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The pigments from Pinnacle Point Cave 13B, Western Cape, South Africa☆

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ABSTRACT

Earth pigments from the three excavations at Pinnacle Point Cave 13B (Western Cape Province, South Africa), spanning the terminal middle Pleistocene and earlier late Pleistocene, are described and analyzed. Qualitative geological categorization primarily rested on textural, fabric, and iron enrichment attributes. Comprehensive recovery allowed identification of non-anthropic pigmentaceous materials, questionable pigments, and 380 pigments (1.08 kg). Less chemically altered pigments were typically fine-grained sedimentary (FGS) rocks, tending to be soft, highly micaceous, prone to laminar fragmentation, and with reddish-brown streaks of intermediate nuance. More iron-enriched forms tended to be harder, denser, poorly micaceous, and with redder streaks of more saturated nuance. Some still qualified as FGS forms, but a large number were categorized as sandstone or iron oxide. Despite some temporal change in raw material profiles, circumstantial evidence suggests primarily local procurement from one outcrop throughout the sequence. Definitely utilized pieces (12.7%) were overwhelmingly ground. Unusual forms of modification include several notched pieces and a deliberately scraped ‘chevron.’ Controlling for fragmentation, streak properties of utilized versus unutilized pieces were used to investigate selective criteria. There was robust evidence for preferential grinding of the reddest materials, strongly suggestive evidence for saturation and darkness being subordinate selective criteria, and some indication of more intensive grinding of materials with the reddest, most saturated, and darkest streaks, and for some deliberate heating of pigments. These findings challenge the initial stages of color lexicalization predicted by the various versions of the basic color term (BCT) hypothesis, they provide grounds for rejecting hafting as a general explanatory hypothesis, and they cannot be accounted for by incidental heating. The results are more consistent with agreed upon canons of ornamentation than with individual display. It is concluded that the material was processed to produce saturated red pigment powders. On theoretical grounds, these are presumed to have served primarily as body paints in ritual performance.

Introduction

With consensus regarding our African origin close to 200 ka, the use of what are generally presumed to be earth pigments (overwhelmingly red ochre/hematite) in the African Middle Stone Age (MSA) has figured prominently in debates about the evolution of symbolic culture (Deacon, 1995; Knight et al., 1995; Power and Aiello, 1997; Power, 1999, 2004, 2009; Watts, 1999, 2002, 2009; McBrearty and Brooks, 2000; Wadley, 2001, 2005a; Barham, 2002, 2004; Henshilwood and Marean, 2003; van Peer et al., 2004; d’Errico, 2008; see also Hovers et al., 2003). Ochre is the only artifactual material frequently encountered alongside MSA stone tools. Despite the unprecedented interest, detailed or even moderately detailed accounts of pigment assemblages—whether in Africa or elsewhere—are rare (e.g., Couraud and Laming-Emperaire, 1979; Couraud, 1991; Smith et al., 1998; Barham et al., 2000; Henshilwood et al., 2001; Barham, 2002; Hovers et al., 2003). A corollary and partial explanation of this situation has been an underdeveloped research agenda.

With a wide range of views regarding the antiquity of symbolic culture (cf. Henshilwood and Marean, 2003) and with few potential early pigments adequately reported, there are divergent claims regarding basic issues such as the antiquity of pigment use and the range of colors (compare Hovers et al., 2003; Watts, 2009). Problems in evaluating the archaeological record are compounded by unresolved epistemological and methodological issues as to what qualifies as pigment, appropriate quantitative measures, and whether there are systematic taphonomic and excavator biases in ‘pigment’ assemblages (Marshack, 2003; Kuhn and Stiner, 2007; Wadley, 2009). At an interpretative level, was ochre used as a tanning agent or as a functional ingredient in hafting cement and could such uses account for much MSA ‘pigment’ (Wadley et al., 2004; Wadley, 2005a)? Do pigment hypotheses have temporal and color selection implications (Knight et al., 1995; Hovers et al.,

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2003)? Are these different from predictions derivable from functional hypotheses? Can rates of utilization between colors be used to identify past selective criteria?

An underlying issue is that archaeologists have often been reluctant or unable to undertake descriptive analysis, viewing this as either beyond their expertise or likely to offer little return for the effort involved. The following analysis of material from Pinnacle Point Cave 13B (PP13B) provides both an empirical contribution and an illustration of how simple descriptive methods can help to characterize raw material variability, identify past selective criteria, and possibly provide clues as to the manner of use. New questions are raised, some of which will be better addressed by archeometric techniques or more refined descriptive methods.

Context

While there can be no formal definitional criteria, the utility of potential earth pigments primarily rests on pulverulence (softness and absence of gritty impurities), staining power, and the particular color (Brabers, 1976; Chaloupka, 1993: 83; Jercher et al., 1998: 385). Red and yellow earth pigments—generally referred to as ochre (cf. Supplementary Online Material [SOM], published with the online version of this article at doi:10.1016/j.jhevol.2010.07.006)—typically take their colors from hematite (an iron oxide producing a red streak) and/or goethite (an iron oxide-hydroxide producing a yellowish-brown streak). Ochre typically results from chemical weathering of a parent rock, involving—inter alia—oxidation and concentration of iron (with or without hydration). The most common accessory minerals are clays (including clay-micas) and quartz. Mineral ratios can vary enormously within a weathering profile, so ochre can be relatively pure or highly heterogeneous (Jercher et al., 1998: 385). The heating of pigments, whether deliberate or incidental (through proximity to hearths), may change their color. Goethite transforms to hematite at fairly low temperatures (Wadley, 2009), while ethnographic evidence suggests that heating of already red forms (ochre or hematite) may further redden and darken the streak (e.g., Jones and Meehan, 1978: their Fig. 3 and p. 32; Le Roux and White, 2004: 98; SOM; but see Wadley, 2009). The specific environment of heating (oxidizing versus reducing conditions and the presence/absence of organic material) may also affect color change, inhibiting or facilitating the phase transition to browner maghemite (Capel et al., 2006; Herries and Fisher, 2010). Small fragments of ochre (<21 mm thick) are more likely to undergo uniform color change than larger pieces (Wreschner, 1983: 33).

A preference for relatively pure hematite over earthy red ochre is ethnographically documented (e.g., How, 1962: 34; Chaloupka, 1993: 83; see SOM), hematite typically producing a darker, more saturated, redder powder—that when burnished may provide a metallic sheen. Heating of both earthy red ochre and of relatively pure hematite to similarly enhance pigment properties is as widely reported ethnographically as the heating of yellow ochre (SOM). In cultures with just two or three 'basic color terms' (cf. Berlin and Kay, 1969), saturated red is invariably identified as exemplary of one of the terms (Heider, 1972: 451; Jones and Meehan, 1978: 27; Levinson, 2000: 10; see SOM); the same cannot necessarily be said of black or white. Dark saturated red tends to be singled out as particularly salient (Heider, 1972: 451; Jones and Meehan, 1978: their Fig. 3).

Global evidence for early (pre-40 ka) pigment use has briefly been reviewed elsewhere (Watts, 2009; see also SOM [including the missing bibliographic details for works cited in Watts, 2009: his Table 4.2]). Initial use probably dates to the middle of the middle Pleistocene at ∼400–500 ka. African later middle Pleistocene occurrences greatly outnumber Eurasian counterparts. Some sites in the African tropics document regular use from ∼300 ka (McBrearty, 2001; Barham, 2002). In South Africa, despite a cluster of Fauresmith occurrences (probably spanning from 276 ± 29 ka to >350 ka; cf. Beaumont and Vogel, 2006: their Table 2), regular and ubiquitous use in rock shelters can only be inferred from between 150 and 170 ka (Watts, 2009). In Eurasia, by contrast, following three or four occurrences >200 ka there is a find gap of approximately 100,000 years (Wreschner, 1982) and nearly all Neanderthal Mousterian occurrences postdate c. 60 ka (Soressi and d'Errico, 2007: 303). The late Mousterian record remains patchy, but includes compelling indirect evidence for body ornamentation (Zilhão et al., 2010). Pigment use may have been more influenced by locally contingent ecological factors (e.g., demography and seasonality) than genetic/cognitive constraints (cf. Power, 2009; Zilhão et al., 2010). Nevertheless, habitual and ubiquitous use of red ochre (where regionally available) approximates a species-specific behavioral trait for *Homo sapiens*. That within the African tropics such behavior may precede our speciation accords with the view that behavioral change tends to be the 'pacemaker' of evolutionary change (Mayr, 1982: 612).

Of approximately 18 African sites with middle Pleistocene pigment assemblages, only Twin Rivers (Zambia) has been adequately published (Barham, 2002). There, the principal finding was that specularite (laminar crystalline hematite), providing a dark, 'purple shade of red' that sparkled (Barham, 2002: 185), was preferentially procured and utilized over lateritic hematite—despite being harder to grind and probably coming from further away (for discussion of additional possible pigments, see SOM). Preferential use of saturated reds was reported at PP13B (South Africa; Marean et al., 2007). Yellow predominates in the 'Lower Sangoan' horizon at Sai Island (Sudan; van Peer et al., 2004), the only middle Pleistocene assemblage not exclusively or overwhelmingly comprising red pigments. The only late Pleistocene MSA assemblages to have been reported in some detail are from Mumba Cave (Zambia; Barham et al., 2000) and Blombos Cave (Henshilwood et al., 2001; Watts, 2009), a coastal site 85 km west of Pinnacle Point. Blombos also showed preferential use of the reddest, most saturated pigments. Rare evidence for use of black, white, or yellow pigments in Southern Africa is largely restricted to post 80 ka contexts (Watts, 2002: 10; Klein et al., 2004: 5710), although some very light, poorly chromatic, utilized pieces are reported from c. 100 ka at Blombos (Henshilwood et al., 2009: their Figs. 16 and 18).

This report expands on the brief, published account of the middle Pleistocene PP13B assemblage (Marean et al., 2007), integrating it with an analysis of the late Pleistocene assemblages. Most late Pleistocene excavation aggregates have provided sequential age estimates between 128 and 91 ka, although there is an MSA aggregate dating to c. 37 ka and several disturbed aggregates. The stratigraphy and dating are described elsewhere (Jacobs, 2010; Marean et al., 2010).

Interpretative frameworks

Summaries of most of the principal interpretative frameworks have been presented elsewhere (Watts, 2009; see also SOM). The original version of the 'basic color term' (BCT) hypothesis (Berlin and Kay, 1969)—invoked by some archaeologists (e.g., Hovers et al., 2003: 493)—predicted that the earliest color terms would be 'black' and 'white' followed by 'red.' Kay and McDaniel's (1978) revision predicted an initial pair of 'light/warm' and 'dark/cool' composite terms (jointly partitioning the perceptual color space), followed by a division of the former into 'white' versus a 'warm' composite focused on red or yellow. The latest revision (Kay and Maffi, 2000) predicts two possible starting points: either a 'black,'