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Reviewed work(s):

Source: *Goodwin Series*, Vol. 10, CURRENT THEMES IN MIDDLE STONE AGE RESEARCH (December 2008), pp. 168-174

Published by: [South African Archaeological Society](#)

Stable URL: <http://www.jstor.org/stable/40650028>

Accessed: 03/01/2013 17:07

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# LE ROUGE ET LE NOIR: IMPLICATIONS OF EARLY PIGMENT USE IN AFRICA, THE NEAR EAST AND EUROPE FOR THE ORIGIN OF CULTURAL MODERNITY

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## ABSTRACT

*The increase in the frequency of ochre recovered from African Middle Stone Age sites has been used, along with other discerned changes in hominid behaviour, to support the hypothesis that modern cognitive abilities gradually arose gradually in Africa, in conjunction with the biological changes that mark the origin of our species. In order to assess this hypothesis I review the earliest evidence for the use of pigmentary material in Africa, the Near East and Europe and discuss its evolutionary significance. This review indicates that the earliest, still unresolved, use of pigments at African sites is possibly associated with archaic Homo sapiens and not with anatomically modern humans; it thus breaks the link, established by the Out of Africa scenario, between biological and cognitive change. This link is also challenged by the systematic use of black pigments by European Neanderthals prior to contact with anatomically modern humans. Ongoing analysis of manganese pieces from Neanderthal sites indicates use that is consistent with symbolic activities.*

**Keywords:** ochre, symbolism, body decoration, Neanderthals.

## INTRODUCTION

Many authors have proposed criteria for the assessment of the symbolic status of prehistoric material culture (e.g. Chase & Dibble 1990; Donald 1991; McBrearty & Brooks 2000; Wadley 2001, 2003; d'Errico *et al.* 2003; Henshilwood & Marean 2003; Bouissac 2004). Complex technologies, regional trends in the style and the decoration of tools, systematic use of pigments, abstract and representational depictions on a variety of media, burials, grave goods, and personal ornaments are among the more common long-lasting creations that attest to the complex symbolic nature that has been observed in ethnographically recorded human cultures. However, views diverge on the significance of each of these categories and on the interpretation of individual finds. The production of abstract or representational engravings, the use of personal ornaments and the use of pigments are generally interpreted as the more reliable archaeological expressions of symbolic cultures (McBrearty & Brooks 2000, Henshilwood & Marean 2003; d'Errico & Vanhaeren 2007).

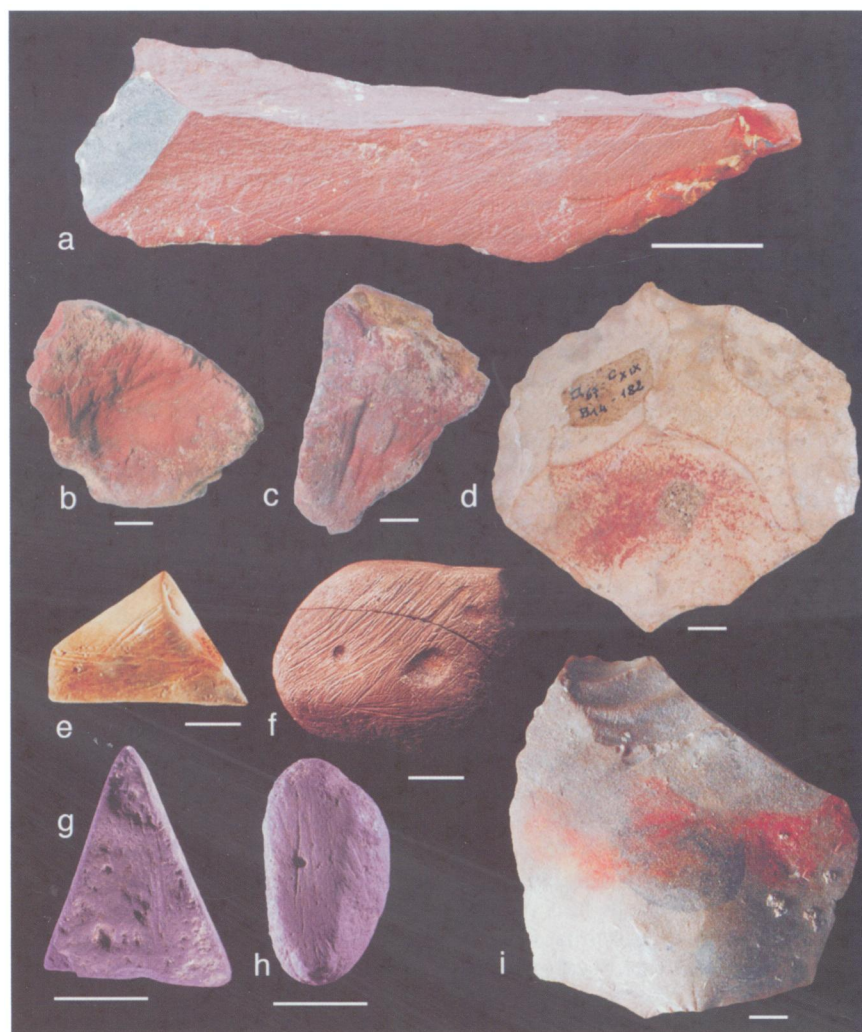
Over the past decade, pigment use has been claimed to be one of the most useful features to differentiate the symbolic capacity of *Homo sapiens* from that of Neanderthals; it has been cited as one of the defining elements of 'modern human behaviour'. Lyn Wadley and the members of her team (Wadley *et al.* 2004; Wadley 2005a,b, 2006; Lombard 2007) have been instrumental in assessing the latter hypothesis and tempering the enthusiasm of those who, perhaps too quickly, have suggested a synonymy between behavioural modernity and pigment use. They have done so by combining careful and systematic microscopic analysis of relevant archaeological material excavated at key Middle Stone Age (MSA) sites and experimental replication of pigment use with a variety of tasks.

This has allowed them not only to investigate in depth the functional uses of ochre, but also to break the dichotomy between functional *versus* non-functional use in order to address more interesting questions, i.e. how pervasive was the use of ochre in the life of MSA societies, what kind of knowledge concerning ochre did these societies create and transmit, and how did this affect other spheres of their cultural systems? I am sympathetic to this approach and I have often followed a similar path to address the significance of different categories of Palaeolithic material culture from Africa and Europe (e.g. d'Errico 1992, 1995a,b; d'Errico *et al.* 1995; d'Errico & Villa 1997; Backwell & d'Errico 2001; d'Errico & Backwell 2003; d'Errico *et al.* 2005). The approach also bears a degree of similarity to the work that Marie Soressi and I are conducting on pigment use by Neanderthals (d'Errico *et al.* 2003; d'Errico & Soressi 2006; Soressi & d'Errico 2007; Soressi *et al.*, in press). I therefore see this volume in honour of Lyn Wadley as the appropriate place to summarize the evidence for the earliest use of pigments in Africa and Europe, to suggest strategies to explore their significance for the origin of behavioural modernity, and to reach some tentative conclusions.

Was pigment use introduced to Europe by anatomically modern human (AMH) colonizers after they had developed it in Africa as a consequence of the cognitive enhancements granted by the origin of our species on that continent, or did it emerge independently in Europe before the arrival of AMHs? Debates over the symbolic behaviour of Neanderthals have always been hampered by the unreliability of much of the evidence that has been invoked in support of it (see Zilhão 2007 and Soressi & d'Errico 2007 for reviews). Relatively few artefacts that suggest symbolic behaviour are reported from Neanderthal contexts before the so-called Middle-Upper Palaeolithic transition, and those artefacts that do exist are often plagued by ambiguity: are they the result of purposeful Neanderthal action or are they the result of non-human factors? Pigment use by Neanderthals, once submitted to a proper analysis, may well be one of the behaviours that is incompatible with an exclusively functional interpretation, and thus may challenge the Out of Africa model for the origin of behavioural modernity.

## THE EARLIEST USE OF PIGMENTS

Twin Rivers in Zambia (Barham 1998, 2002) and Kapthurin in Kenya (McBrearty 2001; McBrearty & Tryon 2006) are among the archaeological sites most cited to support the use of pigments as old as the Acheulean–Middle Stone Age transition (~200 ka ago). At the site of GnJh-15 in the Kapthurin formation, more than 70 pieces of red pigments, with a total mass of more than 5 kg, were apparently associated with an early MSA assemblage ~285 ka old. These pieces, however, have not been analysed, nor illustrated in a publication. Fieldwork at Twin Rivers in 1999 led to the discovery of 176 fragments of pigmen-



**FIG. 1.** Modified pigments and ochre-stained stone artefacts from: cave PP13B at Pinnacle Point, Mossel Bay (1a); the Mousterian levels of Qafzeh, Israel (b–d); the Middle Stone Age levels of Klasies River (e) and Blombos Cave (f), South Africa; the Mousterian levels of Pech-de-l’Azé I, France (g–h); and the Middle Stone Age levels of Sodmein Cave, Egypt (i) (after Van Peer & Vermeersch 2000; Wurz 2000; Henshilwood et al. 2001; Hovers et al. 2003; Marean et al. 2007). Scale bars = 1 cm.

tatious material in layers with ages of about 260 ka and 400 ka. The ~260 ka old layers yielded 132 pieces of pigmentary material. Five different pigment colours with traces of use were recorded. Geological surveys suggest that prehistoric people must have collected these pigments several kilometres away from the settlement site. Discoveries at these two sites were used to confirm previously isolated and undated occurrences of red pigments recorded at sites such as Nooitgedacht (South Africa), Kabwe (Zambia) and Charama (Zimbabwe). The Acheulean site of Berekhat Ram, Golan Heights (Near East), which is about 250 ka old, yielded a reddish tuff clast on which a circular groove was carved (d’Errico & Nowell 2000). The experimental reproduction of this object on the same raw material consistently produced ground red pigment, indicating that this may be one of the explanations for the groove.

More robust evidence for the early systematic use of pigments comes from cave PP13B located at Pinnacle Point near Mossel Bay (South Africa). At this site 57 pigment pieces, with a mass of 93.4 g, were recently excavated from layers ~164 ka old (Marean et al. 2007). Ten pieces have probable traces of scraping or grinding and two were interpreted as having been used; but no further functional interpretation was presented (Fig. 1a). More than 8000 fragments of ochre, which include about 600 with clear anthropogenic modifications (Henshilwood, pers. comm. 2007), come from the ~75 ka old

MSA layers at Blombos Cave (Fig. 1f). Utilized ochre is also abundant in the underlying MSA units M2 and M3 at Blombos – the latter unit is between 125 ka and 140 ka old (Jacobs et al. 2006). The abundant ochre found in the M3 layers of Blombos is thus chronologically close to the worked pieces recently found at Pinnacle Point by Marean et al. (2007).

Although ochre is a common feature at most MSA sites (Fig. 1a, e, and f), the use of red pigments increases during the later phases of the MSA and becomes a constant feature of MSA 2b/Still Bay, Howieson’s Poort and MSA III sites (Watts 1999; Wurz 2000; Rigaud et al. 2006). According to Watts (1999, 2002) people living during the MSA had a preference for the use of a strong red colourant even when yellowish or yellowish-brown material of similar chemical composition was available. These deliberate choices seem to contradict a purely functional interpretation for pigment use. Many MSA colourants are shaped as crayons, suggesting they may have been used to trace lines on soft material such as leather or for body painting. However, experimental work indicates that ‘crayons’ could be a by-product of ochre grinding (Wadley 2005b) and that red ochre might have advantages over yellow ochre with regard to preservation and adhesive properties (Wadley 2005a).

Evidence that indicates that the spread of pigment use is not limited to sub-Saharan regions comes from the site of Sodmein in Egypt (Van Peer & Vermeersch 2000). A Levallois



flake from levels of ~115 ka old is marked on both sides by a continuous red ochre line perpendicular to the flake main axis (Fig. 1i). Van Peer *et al.* (2003) also report that yellow and red ochre was ground in shaped mortars, with selected chert nodules, in an early MSA Sangoan context with an age of ~200 ka on the 8-B-11 Sai Island in the north of Sudan. More than 100 fragments of red pigments, some bearing traces of use, come from the Mousterian levels of Qafzeh, (Israel) ~100 ka old (Fig. 1b,c,d). Qafzeh has yielded burials attributed to AMHs, but no pigments have been found in clear association with the skeletons (Hovers *et al.* 2003).

Taborin (2003) and Hovers *et al.* (2003) reported four complete *Glycymeris* sp. shells each with a perforation on the umbo, and a fragment of bivalve belonging to the same species, from Qafzeh. Walter's (2003) analysis has detected the presence of ochre inside one specimen and manganese oxide, probably post-depositional in origin, both inside and outside two other specimens. At present it is difficult to establish whether these shells were used as ochre containers, palettes or personal ornaments. The shells were certainly brought to the site, which is 40 km from the sea. However, no traces were detected on the perforations to indicate that the shells were deliberately perforated, and no studies of modern or fossil *thanatocoenoses* were conducted in order to quantify the occurrence of perforations on the umbo in natural assemblages. Recent analysis was conducted on accumulations of dead *Glycymeris* sp. shells from the Israeli coast, to study the palaeoecology of this species. The analysis indicates that 19.7% of the shells are unbroken with an abraded hole in the umbo, as are those from Qafzeh (Sivan *et al.* 2006). This implies (d'Errico & Vanhaeren 2007) that the probability of a chance selection of four such shells in a natural accumulation is low ( $P = 0.008$ ), and it suggests that Qafzeh inhabitants either selected naturally perforated *Glycymeris* or deliberately perforated them, leaving no obvious manufacturing traces; alternatively, they left traces that were subsequently erased by taphonomic processes. Deliberate collection or perforation of the shells is consistent with use for personal ornaments, but a function as a palette or a combination of the two, cannot be discarded.

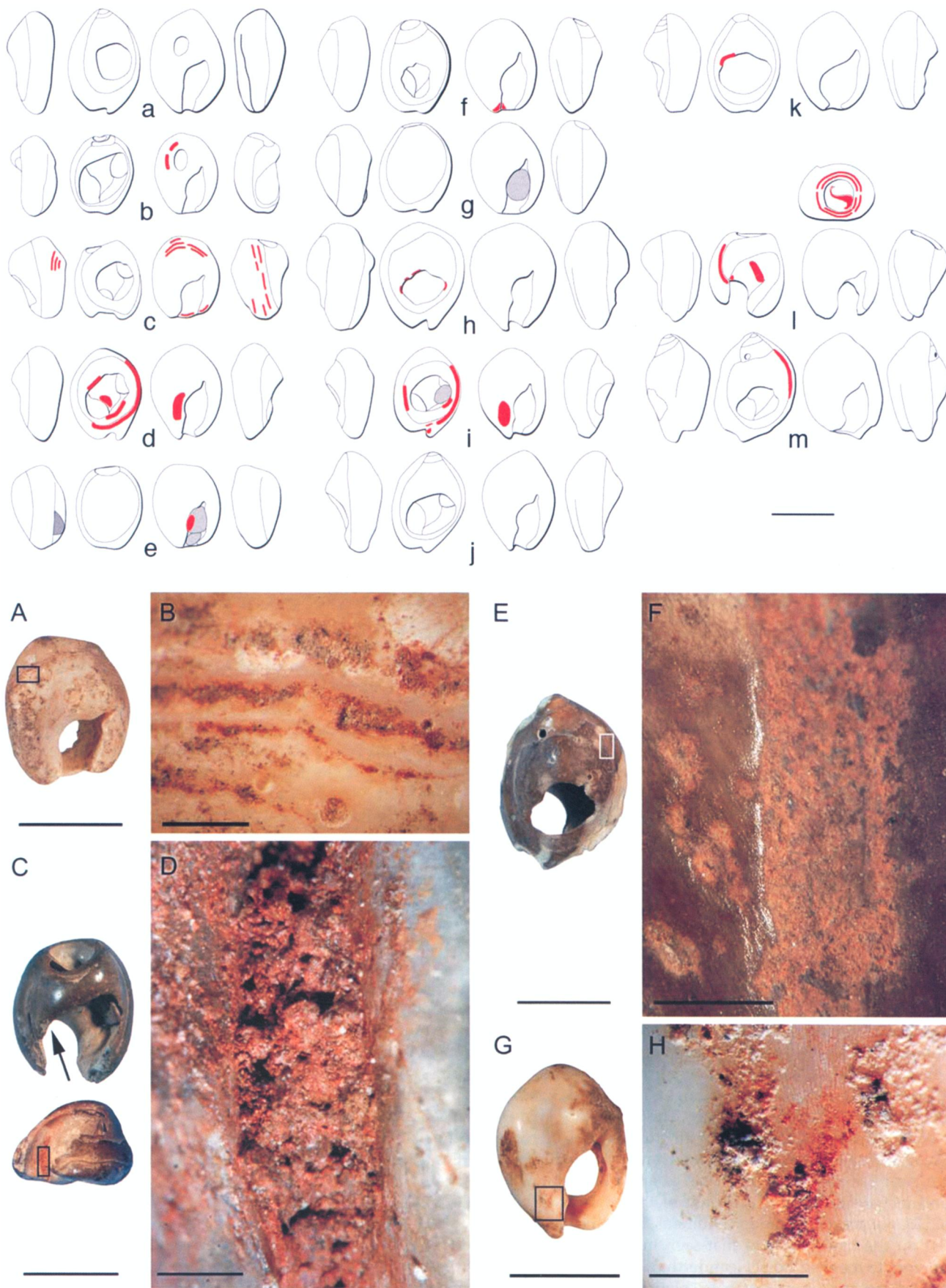
More compelling evidence for the early use of pigment in body decoration comes from the discovery of red pigment residues adhering to shell beads discovered at the Grotte des Pigeons, Taforalt, Morocco (Bouzzougar *et al.* 2007), and at Blombos Cave (Henshilwood *et al.* 2004; d'Errico *et al.* 2005). At the Grotte des Pigeons, microscopic residues of red pigment were detected on one unperforated *Nassarius gibbosulus* shell and on nine perforated shells, out of a total of 13 *N. gibbosulus* shells that were found in layers ~81 ka old (Fig. 2). In some cases the residue is in the sediment obstructing the aperture. In other cases it is trapped in the groove at the contact between the last body whorl and the parietal shield, on the edges of the perforations, on the columella, in fissures in the parietal shield, and in the syphonal canal. On one shell (Fig. 2i) pigment residue is sealed by a calcite concretion. Elemental and mineralogical analysis of the residue on this shell has identified the red pigment as iron oxide with a very high proportion (over 70%) of iron. Four of 41 perforated *Nassarius kraussianus* beads from Blombos Cave layers with an age of ~75 ka, show microscopic traces of red ochre within the shell and on the outer surface. No ochre residues occur on other gastropods found in Blombos MSA layers. Deposition of pigment on the shells may have occurred 1) accidentally during the manufacturing process if the perforating tool and/or the maker's hands had ochre on them, 2) if the shells came into contact with ochre in a pouch or other container, 3) because of deliberate colouring of

the beads, 4) from rubbing against ochre on hide, skin, thread or other material, or 5) from post-depositional contact with ochre in the sediment.

The first hypothesis seems unlikely in the case of two of the perforated shells from Taforalt that have clear traces of wear, because the pigment residues are found on the worn area and post-date any manufacturing process. On these specimens the pigment is caught in micro-cracks that cross the worn area, indicating that wear and colouring were interlinked. This suggests that the presence of ochre on the perforated shells is probably due to rubbing against ochre-stained material during 'use'. No other objects (e.g. artefacts or bones) from the Taforalt deposits carry similar pigments, nor are there obvious particles of natural ochre in the sediments. More or less hydrated iron oxides have contributed a reddish colour to the carbonate and phosphate concretions present in the sediment, and they sometimes adhere to larger objects (especially bones) at the site. It is, however, extremely difficult to see how purer iron oxide could have been deposited on the shells at any point during the diagenesis of these cave sediments, and, if so, how it could have been so closely integrated with the wear patterns. This suggests that the red pigment was an element of the beadwork. The application of red pigment to strung beads may have added visual symbolic value, since these were the only items with evidence of colourant in the cave.

In Europe, more than 70 levels ascribed to the Lower and Middle Palaeolithic yielded material described as blocks of pigment, or as stones used to grind or crush pigment. Most of the pigment used by Neanderthals is manganese dioxide, which produces a black pigment. Red pigment is rare. The pigments are from sites dating mostly to the end of the Middle Palaeolithic, with ages from about 60 ka to 40 ka ago, and are attributed to the so-called 'Mousterian of Acheulean tradition' or the 'Charentian Mousterian'. Ongoing analyses, conducted by Soressi and myself (Soressi & d'Errico 2007), have thus far concentrated on two neighbouring sites: Pech de l'Azé I and Pech de l'Azé IV. The former, excavated in the 1960s by François Bordes, has delivered the largest known collection of Mousterian pigments (Soressi *et al.* 2002). More than 500 blocks of pigment come from this site (Fig. 3), some found during the new excavation in a level older than 43 ka (Soressi *et al.* 2007). Most of the Pech de l'Azé I deposit was excavated during the nineteenth century, so it is likely that the 500 blocks and fragments being studied represent less than half of the manganese fragments abandoned by Neanderthals at the site. The upper layers of the nearby site of Pech IV are contemporary with Pech I (McPherron *et al.* 2001), but have yielded only 26 pieces of manganese dioxide, within nine archaeological levels. Fifteen of these pieces bear traces of modification. A few pieces of red and yellow ochre were also found at both sites, but these have no clear traces of use.

Although manganese is available in the environment close to the Pech sites, the variety of raw material shapes (slabs of various thickness, and pebbles), and the composition suggests the Neanderthals were aware of a variety of potential sources for this pigment. Analysis of the blocks reveals a clear difference between the natural surfaces of the pieces that are usually irregular, and areas used by humans, that are flattened by abrasion and sometimes appear to be polished. Few of these pieces appear to have been scraped or engraved by a sharp object like a flint edge or a piece of bone. Two hundred and fifty pieces from Pech I have ground facets. A number of factors indicate that these modifications are due to the use of pigments and are not natural or post-depositional in origin: 1) a worn grindstone stained with pigment came from the level richest in manganese



**FIG. 2.** Top: areas in red indicate the location of red pigment residues on *Nassarius gibbosulus* shells from Grotte des Pigeons, Morocco. Bottom: pigment residues on the ventral side (A–B, i), inside the bodywhorl (C–D, l), on the dorsal side (E–F, m) and close to the syphonal canal (G–H, i). Rectangles in A, C, E, G and the arrow in C identify the area enlarged in the adjacent micrograph. Scale bars: a–m, A, C, E, G = 1 cm; B, D, F, H = 500 μm (photographs modified after Bouzzougar et al. 2007).





**FIG. 3.** Manganese pieces from the Pech de l'Azé I Mousterian site showing flat facets produced by grinding.

fragments, 2) the abraded facets are similar to those observed in the MSA, in the Upper Palaeolithic and in experimentally ground pigments, 3) the location and morphology of wear surfaces are not random. The narrow edges of the blocks were systematically used in order to produce elongated facets. To produce these facets, Neanderthals exerted a back and forth movement on a grindstone, in a direction parallel or oblique to the axis of the future facet. This process helped to produce flat or slightly convex facets. Seventy per cent of these facets have parallel striations visible to the naked eye. On the remainder of the facets, the prominent areas between striations are smoothed and in some cases, the surfaces of the facets have lost all trace of the original grinding.

Quantitative analysis of the micro-topography of the facets on archaeological samples, and of the surfaces of manganese fragments experimentally modified or used in thirteen different ways, suggests that after Neanderthals had ground the manganese pieces they used them to mark soft material such as animal or human skin. The elongated shape of the facets on the archaeological specimens is consistent, as confirmed experimentally, with producing clearly visible straight black lines, perhaps arranged to produce abstract designs. The use of black pigment for body painting is consistent with the findings of recent palaeogenetic analyses of Neanderthal remains from El Sidron Cave, near Oviedo, Spain. Lalueza-Fox and colleagues (2007) found in two individuals a variant of the Melanocortin allele (MC1R), not present in modern humans, but which causes an effect on the hair similar to that seen in modern redheads. According to these authors, Neanderthals probably had white skin and the same range of hair colour present in modern European populations, from dark to blond and red. It is also consistent with recent genetic evidence (Krause *et al.* 2007) that indicates that a critical gene known to underlie speech – namely FOXP2 – was present in the Neanderthal genome and

that its appearance predates the common ancestor (proposed to be around 300 ka to 400 ka old) of modern humans and the Neanderthals (Krause *et al.* 2007).

The use of ochre became widespread in Europe after 35 ka ago with the Aurignacian, the archaeological culture generally interpreted as reflecting the colonization of the European territories by AMH. Ochre, however, is also found at sites attributed to other Early Upper Palaeolithic technocomplexes such as the Chatelperronian in France and the Uluzzian in Italy. Substantial quantities of red and black pigments are, for example, found in the Chatelperronian layers of the Grotte du Renne, Arcy-sur-Cure, some of them clearly shaped by grinding, possibly to create crayons (Leroi-Gourhan & Leroi-Gourhan 1965; Salomon, pers. comm. 2006). The Uluzzian levels of Cavallo Cave, Apulia, Italy, have also yielded fragments of ochre and limonite (Palma di Cesnola 1993). Ochre crayons carved by scraping and decorated with sets of notches have been found recently at the Early Upper Palaeolithic site of Pekary Ila, Poland, in Pre-Aurignacian layers (d'Errico & Vanhaeren, in press a). The human remains associated with the Chatelperronian indicate that this cultural tradition is due to Neanderthals (Bailey & Hublin 2006). This implies that at the end of their evolutionary history some Neanderthal communities were using both black and red pigments.

#### CONCLUDING REMARKS

The observed increase in the frequency of ochre pieces from African MSA sites has been cited, along with other changes in hominid lifestyle, to support the hypothesis that modern cognitive abilities arose gradually in Africa, in conjunction with the biological changes that mark the origin of our species (Watts 1999; McBrearty & Brooks 2000). The first problem with this interpretation is that the emergence of modern behaviour in Africa seems older than the estimate that geneti-

cists propose for the origin of our species (e.g. Ingman *et al.* 2000), and older than the age of the oldest known African fossils attributed to modern humans (e.g. Clark *et al.* 2003; McDougall *et al.* 2005). This indicates that archaic *Homo sapiens* and not AMHs may have been responsible for the first use of pigments in Africa, thus breaking the functional link established by the Out of Africa scenario between biological and cognitive change. The publication of a detailed description of the allegedly-used pigments from the Kapturin formation is needed to test this hypothesis. The second problem is that there is convincing evidence for systematic pigment use by European Neanderthals prior to any contact with AMHs. Ongoing analysis of Pech I pigmentary materials shows that the use of manganese pieces is, at least at that site, consistent with their use for body and garment decoration; such behaviour is usually associated with the need to transmit socially-mediated information. A degree of uncertainty remains, and probably always will remain, when symbolic intent is attributed to technical actions. This ambiguity, however, equally affects the interpretation of Neanderthal pigments and MSA pigments. One may even argue that there should be more concern over the ambiguity of MSA pigments, since the modified areas of these pieces have not yet been submitted to the type of analysis applied to Pech I pieces. The systematic use of pigments by Neanderthals shows that this is not species-specific behaviour and supports the view that the cognitive prerequisites of modern human behaviour were in place prior to the emergence of both biologically 'archaic' and 'modern' populations (d'Errico 2003; Zilhão 2006; 2007; d'Errico & Vanhaeren, in press b).

## ACKNOWLEDGEMENTS

I would like to thank Marlize Lombard for inviting me to contribute a chapter to this volume honouring Lyn Wadley, and for her constructive comments on the first draft of this manuscript. I also thank Marie Soressi, Marian Vanhaeren, Chris Henshilwood, Joao Zilhão and Karen Van Niekerk, for the stimulating discussions we have had on the topic over the last ten years. This work was funded by the Origin of Man, Language and Languages programme of the European Science Foundation (ESF) and the French Ministry of Research (ACI Espaces et territoires).

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