intent and action. For this to be true, however, artmaking should see its proposed function supported by empirical data, as well as displaying evidentiary criteria of special design. Even if only considering the latter, significant issues arise. Criteria such as precision and efficiency are poorly supported. Specific signs of kinship affiliation materialized in visual art or bodily adornment are relatively easy to fake, leaving the entire cooperative system vulnerable to freeriders. As Coe (1992) recognizes herself, considerable costs are often associated with ancestral artistic

[93] Yet others regard the cultural inheritance stemming from transmission of cultural traits as playing a more significant role, instead warranting more integrated views of gene-culture co-evolution (Mesoudi et al., 2013).

traditions. Making art requires various kinds of resources, not to mention the obvious health risks accompanying invasive practices such as scarification. Such findings, together with the above discussion of proximate mechanisms, appear to suggest that the ancestress hypothesis gravitates more towards a proximate level approach to art.

A very similar line of reasoning possibly applies to Dissanayake's artification hypothesis. This hypothesis too, proposes that the arts enhance ingroup cooperation and prosociality, but this could also be a mere proximate mechanism for obtaining the ultimate function of cooperation. A different example is the simulation hypothesis, applied to both the arts in general and fiction in particular, although the case for fiction is clearer and similar statements about other arts appear to be mostly based on an overall, generalizing inference. Researchers such as Tooby and Cosmides (2001), Boyd (2009) and Carroll (2005) agree that both of these are adaptations, with the general function of providing a training ground, or playground, for exercising the mind. Mental abilities such as imagination, episodic memory, theory of mind and decoupling ability are thought to be operational in fiction, and may be adaptations in themselves. Imagination, for instance, enables an individual to understand and anticipate situations that are yet to come, and to consider different possible alternatives for action within these situations (Tooby & Cosmides, 2001). This would put the individual at an advantage compared to others, who might be less prepared upon dealing with unforeseen circumstances. The same goes for mental time travel, which can be seen as a combination of episodic memory and episodic future thinking (De Smedt & De Cruz, 2011). Neurocognitive evidence indicates that their neural activation patterns significantly coincide, indicating a shared operation or function (Addis et al., 2007). Mental time travel would also be useful for future action. Foraging success, for example, would be greatly increased if hunter-gatherers could mentally anticipate patterns such as animal migrations and seasonal distribution of vegetation. Theory of mind, in turn, is particularly relevant for achieving insight into other people's minds, including their intentions and emotions. It is thought to result in greater empathy towards others (e.g. Baron-Cohen 1995).

Authors endorsing the simulation hypothesis often claim that fiction is an adaptation because it exercises, and thus strengthens, capacities such as imagination, mental time travel and theory of mind (Boyd, 2009; Tooby & Cosmides, 2001). Empirical evidence in support of this has shown, for example, constructive effects of reading fiction on empathy levels (Mar et al., 2006, 2009). It is possible, however, that the actual evolutionary trajectory of fiction took a non-adaptive pathway, and that engaging in fiction turns out to be, upon closer analysis, a proximate mechanism to meet more functional ends, which might be embodied in some of the cognitive mechanisms involved. Fiction could then encompass a byproduct of a variety of mental abilities such as the aforementioned examples, in the technical sense that, like all other traits, it is built upon pre-existing features of a species cognitive, behavioural or anatomical architecture. As a byproduct, it could emerge and be sustained because of the pleasurable experience associated with it, as Pinker (2007) has pointed out. Further exploration of this might be drawn from phylogenetic insights. As previously outlined, cross-species comparison holds limited power for explaining traits unique to a species, but it does allow for investigating whether constituent properties are perhaps also characteristic of other, usually closely related species. Even if the case of fiction - highly unlikely to occur among non-human animals - animal precursors of relevant human capacities have been found, such as the building blocks of advanced human imagination (e.g. Whiten & Suddendorf, 2007).

If the roots of some cognitive skills thought to be heavily involved in fiction can indeed be found in other species, this raises the question whether the assumption of causality in adaptationist thinking on fiction might have been erroneous. The simulation accounts of Boyd (2009), Tooby and Cosmides (2001) and Carroll (2005) broadly describe fiction as giving rise to, and strengthening imagination, but it is equally possible that the actual evolutionary trajectory operates in the other direction, i.e. after imagination arose in our ancestors' cognitive repertoire, fiction emerged as a non-adaptive spin-off. On a similar note, Sugiyama's reverse engineering approach maps fiction in structural properties such as events, agents and actions, proposing that these help us gain greater understanding of the corresponding properties in the real world. Yet this does not exclude that fiction merely contains these elements *because* they are already characteristic of everyday interaction. Of course the question remains why fictional storytelling would be practised as a proximate mechanism linked to, for example, imagination as an adaptation, i.e. why imagination should be put to work in an apparently non-functional context. Proponents of adaptationist explanations of fiction might argue that engaging in fiction does not appear to produce immediate worldly benefits, as cooperation does. As a consequence, fiction appears to be an end in itself, and not a proximate mechanism.

An answer to this might simply be a return to the simulation hypothesis in itself. According to Tooby and Cosmides (2001), fiction works as an operational adaptation, greatly enhancing our cognitive repertoire in various domains. A similar point is made by Boyd. While arguing that fiction is clearly an adaptation, fulfilling multiple functions, the main function all other functions come from, is that it provides a medium for mental practice (2009).[94] Like Tooby and Cosmides, Boyd thus awards an operational function to fiction, albeit among several other, more general functions. This does not, however, automatically prove that fiction evolved as an *adaptation* to develop these skills further - a statement that in itself appears to suggest that functional relevance is mostly present in these abilities, rather than in fiction as such. The proposed operational function is then taken to be indicative of fiction's adaptive nature. This would, however, be at odds with other interpretations of the simulation hypothesis, which generally tends to state that fiction trains our behavioural and social repertoire, and not the applicable cognitive abilities in themselves (e.g. Boyd, 2009; Carroll 2005; Pinker, 2007), with only Tooby and Cosmides (2001) endorsing a more emphasized computational perspective. Regardless of this, however, it is not clear how fiction would be necessary for developing properties such as imagination, as imagination in itself could accomplish this. In the case of theory of mind, it is also unsure to what extent fiction would comprise significant supportive effects, as theory of mind must ontogenetically *precede* the emergence of fictional storytelling, or children's variants such as pretend play. Such arguments make it more likely that fiction would qualify as a byproduct adopted as a proximate mechanism, rather than an adaptation in itself.

Examples such as the abovementioned ones indicate that it is necessary to award closer attention to the ultimate-proximate distinction in evolutionary research on art. Doing so may lead, as Scott-Phillips et al. (2011) argue, to a recognition of the proposed ultimate explanations being instead located at the proximate level, i.e. among those factors that *enable* cooperation or other functional goals, rather than encompassing this function in itself. This appears counterintuitive given the fact that functions such as social cohesion, cooperation, mate advertisement and choice, and cognitive elaboration are commonly presented as ultimate functions, but a shift in explanatory perspective makes clear that this is not necessarily the case, an option explored above for both the ancestress and the

[94] This could be interpreted as an argument in favour of a main, primary adaptive function, complemented with secondary functions through exaptation or secondary adaptation, but this point is not made by Boyd as such.

simulation hypothesis. Researching ultimate and proximate factors involved in art's evolution therefore requires not only identifying which 'traditional' proximate mechanisms may have been at work, such as neurocognitive features (e.g. Krill et al., 2007; Platek et al., 2011), but also whether the same is perhaps true for its assumed ultimate functions.

8.7. Concluding remarks

The above analysis attempted to show that adaptationist thinking on art is considerably more complex than current adaptationist hypotheses appear to recognize. Approaching art as an evolved complex in order to operationalize it as a replicable unit, first and foremost points out that analysis in terms of explanatory categories such as adaptation, should take place at two levels. Constituent features need to be explained, as well as the overall outcome of art, both of which do not necessarily need to be explained with the same attributed functional value. Because current adaptationist hypotheses tend to endorse a more monolithic view of art, or of a specific kind such as fiction, this complexity is not always reflected in adaptationist explanations. Possible evolutionary trajectories such as mixed design or exaptation are underexplored, although exceptions are present (e.g. Verpooten, 2013). The theoretical distinction between categories such as exaptation and adaptation is unfortunately not always entirely clear (e.g. Justus & Hutsler, 2005; McDermott & Hauser, 2005; Trainor, 2006), but the vast number of interactions taking place between genetically and culturally based features of cognition and behaviour make it advisable to award more attention to the option that several explanations do indeed apply to the same trait, i.e. artmaking.

Adaptationist thinking on art is additionally complicated by the fact that many elements in the above discussion are difficult to assess in an empirical manner. A reliable demonstration of adaptivity should not only include empirical evidence in favour of a proposed function, but also support in favour of its contribution to differential reproductive success. Moreover, a demonstrated function should be explained as an outcome of special design, as it could otherwise equally be an exaptation without additional phenotypic modification. Within such reasoning on art, consistent use of the relevant terms would avoid unnecessary confusion. This is true for some concepts in themselves, such as 'exaptation', which has received a number of different interpretations, as well as for dinstinctions such as primary and secondary adaptations, as was done by Carroll. Terms such as 'effect' are better used only, as Williams (1966) noted, for explaining fortuitous outcomes of existing traits, and not so much to refer to proximate mechanisms, as Coe does.

Finally, several adaptationist hypotheses suggest the relevance of processes of cultural transmission and cultural units of selection, such as Coe's ancestress hypothesis or Dissanayake's artification hypothesis. Yet the ethological and evolutionary psychological nature of the present hypotheses does not appear to incorporate these elements fully, leaving a wide variety of new research avenues as to the involvement of cultural processes and products in art's evolution (e.g. De Smedt & De Cruz, 2012). Perhaps some attributed functions are products of cultural adaptation and evolution, rather than having to be classified as adaptive functions or exaptive effects. Frameworks such as gene-culture co-evolution might be particularly useful in this regard, as they additionally include the option of cultural inheritance, rather than the genetic focus common in the traditional view of the concept of 'adaptation' (Boyd & Richerson, 1985; Richerson & Boyd, 2005).

General discussion and conclusion

Summary of thematic parts

This dissertation had as a main goal to explore, scrutinize, and where possible, to substantiate the methodological foundations of evolutionary research into art. It did so by tackling three different methodological approaches. In Part I, Philosophical anthropology, the overall evolutionary study of art was first comprehensively analyzed by critically framing it within the wider evolutionary study of human behaviour and cognition. Subjects such as the evolutionary emergence of social group formation, cooperation, mate advertisement and choice, and social status all prove to be significant for understanding art from an evolutionary perspective. Conversely, each of these topics in itself can perhaps be better understood by examining to what extent the arts play a role in them. The second chapter within this section looked more closely at how to define art within evolutionary research. Various attempts have been undertaken, but neither of these fully grasps both the complexity of the concept of art, and the methodological characteristics of the evolutionary framework. While a final definition of art is unlikely to be ever achieved, including from an evolutionary perspective, it may be possible to draw from the philosophy of art, in order to arrive at a pragmatic view of art for evolutionary purposes. Generally described, this view implies that we should not only look at the complexities of art itself, and at is pluralist nature in both an evolutionary as well as a cross-cultural manner, but that such pluralism can also extend to art concepts in themselves. The third chapter within this section looked at a particular case study on non-human primate artistic behaviour. It investigated whether the roots of art extend beyond the boundaries of not only our current species, but of the genus Homo as a whole. If this were true, i.e. if chimpanzees and other non-human primates display behaviours that are close correlates of human artistic behaviour, we might have an indication of the ancient roots of art, dating back to at least the last common ancestor of humans and chimpanzees. If art was found in the lineage of chimpanzees and bonobos, the theoretical option would also remain that this occurred through a process of convergent evolution. However, no convincing arguments surfaced that chimpanzee drawing and painting truly parallels early evolutionary stages of human artmaking. Cross-species comparison has, on the other hand, as a significant advantage that it informs us about which partial components of art may be shared with other species. In this case, the empirical evidence that was cited, seems to indicate that aesthetic sensibility in particular is a property that other species might share. Moreover, this does not have to be limited to the domain of non-human primates. Hypotheses such as the sexual selectionist account and the sensory exploitation hypothesis already noted that a wide variety of species can be of relevance for grasping aesthetic elements of visual perception. If more extensive research would be conducted that is based on cross-species comparison, it is not unlikely that results emerging from this could in turn be informative for elaborating the pragmatic approach to art that was outlined in Chapter 2. If aesthetics, for instance, turns out to have old phylogenetic roots, this might warrant that it is awarded a more central place within evolutionary conceptualizations of art.

Part II, Cognitive archaeology, turned to the archaeological record and its cognitive interpretation. Chapter 4 explored the question whether symbolic cognition is a prerequisite for art, by means of a case study on geometrically engraved artefacts. The central analysis in this chapter concerned an assessment of the arguments in favour of symbolic interpretations of these artefacts. Whether engraved artefacts constitute the first objects of art is unclear. Because the abstract markings were added intentionally to different material surfaces, it is at least an important theoretical possibility that these artefacts are the first currently known works of abstract art. Both evolutionary and neurocognitive explanatory frameworks appear to support this option. The presence of symbolism is usually unequivocally assumed for the figurative record of the European Upper Palaeolithic, beginning from around 40.000 BP. The appearance of iconic imagery within a wider archaeological record that includes a variety of other seemingly innovative artefacts and behaviours has led many scholars to assume the breakthrough of modern cognition around this time. Different cognitivist models and explanations were proposed, but their empirical foundations are weak to non-existent. Because brains do not fossilize, contrary to fossil crania, insight into internal brain organization and functions is notoriously difficult to achieve. Some researchers have adopted a more parsimonious stance, not heralding the advent of cognition if this cannot be corroborated by clear arguments and evidence. Chapter 5 explored one such hypothesis, Humphrey's analysis of early cave art in terms of the role of theory of mind impairment. The chapter followed up on this, adopting a philosophy of mind framework, and drawing from different lines of research. It focussed specifically on the ability for metarepresentational thought, and discussed how the art concerned may indeed testify to the early developmental stages of this capacity, rather than to the presence of full-blown modern minds. Because the issues discussed in these two chapters mostly concerned the attribution of advanced cognitive abilities on shaky methodological grounds, the question arose what can be said about art that was potentially created by other human, but non-sapiens species. Among these, Neanderthals in particular have recently been endowed with a range of capacities that were previously thought to be characteristic only of anatomically modern humans. Not only do they seem to have mastered a range of functional behaviours, they are also increasingly associated with practices such as burial, personal ornamentation manufacture and use, and notably, artmaking. The latter often elicit strong debate, as they seem orthogonally positioned with regard to the longstanding view that Neanderthals only outscored Homo sapiens in their body and brain size, but lagged far behind in all other regards. Their rapid extinction around the time of Homo sapiens' arrival in Europe appears to corroborate this. The arguments discussed in the previous two chapters addressed how cognitive inferences are often very easily made from material artefacts, but that the establishment of close connections between, for example, art and symbolism, is perhaps unjustified. As a consequence, although the cognitive repertoire of Neanderthals is in itself as yet unclear, this point in itself does not mean that their behaviour in the form of artefacts should necessarily be assessed in a primitivist manner. Following from this, even if the demonstrated presence of symbolic cognition cannot be ascertained for Neanderthals - as it cannot for Homo sapiens - the so far limited record of artistic and aesthetic practices that was cited as examples in this chapter may indeed be art.

Part III, Evolutionary theory, returned to the core matter of evolutionary explanations. It addressed the argumentative structure of these explanations, by focussing first on the discipline of evolutionary psychology, before moving towards adaptationist explanations. The first of these was the subject of Chapter 7. Evolutionary psychology is among the most notable theoretical approaches adopted for explaining the origins of art. It is the basis of the well known aesthetic fitness indicator hypothesis, colloquially known by means of striking examples such as the peacock's tail and the male bowerbirds' constructs, and of various simulation-based ideas that do not only apply to some of the visual arts described in this dissertation, but notably to the practice of storytelling. Its methodological apparatus does not seem to be sufficiently attuned to the subject of art. Concepts such as 'modules' are difficult to define in themselves, but even more difficult to transfer to complex and multilayered cultural traits such as artmaking. Among the points that were critiqued here, was the often weak argumentative support for adaptationist hypotheses. Because these are not limited to the field of evolutionary psychology, Chapter 8 was dedicated to them as well. Here, two additional evolutionary ethological hypotheses were analyzed in terms of their methodological soundness, and their accordance with more general theoretical discussions of the foundations of adaptationist thought. Components such as evidentiary standards for adaptationist claims, the nature of exaptations versus adaptations, and Tinbergen's four questions-framework with its ultimate-proximate distinction were extended to the subject of art. From this analysis, it emerged that at least for some of these hypotheses, considerably more work needs to be done in order to disentangle various concepts and explanatory levels. Based on the current state of argumentation in, for example, the ancestress hypothesis, it might even have to be concluded that it does not fully qualify as a primary, explanatory adaptationist hypothesis in itself. In other instances, such as for the aesthetic fitness indicator hypothesis and the artification hypothesis, matters that were previously signalled to be problematic, appear instead to fit well within overall adaptationist thought.

The crossroads of evolution, cognition, and culture

Because these three thematic sections were mostly concerned with answering the questions that fall under each one, the potential for their integration is yet to be discussed in more detail. Overall, this integration seldom if ever takes place in the research that was discussed in this dissertation. Evolutionary theorists are often relatively unconcerned with explaining particular chunks of the archaeological record with reference to a certain function, whereas palaeoarchaeologists do tend to be interested in interpreting the nature of material artefacts as traces of ancestral behaviour, but usually by making use of only a fairly limited disciplinary repertoire. Inferences are sometimes drawn from ethnographic examples, but little attention is given to the question whether such analogues are methodologically valid. The same type of ethnographic comparison is occasionally made in explanatory evolutionary hypotheses, especially those rooted in ethology. Yet overall, archaeologists operate within the very specific realm of particular sites and objects, which are explained in terms of their significance in local ancestral societies and with ties to cognition, but are not extended to, or even merely framed within larger-scale evolutionary frameworks. Conversely, evolutionary theorists are primarily concerned with providing such larger-scale framework, sometimes passing by the complex reality of prehistoric art - the record that, if origins are at stake, is the one to be explained.

Several subjects that were discussed over the course of this dissertation explored some of the ways in which insights from prehistoric archaeology and evolutionary theory might be bridged. Geometrically engraved artefacts, for example, are usually explained by providing a number of mere interpretative explanations, of which the least likely are eliminated until an explanation in terms of symbolic meaning remains. However, as the discussion in Chapter 4 showed, evolutionary and neurocognitive insights can be of great value here. Hodgson's neurovisual resonance theory, for instance, adds to the options an explanation that is devoid of any meaning attribution at all, but that merely invokes the structure and workings of the visual brain. Because the burden of evidence for making claims as to the presence of symbolism is with those who endorse these, this particular neurocognitive framework, or evolutionary-based views on proto-symbolism such as those of Dissanayake and Mithen, constitute a more parsimonious view on the subject matter. The same goes voor the analysis of the earliest figurative depictions of the European Upper Palaeolithic. Traditionally symbolic explanations, taken as an indicator of the advent of modern cognition, are poorly, if at all supported by empirical evidence. Changing the perspective from traditional archaeology to a framework drawn from research on the evolution of human cognition, with an emphasis on metarepresentational ability, can remedy this. Because research on contemporary human cognition can be based on the immediate assessment of cognitive abilities of study participants, a careful application of such insights to the record of prehistoric art can yield a new view of the art, which can in turn be extended into a fully valued explanatory hypothesis.

Conversely, evolutionary hypotheses have much to gain from looking more closely at the archaeological record. The breadth of the archaeological record for visual art alone, is so extensive that any hypothesis should at least address the range it tries to account for. Doing so is likely to strengthen its explanatory power, as it becomes possible to formulate more detailed considerations as to how a particular function would have been at work in Prehistory. The sexual selectionist explanation, for example, can be, and has been applied to Acheulean handaxes, but there is a considerable chance that it is also valid as an explanation for practices such as the use of ochre and other kinds of personal ornamentation, and of course to the manufacture of eventual abstract and figurative art itself. Similarly, endorsing an explanation that is based on cooperation and social cohesion, such as those mentioned in the ancestress and the artification hypotheses, would be advanced if such explanations were finetuned to account for very particular parts of the archaeological record. If, for example, increased cooperation or social group maintenance was predicted specifically in relation to personal adornments such as shell beads or pendants, it would be far more transparent to theoretically assess and empirically approach such claims, than if they were made with regard to 'art' or 'the arts' as a whole. In addition, integrating the archaeological record also clarifies the varied and cultural nature of art. While this seems self-evident, the definitional discussion in Chapter 2 clarified how the concept of art is often approached in a monolithic manner, after which it is usually framed within relatively traditional gene-centric approaches that study traits. It is as yet unclear to what extent art can be seen, in one way or another, as a trait in the classic, genecentric adaptationist sense, or whether other approaches centered around the analysis of cultural traits may be more useful. Among these are views in evolutionary archaeology (e.g. Maschner, 1996), or in gene-culture co-evolution. The ancestress hypothesis, for example, may well suffer from the fact that the level of analysis - phenotypic traits such as traditions - mismatches with the explanatory mechanism invoked - i.e. traditional, gene-based natural selection. While this does not necessarily debunk the entire hypothesis, it does appear that processes of cultural evolution might have more to say.

Overall, a methodological perspective that combines three major disciplinary approaches holds the potential for highlighting and addressing issues and questions that could not be fully recognized, let alone addressed, from a single disciplinary point of view. The recognition of this has led to a recent suite of new approaches that bridge cognition and culture. 'New thinking', for instance, endorses the integration of methods and insights from evolutionary biology, psychology, anthropology and neuroscience with those from archaeology, economics, and philosophy (Heyes, 2012). It explicitely targets the premises of standard evolutionary psychology (see also Barrett et al., 2014), and notes how these may be insufficient to account for the complex trajectories of human behavioural and cognitive evolution. New thinking explicitely recognizes the forces of cultural evolution and gene-culture co-evolution, in addition to what is referred to as "techno-social co-evolution." This occurs, for example, when selection pressures for more advanced technological skills become intertwined with selection pressures for social skills: "for example, innovations in tool-making techniques may create pressure for more intensive cooperation, and more intensive cooperation, in turn, puts a premium on further advances in tool making technology." (Heyes, 2012, p. 2093) As a consequence, this view puts forward the possibility that material culture played an active role in the evolution of human cognition (Coward & Gamble, 2008; Malafouris, 2013). On an ontogenetic level, Mithen and Parsons talk about "the brain as a cultural artefact," referring to the various ways in which concrete experiences and cultural behaviours can affect the neuronal structures of an individual brain (2008, p. 418). A similar process might have occurred on a species-wide level, for which the concept of the extended mind appears useful.

The extended mind hypothesis (e.g. Clark, 1997; Menary, 2007) generally states that cognition is not confined to the brain, i.e. that the evolution and manifestation of cognitive abilities is not merely driven by the internal structure and organization of the mind itself. Instead, a variety of external factors can play a role in this. These are often material artefacts, but can also be other externalized media such as written language. As such, ideas concerning the extended mind are part of a larger development of so-called "e-cognition," taken to refer to views of cognition as being "embodied, embedded, enactive, extended, and extensive." (Barrett et al., 2014, p. 10) They extend beyond more mainstream views of gene-culture co-evolution, in that it is not so much an interaction between genetic and cultural properties within a given environment, but rather a feedback loop that is established between the presence of material culture, and the structure of the brain and mind itself. Processes of this kind may have been at work during the evolution of art, and ideas along these lines have cautiously been offered for the explanation of both early geometric mark-making and the emergence of figurative art. In the first case, markings that could have been incidental in origin, probably resonated with the structure of the visual brain, which first led to a reaction of intentional mark-making before embarking upon an evolutionary trajectory that could include the attribution of symbolic meaning at later stages. With regard to Upper Palaeolithic figurative art, particular hypotheses such as those discussed at length in the corresponding chapter, have proposed that here too, we are looking at the early manifestations of cognitive abilities such as externalized representation. The brain could then use these mental images, externalized onto a rock surface, in order to elaborate the neural pathways that were already being laid out. If such views do apply to the record of Palaeolithic art, this highlights the very significant issue that most theorizing up until this point has presupposed a much more linear and onedirectional process from cognition to behaviour, and eventually, to culture.

Future directions

It is inevitable that a dissertation that starts from questions, ends with more questions. Indeed, diving in the world of methodology and meta-analysis sparks more issues, uncertainties, yet-to-be-explored connections and perhaps-impossible-to-answer questions, than it can address within the scope of one dissertation. Even when staying within the evolutionary framework itself, numerous of these remain. Which other conceptual features does evolutionary psychology house that can be relevant for understanding art? What about, for example, the Environment of Evolutionary Adaptedness from standard evolutionary psychology, and is it even possible to address this issue, given the fact that we have virtually no idea about what the earliest manifestations of artistic behaviour were? What would become from a single adaptationist hypothesis if it was in its entirety subjected to theoretical considerations concerning adaptationist thought? Why do byproduct or co-evolutionary hypotheses appear to be subjected less to methodological criticism? Aside from the limited points that have been raised before, which evidentiary standards could we use for these? Can we at all 'prove' that artmaking was an adaptation, byproduct or exaptation for one purpose or another, and in what ways should we approach this matter empirically? Is the category of visual art that was pragmatically adopted in this dissertation in fact too broad to fit within a singular explanatory hypothesis?

To what extent are various biases in the archaeological record detrimental to the formation of evolutionary or archaeological interpretative frameworks? Is any explanatory hypothesis of art's evolutionary origins impaired by the fact that we still have no certainty whatsoever about what art's archaeological origins really are? What are the implications of ever more ancient findings such as the proclaimed Homo erectus engraving from Java, Indonesia? Is the set of apparent non-Homo sapiens artistic or aesthetic practices crucial to our understanding of art, and in what ways? Does it fatally affect some of our long standing and most cherished 'truths' about the nature of early art and its makers? Do these findings make it easier to discover the roots of art, or do they instead make matters more complex? How could an intergration of evolutionary and archaeological data be more thoroughly addressed than was done in this dissertation? Are there advanced ways of testing evolutionary hypotheses against the archaeological record, and what might these be? Aside from the evolution of cognition, how do the workings of the brain fit in? Are neurocognitive processes that were here left aside for reasons of space perhaps essential for clarifying outstanding questions? Indeed, can neuroscience back up some of the arguments in this dissertation, that are of a more speculative nature, such as the analysis of Upper Palaeolithic figurative art from a metapresentational point of view? Or could it debunk some of the statements that were made? How can vastly complex and, at the same time, slightly vague concepts such as 'symbol' be anchored in a neurocognitive manner?

Finally, the philosophical and anthropological questions that can be raised with regard to this subject matter are many. Even if comparative research on chimpanzees concludes that their cognitive abilities do not seem to rival those of Homo sapiens involved in art, does this truly mean that cross-species comparison is of no great use for understanding the origins of art? Do more recent findings of ever older artefacts highlight the centrality of concepts such as aesthetics in art, and should we then return to a cross-species comparative framework in order to assess phylogenetic predecessors of this capacity? Are there other methods of comparison which might yield additional insight? One such method, sometimes invoked in archaeological studies as inferential evidence for the function of prehistoric art, is the development of ethnographic analogues for prehistoric art, but is this scientifically valid? Moreover, is it ethically valid to put contemporary minds on a par with ancestral ones? If not, what other sources of information are there, that have not been explored so far? What about the all-important concept of 'modernity'? Can the evolution of behaviour and cognition truly be seen as reflecting a more or less linear process from premodern to modern minds? Or does the concept of 'modernity' become void in the light of new and ever more exciting discoveries of ancient palaeoanthropological remains and artefactual feats?

Clearly, all of these questions are of great importance for gaining a complete understanding of the origins of art. Some of these can be approached by making use of as yet underexplored hypotheses, such as cultural niche construction theory. Niche construction generally implies that humans, over the course of evolution, transformed their physical and social environments to the extent that they created their own 'niches'. These, in turn, produce new selection pressures, which then lead to the development of new adaptations (Sterelny, 2004, 2007). In essence, niche construction theory is also co-evolutionary in nature, except that it is not primarily genes and culture, or brains and material artefacts, but humans and their environment that co-evolve. Based on the recurring references to the brain in approaches such as niche construction theory, or concepts such as the extended mind, it is clear that the neurocognitive insights will also ultimately prove central to understanding the evolution of art.

In addition to the exploration of new theoretical insights, empirical testing is equally paramount. This can be accomplished in various ways. At the basic level of explanatory evolutionary hypotheses, more studies are needed in order to assess which of the proposed functions is perhaps better supported than others. Such studies, if set up experimentally, must necessarily make use of present-day individuals. It is important to note that if evidence is found in favour of a particular adaptationist hypothesis, such as increased cooperation through art, this is not necessarily true for art's original function. In addition, empirical investigations can target the cognitive features that appear to be involved in art. This is one way in which an empirical approach can contribute to interpreting the archaeological record. If metarepresentational ability was operationalized in a testable manner, for example, it would be possible to assess its role in figurative image-making, even when using present-day participants. Moreover, evolutionary theorizing could be tested not merely experimentally, but in combination with information available in the archaeological record. Specifically, the latter allows for constructing a temporal framework of which artefacts appeared at what time, and under what kind of environmental circumstances. An explanation of art in terms of increased social cohesion and cooperation, for instance, needs to assess whether the timeframe that produced the art being explained, was perhaps characterized by socioecological changes that created new selection pressures for prosociality and cooperation, for which artmaking might be an adaptive solution. Similarly, a hypothesis based on sexual selection benefits from browsing the archaeological record, by means of an assessment of which artefact types might be suggestive of such an explanation. Here, the strikingly symmetrical handaxes of the Acheulean come to mind. Spanning more than a million years of evolutionary time and seeing the appearance and disappearance of various species, they have repeatedly been explained as instances of mate advertisement. The clear aesthetic, non-utilitarian concern taken during their manufacture suggests that they may not only have been functional tools, but additionally, that they testify to the dawn of art.

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English summary

The evolutionary study of art is an upcoming area of research that has, since the last few decades of the 20th century, drawn the attention of authors in fields such as psychology, ethology, anthropology and biology. In addition, it has raised interest among humanities scholars in art history, archaeology and philosophy, with rising numbers endorsing evolutionary explanations for the arts. Some of this research aims to account for the biological origins of visual art, whereas other literature deals with practices such as music making and storytelling. This dissertation approaches the first subject, i.e. visual art, in an evolutionary manner. Specifically, it undertakes a methodological, meta-level assessment of this growing field, by addressing a number of conceptual and methodological questions and issues. These include, but are not limited to scrutinizing the theoretical foundations of evolutionary hypotheses, analyzing how biases in the archaeological record of visual art might influence our interpretation of these findings, and inquiring how art as a biologically based, evolved behaviour is related to a species-wide human nature.

Researching art from an evolutionary perspective is a vastly complex and interdisciplinary undertaking. It does not only make use of a variety of different fields, such as evolutionary perspectives in psychology, ethology, anthropology, archaeology, biology, philosophy and cognitive neuroscience, but also integrates these in many ways. Evolutionary psychology and archaeology have been bridged in the field of cognitive archaeology, whereas the combination of ethology and

anthropology, if framed within an evolutionary context, has produced ethnographically-informed explanatory hypotheses of artistic behaviour. In other cases, such integration does not appear to take place sufficiently, or is undertaken in methodologically less rigorous ways than should be done. The questions that spring from these and other issues are the subject of the present dissertation.

Thematically, this dissertation is composed of three parts. In the first part, entitled 'Philosophical anthropology', the evolutionary study of art is approached from a disciplinary outlook that is generally concerned with the study of human nature. As such, philosophical anthropological considerations can be seen as being foundational aspects of evolutionary research on art. They include, for example, questions concerning attempts to set out the boundaries of art and to understand the practice of artmaking as an essential feature of the human kind, and explorations as to the presence of non-human animal predecessors of art, and the epistemological value of these and other comparative methods. The first chapter within this part comprehensively summarizes the research area of the evolutionary study of art, and frames these findings within the wider study of human behaviour. In addition to providing a brief archaeological overview of the appearance of visual art in the archaeological record, this chapter also discusses the most important evolutionary hypotheses that have been put forward to explain art's emergence, and makes connections with disciplines that provide supportive insights, such as cognitive archaeology, evolutionary aesthetics, and cognitive neuroscience. The second chapter looks more closely at the matter of defining art. While this is already a complicated discussion within aesthetics and philosophy of art, adopting an evolutionary framework requires thinking of art in a more bottom-up, naturalistic manner, necessitating a different approach than those generally used in the traditional humanities. The chapter reviews current attempts at defining art evolutionarily, and adds to this a pragmatic, non-definitional alternative. Finally, the third chapter within the overarching perspective of philosophical anthropology explores if and how art transcends the boundaries of the human species. Specifically, it looks at the subject of 'ape art', or paintings and drawings by chimpanzees that have been put forward as a window to the ancient, phylogenetic roots of art. The chapter investigates theoretical arguments and existing empirical studies on this topic, and concludes that only very partial answers to the question of art's origins will be found among non-human primates.

The second part, 'Cognitive archaeology', studies in more detail the crossroads of archaeology and cognitive science, and places these within an evolutionary framework. It looks closely at three different sections of the archaeological record. In the first chapter, geometrically engraved artefacts from the European Middle Palaeolithic and the African Middle Stone Age are assessed in terms of their presumed symbolic nature. Various ways in which this interpretation can or cannot be maintained are explored, in addition to the more general question whether symbolic cognition is a prerequisite for art. After this, the second chapter turns to the figurative record of the European Upper Palaeolithic. The parietal and portable art from this time is widely regarded as the undisputed beginning of the history of art. In addition, the elaborate nature of these works is commonly interpreted as clear proof that their makers possessed a substantially advanced kind of modern cognition. The intent of this chapter is to assess the role of metarepresentational cognition through the use of cognitive anthropological and developmental psychological insights. It concludes that the often made claims pertaining to fully modern cognition are poorly supported by empirical data. The final chapter in this section tackles the tacit assumption that Homo sapiens, or anatomically modern humans, were the only human species capable of artmaking. Recent archaeological findings and studies have put foward the hypothesis that Homo neanderthalensis, and even the much more ancient Homo erectus also possessed artistic and aesthetic proclivities. These findings are briefly reviewed and weighed in the light of new insights pertaining to the relationship between cognition and culture, concluding that art might indeed not be the sole achievement of our species.

This dissertation concludes with a third section, 'Evolutionary theory', that returns to the core of the subject matter. Theoretical evolutionary approaches to the arts are varied, and the last two chapters address two of these. First, the discipline of evolutionary psychology, and specifically its applications to art, are looked at in more detail. This analysis produces both more general issues which are also relevant for substantiating other disciplinary approaches such as evolutionary ethology, and more specific matters that are paramount to evolutionary psychology in itself. The second chapter in this section, and the last in this dissertation, studies the argumentative structure of adaptationist thinking on art. This view makes use of both evolutionary psychology and ethology. Central theoretical issues and concepts are discussed, leading to several methodological recommendations as to how this line of research could be pursued more fruitfully. The dissertation concludes with a discussion that bridges these various disciplinary points of view.

Nederlandstalige samenvatting

De evolutionaire studie van kunst is een opkomend onderzoeksgebied dat vooral tot ontwikkeling kwam tijdens de laatste decennia van de 20ste eeuw, door de aandacht te trekken van auteurs in disciplines zoals psychologie, ethologie, antropologie en biologie. Daarnaast raken geleidelijk ook meer en meer onderzoekers uit de *humanities* in dit onderwerp geïnteresseerd, en ontwikkelen ook hier steeds meer auteurs evolutionaire perspectieven op, en verklaringen voor kunst. Een deel van dit onderzoek richt zich op het evolutionair verklaren van kunstvormen zoals muziek en narratieve media, terwijl een ander deel vooral begaan is met visuele kunst. Dit doctoraat legt de nadruk op de vraag hoe visuele kunst kan verklaard en geïnterpreteerd worden binnen een evolutionair kader. Meer specifiek wordt hiervoor gebruik gemaakt van methodologische en meta-level vragen, die een groot aantal conceptuele en methodologische vragen en problemen behandelen. Dit houdt onder meer in dat kritisch gekeken wordt naar de theoretische fundamenten van evolutionaire hypothesen, en naar de wijze waarop vertekeningen in de archeologische gegevens die we ter beschikking hebben inzake de oorsprong van visuele kunst, de interpretatie van deze gegevens kunnen beïnvloeden.

Evolutionair onderzoek naar kunst is een complexe onderneming, niet in het minst omwille van de grote mate van interdisciplinariteit. Dit onderzoek maakt niet alleen gebruik van evolutionaire ideeën uit verschillende disciplines, waaronder psychologie, ethologie, antropologie, archeologie, biologie, filosofie en cognitieve wetenschap, maar integreert de bevindingen van deze disciplines ook op verschillende manieren. Evolutionaire psychologie en archeologie worden gecombineerd in het onderzoeksveld van cognitieve archeologie, terwijl het samengaan van ethologie en antropologie binnen een evolutionaire context kan leiden tot etnografisch gebaseerde verklaringshypothesen voor artistiek gedrag. In andere gevallen vindt een dergelijke intergratie niet plaats, of op methodologische gronden die minder rigoreus zijn dan noodzakelijk is. De vragen die uit dit soort en aanverwante kwesties voortkomen, zijn het onderwerp van dit doctoraat.

Dit proefschrift is opgebouwd uit drie delen, die elk een disciplinair kader centraal stellen. In het eerste deel over wijsgerige antropologie wordt de evolutionaire studie van kunst benaderd vanuit een denkkader dat zich richt op de studie van de menselijke natuur. Filosofisch antropologische overwegingen kunnen in zekere zin dus als de fundamenten van dit onderzoek worden beschouwd. Hieronder vallen bijvoorbeeld vragen over de definiëring van kunst, hoe kunst kan begrepen worden als een algemeen kenmerk van de menselijke soort, verkenningen van de mogelijke aanwezigheid van artistieke componenten bij niet-menselijke primaten die Homo sapiens ver vooraf gaan, en van de epistemologische validiteit van dergelijke vergelijkende methoden. Het eerste hoofdstuk in dit deel biedt een overzicht van de evolutionaire studie van kunst binnen een breder kader van de evolutionaire analyse van menselijk gedrag. Naast een kort archeologisch overzicht van de eerste sporen van visuele kunst zet dit hoofdstuk ook de voornaamste verklaringshypothesen uiteen, alvorens verbindingen te leggen met andere vakgebieden zoals cognitieve archeologie, evolutionaire esthetica, en cognitieve neurowetenschap. Het tweede hoofdstuk kijkt in detail naar definities van kunst. Terwijl deze definities al een significante uitdaging vormen voor onderzoekers in esthetica en kunstfilosofie, voegt een evolutionair perspectief hier nog de complicerende factor van een biologische bottom-up benadering aan toe. Dit hoofdstuk omschrijft huidige pogingen om kunst op evolutionaire wijze te definiëren, en voegt hier een pragmatisch alternatief aan toe waarbij geen vaste definitie vereist is. Het derde hoofdstuk in dit deel verkent de grenzen van kunst in relatie tot de grenzen van de menselijke soort. Specifiek wordt gekeken naar het onderwerp van ‘ape art’, dat betrekking heeft op tekeningen en schilderijen gemaakt door chimpanzees. Deze grafische uitingen worden soms vooropgesteld als indicaties voor de fylogenetische oorsprong van visuele kunst. In het hoofdstuk worden theoretische argumenten en empirische studies over dit onderwerp met elkaar geconfronteerd, met als conclusie dat niet-menselijke primaten slechts voor een klein deel inzicht kunnen bieden in het vraagstuk over de oorsprong van kunst.

Het tweede thematisch gedeelte behandelt het perspectief van cognitieve archeologie, of het samengaan van archeologie en cognitieve wetenschap binnen een evolutionair kader. In elk van de drie hoofdstukken wordt nader gekeken naar een specifieke categorie van archeologische vondsten die ons informeren over de Prehistorie van kunst. Het eerste van deze drie hoofdstukken behandelt geometrische markeringen die zijn aangebracht op verschillende soorten objecten tijdens het Midden Paleolithicum, en in het bijzonder hun mogelijke interpretatie als symbolische artefacten. Het hoofdstuk verkent verschillende argumenten waarom deze artefacten al dan niet als symbolisch zouden moeten worden beschouwd, en daaruitvolgend, of symbolisch denken een noodzakelijke cognitieve voorwaarde is voor het maken van kunst. Hierna wordt de aandacht gevestigd op figuratieve kunst uit het Laat Paleolithicum. Muurschilderingen en draagbare objecten uit deze periode worden algemeen gezien als het onbetwiste begin van de kunstgeschiedenis. Het esthetisch gehalte van deze kunst wordt ook vaak aanzien als duidelijk bewijs dat de makers geavanceerde, moderne cognitie bezaten. In het hoofdstuk wordt onderzocht of het vermogen tot metarepresentationeel denken noodzakelijkerwijs moet verondersteld worden voor het maken van figuratieve kunst, en dit met behulp van inzichten uit cognitieve antropologie en ontwikkelingspsychologie. Hoewel beweringen over de aanwezigheid van moderne cognitie in het Laat Paleolithicum moeilijk kunnen weerlegd worden, is er niettemin weinig empirisch bewijs hiervoor. Het laatste hoofdstuk in dit thematisch gedeelte beschouwt de vaak voorkomende, onuitgesproken aanname dat alleen Homo sapiens in staat was tot het maken van kunst. Op basis van recente archeologische vondsten wordt meer en meer gedacht dat dit ook het geval zou geweest zijn voor Homo neanderthalensis, en zelfs voor de veel oudere Homo erectus. Deze vondsten worden kort overlopen en afgewogen in het licht van theoretische bevindingen die een nauwe relatie tussen cognitie en cultuur in vraag stellen, met als conclusie dat het maken van kunst inderdaad mogelijk niet enkel een eigenschap van Homo sapiens is.

Het derde en laatste thematisch gedeelte keert terug naar de basis van evolutietheorie. Theoretische evolutionaire benaderingen van kunst zijn bijzonder gevarieerd, en de laatste twee hoofdstukken van dit doctoraat behandelen twee thema's hierbinnen. In het eerste hiervan wordt de evolutiepsychologische studie van kunst nader bekeken. Dit leidt niet enkel tot meer inzicht in methodologische problemen die eerder algemeen zijn voor de evolutionaire studie van kunst, maar ook in onduidelijkheden en conceptuele problemen die specifiek zijn voor evolutionaire psychologie. Het laatste hoofdstuk analyseert tenslotte de argumentatieve grondslagen van adaptationistisch denken over kunst. Adaptationistische hypothesen maken doorgaans gebruik van zowel evolutiepsychologie als evolutionaire ethologie. Centrale theoretische concepten en spanningsvelden worden aangehaald, wat leidt tot verschillende aanbevelingen voor toekomstig onderzoek in deze lijn. Het doctoraat wordt afgesloten met een discussie die de raakpunten tussen deze verschillende disciplinaire perspectieven onder de aandacht brengt.