4 Red ochre, body painting, and language: interpreting the Blombos ochre

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4.1 Introduction

Whereas language leaves no material trace, collective ritual—with its formal characteristics of amplified, stereotypical, redundant display—might be expected to leave a loud archeological signature. Does the archeological record of ochre use provide such a signature, and can it indirectly contribute to our understanding of the evolution of language?

I begin by highlighting the formal differences between language and ritual as modes of communication. Why, despite having opposed characteristics, is ritual widely regarded (Durkheim 1961; Rappaport 1999; Knight 1999) as establishing the social conditions for language? I then turn to the principal theories and inductive hypotheses that can be brought to bear on the interpretation of early (pre-45 ky) ochre use. In addition to being the first major theorist to posit a link between language and ritual, Durkheim drew attention to the role of body-painting in grounding the collective representations central to ritual action. Subsequent theoretical perspectives can be distributed along a spectrum. At one extreme is the innatist view that biology provides sufficient constraint to account for universal features of color labeling (Berlin and Kay 1969). Although this "Basic Colour Term" (BCT) theory is biological, it is not evolutionary and generates no predictions as to when pigments should be expected to emerge. It has, however, been used to predict the order in which different pigments should appear (Hovers et al. 2003). At the other

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extreme is the "Female Cosmetic Coalitions" (FCC) model (Knight et al. 1995; Power and Aiello 1997; Power this volume). This sets out from premises in human behavioral ecology, prioritizing the role of reproductive strategies in driving early pigment use and generating archeologically testable predictions. Between these two poles is the qualified innatism of Deacon (1997: 119), who treats the evolution of BCTs as subject to constraints from both neurophysiology and "pragmatic constraints of human uses." Deacon's model specifies a ritual and a temporal context, but is indistinguishable from BCT theory with respect to the sequence in which terms should arise. Finally, challenging the presumption that ochre was a pigment, several utilitarian hypotheses have been proposed (Klein 1995; Wadley et al. 2004; Wadley 2005a). I evaluate these perspectives and their implications in the light of a survey of early potential pigments and my research on the Blombos Cave ochre assemblage.

4.2 Context

Our species evolved in Africa sometime between ~150 ky and ~200 ky (Ingman et al. 2000; McDougal et al. 2005). Shell beads and geometric engravings on red ochre (d'Errico et al. 2005; Bouzouggar et al. 2007; Henshilwood et al. in press) indicate that symbolic traditions were present in Africa by the time a small subgroup of *Homo sapiens* migrated beyond the continent, between ~80 ky and ~60 ky (Oppenheimer 2003; Mellars 2006). All of this occurs within a technological stage known in Sub-Saharan Africa as the Middle Stone Age (MSA), a prepared core technology that evolved out of the Acheulian around 300 ky, and lasted until ~25 ky in southern Africa (Clark 1997), ~45 ky in eastern Africa (Ambrose 1998). The beads and engravings double the conventionally accepted antiquity of symbolic traditions, previously regarded as restricted to the Upper Paleolithic (Eurasia) and Later Stone Age (Africa). These findings have been used as a proxy for language (e.g. Henshilwood and Marean 2003: 636; Henshilwood et al. 2004: 404; Mithen 2005: 250; but see Botha, this volume). In most Middle Stone Age contexts, the only recurrent artifact class other than stone tools is red ochre.

Archeologists commonly use "ochre" as a generic term for any rock, earth, or mineral producing a reddish or yellowish streak when abraded, attributable respectively to hematite (an iron oxide) or one of the iron hydroxides (typically goethite). Ethnographically and archeologically, red ochre is the most widely reported earth pigment. Use of ochre and other potential earth pigments such as black manganese is not restricted to *Homo sapiens*. The field may, therefore, provide comparative insights on the signaling strategies of closely related species (cf. d'Errico 2003).

4.3 Language and collective ritual

In the animal world, signals vary according to whether they encounter strong or weak resistance. High resistance from receivers prompts costly multimedia display; by contrast, low resistance permits low-cost "conspiratorial whispering" (Krebs and Dawkins 1984). Translating this general principle into the domain of human social communication, ritual ("costly signaling") and language ("conspiratorial whispering") have the expected diametrically opposed formal characteristics (Knight 1998, 1999: table 12.1), summarized in Table 4.1. With resistance minimal, language evolves to be conventionally coded, low cost, generally of low amplitude, digitally processed, interpersonal, focused on underlying intentions, and allowing for potentially infinite creativity. Being cheap and intrinsically unreliable, words are unable to signal social commitment (Rappaport 1999). Language leaves no direct archeological trace (Botha this volume), and is biologically unprecedented (Chomsky 2002). Designed to overcome high levels of resistance and to cement social contracts, ritual signals are multimedia indexical displays, costly to produce, of high amplitude and redundancy, evaluated on an

TABLE 4.1 *Signals: speech versus ritual (adapted from Knight 1999: fig. 12.1).*

Speech	Ritual
Cheap signals	Costly signals
Conventionally coded	Iconic & indexical
Low amplitude	High amplitude
Digitally processed	Analog scale evaluation
Productivity/Creativity	Repetition/Redundancy
Interpersonal	Group-on-group
Focus on underlying intentions	Focus on body boundaries and surfaces

analog scale and focused on body boundaries and surfaces (Sperber 1975; Rappaport 1979: 173–246, 1999). These features suggest that collective ritual might leave a loud archeological signature. Unlike language, human ritual has clear evolutionary precedents in the ritualized displays of other animals (e.g. Laughlin and McManus 1979; Maynard Smith and Harper 2003).

Although ritual and language represent opposite extremes, a long theoretical tradition holds that they are mutually interdependent. This position holds that collective ritual created the supportive framework for contractual understandings and associated symbolic communication between group members to become established (Durkheim 1961; Turner 1967: 93–111; Rappaport 1979, 1999; Gellner 1988; Maynard Smith and Szathmáry 1995: 272–273; Searle 1996; Deacon 1997: 402–407). The central function of ritual is to create the intensity of in-group trust necessary for symbolic communication to be possible (Knight 1998). Deacon (1997: 402) adds that ritual facilitates the transition from concrete sign–object associations (indices and icons) to abstract sign–sign associations. Alcorta and Sosis (2005) explain that it is the costliness of ritual that enables it to demonstrate commitment and deter freeriders.

4.4 A prediction ahead of its time

The basic premise concerning the role of ritual in sustaining symbolic culture can be traced back to Durkheim. Less well known, Durkheim also proposed that "the first form of art" consisted of geometric designs painted on sacred objects and on the bodies of ritual performers (1961: 149 fn.150, see also pp. 148, 264–265, 417), these designs bearing witness to the participants' "moral unity" (1961: 432). Typically, according to Durkheim (1961: 159–161), such designs would be executed in red ochre, a substance of "equal importance, religiously" as blood. While drawing heavily on Aboriginal Australian ethnography, Durkheim advanced the following arguments on the basis of general theoretical considerations:

- The "emblems" of collective representations had to be abstract because the representations concerned "social facts"—things that have no real-world likenesses but exist only by virtue of collective agreement (1961: 236).

- Such emblems had to appear first on the body because collective ritual is a bodily display of participation "in the same moral life" (1961: 264–265).
- Red ochre inevitably symbolized blood, this substance being reified to a "sacred principle" (1961: 159–61).[1]

4.5 Innatist theory

The theory of "basic color terms" (e.g. Berlin and Kay 1969) has come to exemplify the more general proposition that perceptually grounded semantic categorization is a direct projection of innate cognitive universals, structured by hard-wired neural mechanisms. This view, endorsed by some linguists (Landau and Jackendoff 1993), is associated with cognitive psychology (Fodor 1975; Pinker 1994) and evolutionary psychology (Tooby and Cosmides 1992). While a strong form of innatism is found in some "basic color term" (BCT) literature (e.g. Berlin and Kay 1969: 109; Kay and McDaniel 1978: 611; Kay and Berlin 1997: 201), elsewhere the more limited claim is that "the semantics of basic color words . . . is partially constrained by parameters of the visual system" (Kay et al. 1991: 24; see also Kay in Ross 2004).

A tacit assumption of BCT theory has been that the color domain is a natural and universal semantic field of such salience that all languages will have dedicated terms exhaustively partitioning the domain (cf. Kay 1999: 76). Among the original criteria for BCT status (Berlin and Kay 1969: 6) were that terms should be monolexemic (excluding referent-based similes for hue, e.g. "blood") and that application should not be restricted to a narrow class of objects (as in the case of "blond"). The principal cross-cultural findings informing the theory were:

- All languages have between two and eleven BCTs.
- There are high levels of agreement within and between cultures as to the focal points of the extremes of the achromatic scale (black and white) and the four unique hues of red, yellow, green, blue (where languages have BCTs in the appropriate hue area).
- The foci of BCT terms can be predicted from their number.

[1] The argument as to why blood is reified to a sacred principle is minimally developed in *Elementary Forms* (1961: 161 and footnote 50), the reader being referred to an earlier paper (Durkheim 1898) in which menstruation plays the central role.

The last finding led to the hypothesis of an implicational scale of seven cultural evolutionary stages (Berlin and Kay 1969: 4). Stage I comprised Black versus White, followed by Red (Stage II), followed by either Green or Yellow (Stages IIIa and IIIb). In outlining this successive encoding of new foci, labels were used loosely, sometimes referring to category foci (e.g. pure black), sometimes to the foci plus its extension (e.g. pure black and all dark hues). In a revised formulation (Kay and McDaniel 1978), the initial BCTs comprise two composite categories with several potential foci, successively fractioned out in subsequent stages. Stage I comprised "light/warm" versus "dark/cool" terms (respectively focused on white or red or yellow versus black or green or blue). The new composite of Stage II was "warm" (focused on red or yellow). The vague biological explanation of Berlin and Kay (1969: 109) was reformulated such that six "fundamental neural response categories" (FNRs) of black, white, red, yellow, blue, and green are "encoded as the universal semantic categories" (Kay and McDaniel 1978: 625, 627). FNRs were the postulated output of the achromatic vision provided by rod cells (cf. Kandel et al. 2000: 507–513), and of trichromatic vision—where signals from three types of cone cell are pitted against one another (opponent processing) to derive a difference signal, enabling the four unique hues to be discriminated from the wavelength continuum (De Valois and De Valois 1993; Abramov 1997; but see Jameson and D'Andrade 1997). Trichromatic vision evolved with Old World monkeys (Jacobs 2002).

How far back in time are these posited stages projected? Stage I terms could potentially date to when vocabularies were of a size comparable to "the repertoire of discreet [sic.] verbal signs used by apes and monkeys" (Berlin and Kay 1969: 16). However, contrary to the impression given in some commentaries (e.g. Hovers et al. 2003: 493), a biological mechanism accounting for the order in which BCTs are labeled (as distinct from the category foci) forms no part of the original theory (Berlin and Kay 1969: 17). Despite red being invariably labeled before other hues, red and yellow are treated as equally plausible potential foci of "light/warm" and "warm" terms (Kay and McDaniel 1978: fig. 13; Kay and Berlin 1997: 201). Sahlins (1976: 3–8) outlined possible mechanisms and biases underpinning the "natural-perceptual logic" to the emergence of BCTs, while arguing persuasively that the terms are "codes of social, economic, and ritual value" (1976: 8), not labels for natural categories.

The ambiguous classificatory status of red in any binary lexicon is evident in Berlin and Kay's (1969) discussion of Stage I languages. Both their examples concerned New-Guinea Highland cultures of the Danian language group. Among the Jalé, "the appearance of blood is *siŋ* 'BLACK,' exactly as 'blood (red)' should be at Stage I because of its low brightness" (1969: 24, citing a seminar presentation by K. F. Koch). However, their second source (Bromley 1967) reported that related languages divided colors into "brilliant" and "dull," the "brilliant" category including most reds, yellow, and white (Berlin and Kay 1969: 24). The 1978 revision of Stage I categories largely arose from Heider's (1972) research with the Dugum Dani. Presented with a saturated array of Munsell color chips, the best exemplar of the "light/warm" term selected by her informants ($n = 40$) was not white but dark red (selected by 69%), followed by light pink (most informants selecting pink already having a term for red that denoted a red clay pigment).

One of the few other published studies of an arguably Stage I language concerns the Gidjangali of Australia (Jones and Meehan 1978). The Gidjangali "light" term—*gungaltja*—"refers to light, brilliant and white colors, and also to highly saturated red" (1978: 27). The authors emphasized the element of "brilliance" or "animation" in the *gungaltja* concept. Asked to identify examples of this term among saturated Munsell chips, their principal informant responded that there were no proper *gungaltja* colors there, pointing instead to some silver foil. Subordinate to this universal binary classification, the color of a restricted range of objects or states could be described using the terms for four pigments (pipe-clay, yellow ochre, red ochre, and charcoal), constituting the four ritually recognized colors. Jones and Meehan considered that *djuno* (red ochre) was the color that excited most interest (1978: 31). The best Gidjingali exemplars of this term were two types of ochre, with Munsell hues of Purple and Red-Purple, both decidedly dark (brightness levels 4 and 3). The darker type was "a high grade haematite with a lustrous purple streak" which, when burnished on objects, gave "a metallic sheen" (Jones and Meehan 1978: 32). These ritually defined and recognized colors are at least as salient to color lexicalization as the two Gidjingali BCTs.

Both Jones and Meehan (1978: 27) and Heider (1972: 464) noted that red's inclusion in the "light" or "light/warm" term was paradoxical given its low brightness (cf. Solso 1994: fig. 1.7). Heider speculated that the original meaning of the term glossed as "light/warm" was centered on "warm" dark colors (i.e. red). Her findings led Berlin and Berlin (1975: 84) to conclude that the foci for the two primordial categories are "fluid and unstable," and to speculate that red might be the principal focus of "light/warm" terms, with black dominating "dark/cool" terms. Neither speculation has been pursued in subsequent BCT-inspired research, but one would not predict specifically dark red to be exemplary in a red-versus-black opposition.

Red plays a more prominent role in well-documented Stage I languages than is conveyed by the BCT glosses. Factors contributing to its exclusion as a BCT may include active nominal reference and restricted usage; but, given the critical role of metaphor in the evolution of language (Deutscher 2005), nominal reference is likely to provide clues as to the domain in which color lexicons arose. The most common analyzable root of any BCT or referent-based simile for hue is "blood" (Greenberg 1963: 134; Berlin and Kay 1969: 38; Nash 2001; Everett 2005: 627; Deutscher 2005: 237), probably followed by "red earth pigment" (see above; Koch in Berlin and Kay 1969: 23). Analyzable "black" and "white" terms (e.g. Berlin and Kay 1969: 38–39, citing Rivers 1901; Levinson 2000: 10; Everett 2005: 627) also often refer to things with partible color (e.g. cockatoo feathers, charcoal, cuttlefish ink). Important exceptions to this tendency are "black" and "white" terms such as "night," "darkness," or "to see," taking us beyond the labeling of surface color. Such exceptions notwithstanding, ritual display would appear to be deeply implicated in simple forms of color lexicalization.

Paul Kay himself now grants that there is no physiological evidence for or against neural processing determining BCTs (Ross 2004). While there are constraints from visual perception, it seems that perception can itself be biased by linguistic categorization (Kay and Kempton 1984; Davidoff et al. 1999; Levinson 2000, 2003). Some cultures with simple classificatory systems have no universal partitioning of the color domain, no composite color terms, and referent-based similes for hue may circumscribe BCTs (Levinson 2000). In societies with simple coloring technology, other aspects of surface appearance such as brightness/dullness, freshness/dryness, brilliance, or pattern may be at least as salient as hue (e.g. Conklin 1955; MacLaury 1992; Lyons 1995; Casson 1997; Lucy 1997; Levinson 2000). Addressing some of these challenges, BCT theory has been further revised (Kay and Maffi 1999), but as Levinson (2000, 2003) points out, the revision is incompatible with the innatist claim that universal perceptual constraints directly determine semantic universals (Kay and McDaniel 1978: 610; Durham 1991: 281; Shepard 1992: 522; Pinker 1994: 63; Hovers et al. 2003: 493).

4.5.1 *Archeological application of BCT theory*

Using Berlin and Kay's (1969) original formulation, Hovers and colleagues (2003: 493) attempt to apply BCT theory to archeological data.[2] One would predict on this basis that the earliest pigments should be black and white, followed by red, and then yellow. They claim: "red and black pigments are relatively ubiquitous in Paleolithic . . . sites, from the Plio/Pleistocene to Upper Paleolithic" (2003: 491). Archeologists are urged to re-examine existing collections for black and white pigments, as their presence would be "in line with linguistic studies of color terms" and the "infrastructure of trichromatic vision" (2003: 518).[3] If, instead, Kay and McDaniel's (1978) formulation had been used, there is no theoretically grounded predictable order in which red, black, yellow, and white (the most common earth pigments) should appear, since all are potential foci of Stage I composite terms.

4.6 Qualified innatism

Deacon (1997) accepts the BCT hypothesis concerning the stages of color lexicalization; he, too, presents the unrevised stages (1997: 117).[4] However, challenging innatism, he argues (1997: 119) that the process by which shared—perceptually based—semantic categories emerge is determined both by hard-wiring and "the pragmatic constraints of human uses." He goes on to make a more general argument, positing the demands of *ritual action* as the earliest pragmatic constraint in "symbol discovery" (1997: 402). Specifically, Deacon argues for the primacy of rituals cementing sexual contracts, arguing that these extend back ~2 my (1997: 384–401). He concludes: "Out of the ritual processes for constructing social symbolic relationships, symptoms of the process itself (exchanged objects, body markings, etc.) can be invested with symbolic reference" (1997: 406).

Discussing a probable association of red ochre with early *Homo sapiens* burials at Qafzeh (Palestine), ~92 ky, Hovers and colleagues (2003: 508-509) invoke Deacon's argument about the role of ritual in constructing symbols (his critique of innatism goes unremarked). No

[2] Although Kay and McDaniel (1997) and MacLaury (1992) are cited, Hovers and colleagues do not refer to revised BCT stages.

[3] Trichromatic vision does not concern achromatic perception.

[4] Deacon's account incorrectly states that the simplest classifications comprise three terms and that green necessarily follows the labeling of red.

ritual context is proposed for any other early pigment occurrences. They conclude (2003: 509) that the record of early use of red and black pigments (purportedly extending back ~2 my) accords with Deacon's claim for early beginnings to the gradual co-evolution of the brain and symbolism. However, they continue, "normative social constructs" can be inferred only when co-associations of the kind argued for at Qafzeh occur. The use of Deacon to theoretically justify a focus on ritual represents a welcome development in archeological discussion of early pigment use and symbolism in general. However, uncritical adherence to BCT theory precludes the possibility of ritual displays themselves influencing pigment choice.

4.7 The "Female Cosmetic Coalitions" model

The FCC model (Knight et al. 1995; Power and Aiello 1997; Power 1999; Power this volume) has much in common with Deacon's model of the origins of symbolic culture. Both approaches stress conflicting male-versus-female reproductive interests in the context of encephalization, maternal energy budgets, and access to meat and mating opportunities. Both identify ritual as the basic mechanism for resolving these conflicts. Finally, both agree that as brain size increased with increasing group size, females had to bear the costs of producing and maintaining increasingly slow-maturing, energetically demanding babies. While Deacon envisages wedding ceremonies stretching back to the Plio-Pleistocene, the FCC model envisages initiation rituals of much more recent date. According to this model, pressure to reward investor males at the expense of philanderers favored concealed ovulation, extended receptivity, and enhanced capacities for ovulatory and menstrual synchrony. With signals of ovulation phased out, menstruation was left salient as a signal of imminent fertility. Males are expected to compete to bond with females perceived to be cycling, doing so at the expense of current partners who are pregnant or nursing. Females threatened by corresponding loss of male investment should respond by scrambling the signal. Building on standard explanations for ovulation concealment (Alexander and Noonan 1979; Hrdy 1981; Sillén-Tullberg and Møller 1993), a similar logic is applied to menstruation. How might females scramble the information divulged by this biological signal? Artificial pigments suggest one possibility (Plates 6–8). In this scenario, menstrual onset prompts pregnant/lactating females to paint up as "imminently fertile" on the model of their cycling relatives. This leads to the following archeological predictions concerning pigment use:

- The initial focus should be on red rather than black, white, or yellow.
- Pigment use should not predate the marked increase in encephalization that begins in the middle of the Middle Pleistocene (between ~400 ky and ~550 ky, Ruff et al. 1997; Rosenberg et al. 2006). It should predate the achievement of modern encephalization quotients, between ~200 ky and ~100 ky (De Miguel and Henneberg 2001).
- Within this time-window (c. 500 to 150 ky), there should be a shift from irregular to regular use of red cosmetics (accompanied by rapid spread of such usage) as an initially context-dependent "sham menstruation" strategy was raised to the level of a regular monthly ceremony, performed whether or not a menstruant was present.
- Coalitions living in areas lacking blood-red earth pigments would be expected to incur heavy costs to procure them from elsewhere.

4.8 Utilitarian hypotheses

Challenging the presumption of use as pigment, some archeologists have suggested alternative general explanations for early ochre use—foremost being the hypothesis that ochre was used as a tanning agent and/or as a functional ingredient in cements for hafting stone tools (Klein 1995; Wadley et al. 2004; Wadley 2005a).

The tanning hypothesis arises from a misunderstanding of basic chemistry, where the properties of certain soluble iron salts (e.g. iron sulphate) have been assumed to be shared by relatively insoluble iron oxides (e.g. Keeley 1980: 172; Knight et al. 1995: 88; Wadley et al. 2004: 662; all citing Mandl's [1961] experiments with metal salt solutions). Iron salts have been used as tanning agents (Tonigold et al. 1990), but no ethnographic or leather industry sources confirm similar use of iron oxides.[5] This hypothesis can therefore be dismissed.

[5] The two claimed ethnographic precedents for use of ochre as a tanning agent (cf. Wadley et al. 2004: 662; Wadley 2005a: 589; Audouin and Plisson 1982: 57) do not bear scrutiny. Steinmann's (1906: 78) inference is contradicted by more detailed observations on Tehuelche hide working (Cooper 1946: 148, with refs.). Sollas (1924: 275) made no functional claim; his uncredited primary source (Mathews 1907: 35) simply stated that the mixture of ochre and grease made garments water resistant. The claimed experimental support (Wadley et al. 2004: 662; Wadley 2005a: 589, citing Audouin and Plisson 1982) can be more parsimoniously accounted for by the desiccating action of red ochre (Phillibert 1994: 450).

The hafting-cement hypothesis is consistent with archeological reports from relatively late (post-80 ky) MSA assemblages, where ochre residues on stone tools were predominantly restricted to parts which would have been in a haft (Lombard 2007 with references). Replication experiments (Allain and Rigaud 1986; Wadley 2005a) confirmed that the inclusion of either yellow ochre or hematite in resin-based cements made them more manageable during use, helped drying and hardening, and made them less brittle.

However, no property of ochre has been identified that might make it preferable to the wide range of ethnographically documented filler/loading agents, most of which would be easier to procure and process. Australian accounts mention the use of plant fiber, dung, calcined powdered shell, powdered charcoal, dirt, sand, and ochreous dust (Dickson 1981: 67–69, 164; Helms 1892–6: 274, 280). The primary requirement appears to have been for substances that were desiccant but otherwise inert.[6]

Presenting this as a plausible general account even for early large MSA "pigment" assemblages such as Twin Rivers (where 60 kg of pigment is estimated to have been recovered in the original excavations—Barham 2002b), Wadley (2005a: 599) has suggested that such assemblages might resemble the material used in her hafting experiments. This comprised 3 kg of ironstone nodules, only the weathered cortices of which were pigmentaceous. Consequently, seven hours' "vigorous" grinding (Wadley 2005b: 5) exhausted the nodules, but produced just 70 ml of powder (enough to haft 28 tools). However, available evidence is that MSA assemblages overwhelmingly comprise homogenously pigmentaceous material (Watts 1998; Barham 2002b; and see below).[7] Additionally, if 2.5 ml of powder (representing 15 minutes' work) was required to haft one tool, one would not predict pieces of ochre with solitary, small grinding facets. That both yellow ochre and hematite were experimentally successful implies that the hypothesis is null with respect to the hue and chroma of raw materials. At present, ochre in hafting cements is more parsimo-

[6] Burnt shell may additionally have served as a polymerising agent (Dickson 1981: 70).

[7] Twin Rivers is currently the best described MSA pigment assemblage; there is nothing in Barham's (2000, 2002) accounts indicating non pigmentaceous associated material. In Watts' examination of over 4,000 pigments from 11 southern African MSA assemblages, only three pieces are reported as predominantly non pigmentaceous material (Watts 1998: plates 5.1, 6.81 and tbl. 6.46).

niously interpreted in terms of symbolic considerations determining functional choices.

4.9 Early pigment occurrences: differences between African and Eurasian hominins

There are two claims (Leakey 1958: 1100; Beaumont and Vogel 2006: 222) and one suggestion (Clark and Kurashina 1979) for ochre use in the Lower Pleistocene (790 ky to 1.8 mya) and early Middle Pleistocene (c. 500 ky to 790 ky), but these are not compelling.[8] Middle Pleistocene (130 ky to 790 ky) occurrences are listed in Table 4.2. Current evidence suggests initial use in the middle of the Middle Pleistocene, between ~300 ky and ~500 ky (Howell 1966; de Lumley 1969; Barham 2002b; Tryon and McBrearty 2002; Brooks 2006a; Beaumont and Vogel 2006). However, only one of these early occurrences (Barham 2002b) has been adequately published, and doubts have been raised whether the material at two of the European sites was pigment (Butzer 1980 re. Ambrona; Wreschner 1983, 1985 re. Terra Amata). A stronger case for initial European use can be made at ~250 ky (Thévenin 1976: 984; Marshack 1981).

Initial occurrences of red ochre may be broadly coeval, but European and African records for the later Middle Pleistocene and earlier Late Pleistocene differ dramatically. For Middle Pleistocene Europe, there are at most five occurrences, three of which are questionable. All are thought to predate 220 ky, and are followed by a find gap of at least 100,000 years (Wreschner 1985: 389). Even after this gap, I know of only two cases from the earlier Late Pleistocene, between 128 ky and 75 ky (Demars 1992 re. Combe Grenal layers 57/8; Marshack 1976 re. Tata). The great majority of the 40 or so European Mousterian sites with pigment date to the Last Glacial (beginning 74 ky), most post-date 60 ky, and manganese predominates over red ochre (Demars 1992; d'Errico and Soressi 2006: 86). Forty is a small proportion of

[8] Citing Mary Leakey (Leakey 1971), Dickson (1990: 42 43) states that the two pieces of red ochre (subsequently identified as rubified tuff) from Olduvai Bed II at site BK "show signs of having been struck . . . by hammerstone blows". The basalt manuports at the Lower Pleistocene site of Gadeb, Ethiopia (Clark and Kurashina 1979) showed no signs of use and pigmentaceous material was weathered cortex. Beaumont and Vogel (2006) claim that hematite use at Wonderwerk extends to the initial Middle Pleistocene; however, the hematite is thought to derive from the cave host rock and no use wear is reported, so the claim remains to be substantiated.

Table 4.2. *Middle Pleistocene potential pigment occurrences.*

Site	Country	Unit	Approximate age	Technological association	Pigment	References (dating references in parentheses)
Europe						
Terra Amata	France		380 ± 80 ky (ESR) or 214 & 244 ky (TL)	Acheulian	Questionable	de Lumley 1966, 1969; Wreschner 1983, 1985 (Falguères et al. 1991; Wintle & Aitken 1977)
Ambrona	Spain		>350 ky	Early Acheulian	Questionable	Howell 1966; Butzer 1980 (Pérez Gonzáles et al. 2001)
Maastricht Belvedeer	Holland	Site C, Unit 4	c. 250 ky	Middle Paleolithic	Probable	Roebroeks 1988
Achenheim	France	Middle Loess (lvl 19)	c. 250 ky	Middle Paleolithic	Good	Thévenin 1976; Wernert 1952
						(Buraczysky & Butrym 1984)
Beçov 1A	Czech Rep.		c. 222 ky?	Middle Paleolithic	Good	Fridrich 1976, 1982; Marshack 1981
India						
Hunsgi	southern India		c. 200 300 ky	Acheulian	Good	Bednarik 1990

(*Continued*)

Table 4.2. (*Continued*).

Site	Country	Unit	Approximate age	Technological association	Pigment	References (dating references in parentheses)
Africa						
Sai Island	Sudan	BLG/TLG gravel	c. 200 ky?	'Lower' Sangoan	Good	van Peer et al. 2004
		RS sand	152 ± 10 ky, 182 ± 20	'Middle' Sangoan	Good	
Olorgesaillie†	Kenya	B OK 1	>340 ky, <493 ky	Post Acheulian	Probable	Brooks 2006a
Kapthurin (GnJh 15)	Kenya	K3 Sedi ments	>285 ky	Fauresmith/MSA	Good	McBrearty 2001 (Tryon & McBrearty 2002)
Mumba^	Tanzania	Stratum VIB	132 ky	Sanzako (MSA)	Probable	Mehlman 1979:91 (Mehlman 1991)
Twin Rivers	Zambia	A Block	266 ky to >400 ky (?)	Early Lupemban	Good	Barham 2002
		F Block	140 ky to 200 ky	Early Lupemban	Good	
Mumbwa	Zambia	Unit X	>172 ± 22 ky	MSA	Good	Barham 2000
Kabwe	Zambia		c. 300 400 ky ?	Charama?	Probable	Clark 1950 (Barham et al. 2002)
Kalambo Falls*	Zambia			Lupemban (Sis zya)	Probable	Clark 1974
Pomongwe	Zimbabwe	Area 1, lyrs 22 27		Charama (MSA)	Good	Cook 1963, 1966; Watts 1998
Bambata	Zimbabwe	Lower Cave Earth		Charama (MSA)	Good	Jones 1940:17 (cf. Cook 1966 re. Charama)

Wonderwerk	S.A. (Northern Cape)	Major Unit 7	c. 790 ky	Acheulian	Questionable	Beaumont & Vogel 2006
		Major Units 3 4	276 ± 29, >350 ky	Fauresmith	Probable	
Kanteen Koppie	S.A. (Northern Cape)	Stratum 2a		Fauresmith	Probable	Beaumont 2004
Nooitgedacht 2	S.A. (Northern Cape)			Fauresmith	Good	Beaumont 1992a
Pniel 6	S.A. (Northern Cape)	Stratum 3		MSA/Fauresmith?	Good	Beaumont 1992b, Watts 1998
Kathu Pan 1	S.A. (Northern Cape)	Stratum 4a		Fauresmith	Probable	Beaumont 1992c
		Stratum 4b		Acheulian	Questionable	Beaumont & Vogel 2006¶
Kathu Townlands 1	S.A. (Northern Cape)			Acheulian	Questionable	Beaumont & Vogel 2006¶
Duinefontein 2	S.A. (Western Cape)		>270 ky, <290 ky	Late Acheulian	Good	Cruz Uribe et al. 2003

(*Continued*)

TABLE 4.2. (*Continued*).

Site	Country	Unit	Approximate age	Technological association	Pigment	References (dating references in parentheses)
Border Cave	S.A. (Kwa Zulu Natal)	6BS	>227 ky	MSA	Good	Watts 1998 (Grün & Beaumont 2001)
		5WA	227 ± 11, 174 ± 9	MSA	Good	
		5BS	166 ± 6, 147 ± 6	MSA	Good	
Pinnacle Point 13B	S.A. (Western Cape)	LC MSA Lower	164 ky	MSA	Good	Marean et al. 2007
Blombos Cave	S.A. (Western Cape)	Layers CL CP	>143 ky	MSA	Good	Watts this paper (Jacobs et al. 2006)

† Pending geochemical analysis, the artifactual status of the ochre at Olorgesaillie remains indeterminate (Brooks pers. comm.)
^ The traits of the Sanzako industry suggest that the U series date on bone (from approximately the same level as the oldest ochre), may be a minimum age.
* The Siszya Lupemban is only assigned a Middle Pleistocene age on the basis of comparison with Twin Rivers
¶ The authors cite Beaumont & Morris 1992 for this claim, but the relevant paper (Beaumont 1990c) does not mention pigment in stratum 4b at Kathu Pan or in the Townlands site

excavated Mousterian sites. It is not until the arrival of modern humans (~40 ky) that pigment use in Europe becomes ubiquitous, when it overwhelmingly takes the form of red ochre. The last (Châtelperronean) Neanderthals, living alongside the newcomers, also start using much larger quantities of red ochre (Harrold 1989: 696; Couraud 1991).

In Africa, it is estimated that the number of excavated MSA sites is only a tenth of the European Mousterian ones (McBrearty and Brooks 2000: 531). Despite the less intensive history of research, excavation units from at least 18 sites dated or believed to date to the Middle Pleistocene (three to six times the number of European sites) have provided probable earth pigments. Most of the earliest occurrences span the transition from the Acheulian to the MSA. Contrary to some authors (Wadley 2005b: 2; d'Errico et al. 2003: 4), Barham's Twin Rivers excavation did not provide evidence for use of a wide range of colors. Use-wear was restricted to nine pieces of specularite (laminar crystalline hematite) and a piece of pedogenic, earthy "hematite" (Barham 2002b: table 1). The specularite is thought to have come from further afield than the hematite; it produced "a darker, purple shade of red (Munsell 10R 4–3/3–3) that sparkles" (Barham 2002b: 185). Of the 302 potential pigments (1,617 g), 93.1% were red (92.4% by weight), these being overwhelmingly specularite. None of the yellow limonite was utilized, although a limonite "crayon" is reported from the original F Block excavations (Clark and Brown 2001: fig. 20, no. 23). Barham treats the tiny amount of manganese as introduced to the site, but this could readily have come from autochthonous concretions (Barham 2002b: fig. 3). The only well-supported case for Middle Pleistocene black pigment is a small fragment of graphite associated with "Middle" Sangoan material at Sai Island. This site is also unique among both Middle and earlier Late Pleistocene assemblages in that yellow predominates over red. All other Middle Pleistocene reports exclusively concern red ochre in one form or another.

Pigment use is not ubiquitous in the early MSA, nor is it necessarily a regular behavior in the early assemblages where it is documented. For example, at Kalambo Falls in Zambia it is absent in the early Lupemban but present in the later Lupemban (Clark 1974: table 10). In the long cave sequences of Mumba, Pomongwe, and Bambata, it is rare in the basal assemblages, becoming more frequent in overlying layers. In South Africa, it is absent in the large, early (undated) MSA assemblages at Peers Cave and Cave of Hearths, but is a recurrent feature of overlying Late

Pleistocene MSA layers (Volman 1981: 325; Mason 1957: 135; pers. obs. regarding Peers Cave Late Pleistocene).

Currently the most informative South African site for this period is Border Cave (Watts 1998). Figure 4.1 shows the relative frequency of pigment for the first five stratigraphic aggregates. The basal unit (6BS) is >227 ky (Grün and Beaumont 2001); a sample of almost 10,000 lithics provided just one piece of ochre, on the threshold of archeological visibility. The overlying unit, with a similarly sized lithic sample, provided just three pigments. The youngest of the Middle Pleistocene units (5BS) provided inverted dates of 166 ky and 147 ky, placing it in the middle of the penultimate glacial. This witnesses a fivefold increase in relative frequency, with overlying Late Pleistocene samples providing comparable percentages. At this site, use of red ochre only became regular between ~170 ky and ~150 ky.

Pinnacle Point (approximately 85 km east of Blombos) confirms regular use of red ochre from ~164 ky (Marean et al. 2007). There is suggestive evidence, therefore, that red ochre use in southern Africa only became habitual and ubiquitous to cave/rockshelter occupations with the spread of *Homo sapiens*. It remains so thereafter (Watts 1999). In the Late Pleistocene MSA of southern Africa, non-red pigments are rare, with black, white, and yellow largely restricted to a few Still Bay and Howiesons Poort contexts (~75 ky to ~60 ky) (Watts 2002: 10–11).

To conclude, archeology provides no support for revised or unrevised versions of BCT Stage I, for Deacon's proposed Plio-Pleistocene weddings, or for use of red and black pigment ("ubiquitous" or otherwise) extending back to the Plio-Pleistocene. The African Middle Pleistocene record is probably of greater antiquity than non-African counterparts, is certainly much more extensive, and—unlike the European record—is continuous. The habitual use of red ochre can be considered a species-defining trait. Occasional use may have occurred among all post *Homo erectus/ergaster* lineages, but it is no longer acceptable to suggest that the pigment record of Neanderthals and their immediate ancestors is comparable to that of early *Homo sapiens* and their immediate ancestors (e.g. Klein 1995: 189). Having discounted the two principal utilitarian hypotheses as alternative general explanations, it is the habitual nature of the behavior from the end of the Middle Pleistocene in southern Africa (probably earlier in the African tropics) that permits the inference of habitual collective ritual,

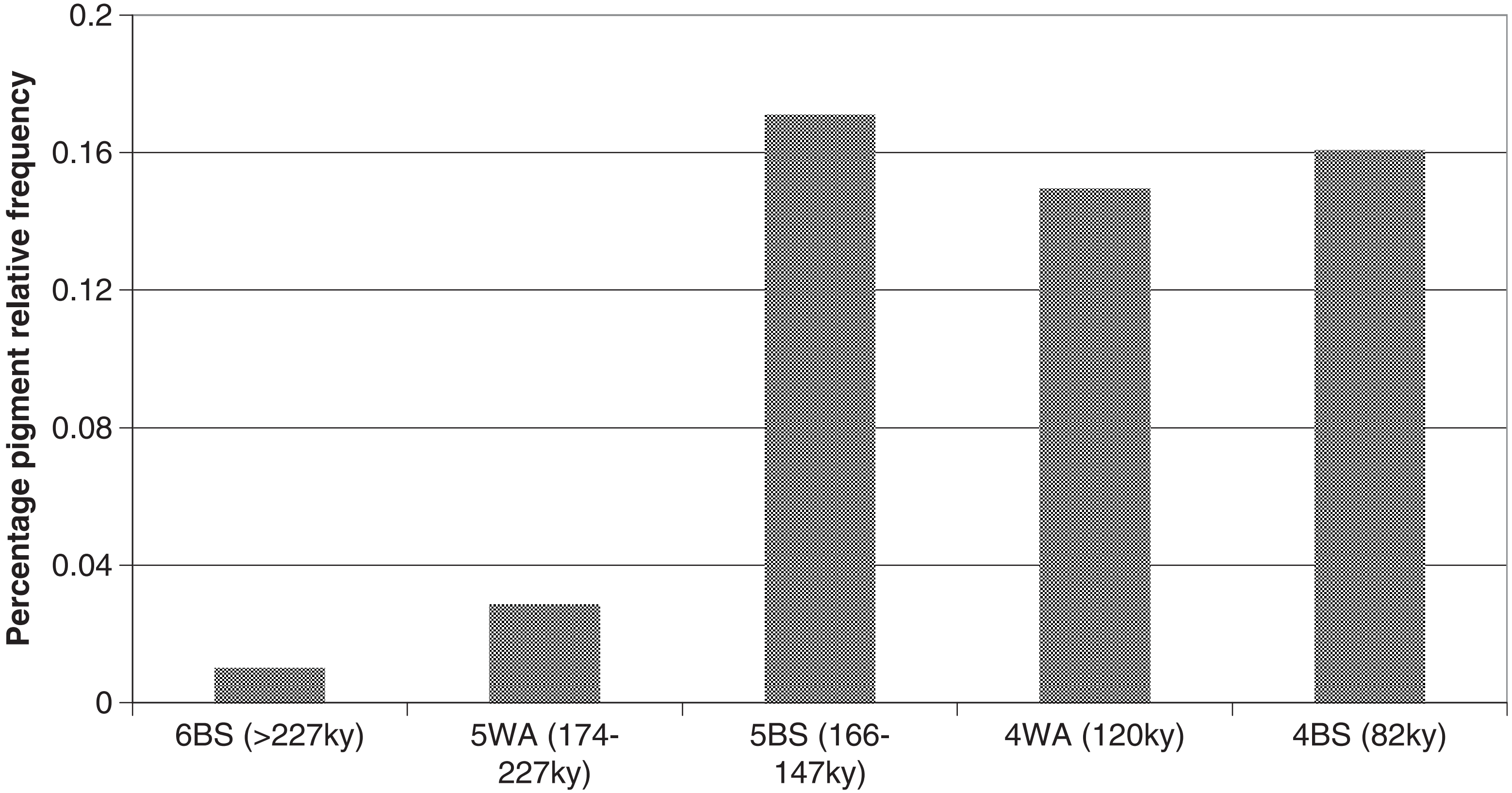

Fig. 4.1 Changes in the relative frequency of pigment in the earlier MSA (Pietersburg) units at Border Cave (KwaZulu-Natal). Excavation units from Beaumont's 1987 excavation. Relative frequency pigment counts as a percentage of the combined pigment and lithic assemblages. Source: Watts 1998: fig.7.23, dates from Grun & Beaumont 2001.

with applications of red pigments to the body playing an integral part in ritual displays.

Given the posited relationship between collective ritual and language (Knight 1998), the higher-level inference is that, at least by the terminal Middle Pleistocene, speech communities were distributed across Africa, with roots probably going back at least 250 ky within the tropics (see also Barham 2002b). The temporal and color focus predictions of the FCC model are particularly consistent with the summarized African data, although a detailed account of the claimed early hematite at Wonderwerk (footnote 8) is awaited, and the predominance of yellow ochre at Sai Island is surprising. This raises some intriguing questions in relation to Europe. Why should a lineage ancestral to Neanderthals have briefly and sporadically engaged in a behavior consistent with the FCC hypothesis, only to abandon it? Why should a more varied form of pigment use reappear with late classic Neanderthals, only to converge with modern human practice during the brief period of co-existence (see Power this volume)?

4.10 Red ochre use at Blombos Cave

The coastal site of Blombos Cave has provided some of the earliest compelling evidence for symbolic traditions: shell beads (some bearing ochre residues), dated to ~75 ky (d'Errico et al. 2005), and geometric engravings on ochre spanning the period from ~100 ky to ~75 ky (Henshilwood et al. 2002, in press). I know of no hunter-gatherer society without some form of body marking—predominantly body painting, but including also tattooing and scarification. As predicted on theoretical grounds by Durkheim, the designs are invariably non-figurative, comprising geometrically arranged lines or shapes (e.g. Spencer and Gillen 1899; Teit 1927–8; Drury 1935: 102; Marshall 1976: 276; Lewis 2002, Plate 9.4, 9.5; Fiore 2002). It is almost inconceivable that the MSA occupants of Blombos were engraving such designs onto pieces of ochre while not doing similar things with ground ochre powder on their bodies (grinding being the predominant form of use-wear).

The MSA sequence spans the period from >143 ky to ~70 ky (Jacobs et al. 2006). Ochre is present throughout. At least in the younger occupations, its use seems to have permeated many aspects of life. As well as appearing on some beads, it may have been used as a polishing agent to lend "added value" to some of the bone tools from the ~77 ky layers (Henshilwood et al. 2001b). My own cursory examination of selected lithics found variably distributed ochre residues on a variety of tools—predominantly from the younger layers.

Over 1,500 pigment pieces ≥1 cm in length were analyzed, weighing 5.6 kilos.[9] Shale, siltstone, and coarse siltstone predominate (Figure 4.2). Fewer than a dozen pieces (c. 150 g in total) were associated with significant non-pigmentaceous material. While pigment use was habitual, the quantities vary enormously through time (Layer CI, for example, accounts for half the assemblage mass). This is attributed to changes in sea level and sand cover, exposing and then masking a local exposure of Bokkeveld shale and siltstone. The inference is based on two observations. First, in layers where pigment is most abundant (CJ-CH)—culminating around 100 ky—much of it shows borings by pholadid molluscs and carbonate tests of marine organisms (e.g. Plate 4.1), testifying to procurement from the wave-eroded coastal peneplane. Second, although there is currently no exposed Bokkeveld within c. 15 km of the site, there is an extensive, largely masked contact between the Bokkeveld and (non-ochreous) quartzitic sandstone (Table Mountain Group), running parallel to the coast (Rogers 1988: 411); the closest coastal intercept to Blombos is estimated 3–5 km WNW (masked by beach sand). Where ochre is less abundant (underlying CL-CP, and overlying CF-BZ), traces of marine organisms are rare (absent above CF), and hematite and fine sandstone are better represented (Figure 4.2). Color profiles[10] track the raw material changes (Figure 4.3), with the combined representation of "saturated reddish-brown," "very red," and "very dark" values tracking hematite

[9] The data presented here supersedes the preliminary site report (Henshilwood et al. 2001a). They will be presented more exhaustively in a forthcoming report.

[10] The Natural Color System Index (2nd edn., 1999) was used to code streaks. This uses a percentage metric for blackness, chroma, and hue. Values were grouped along two axes. Nuance (combined blackness and chroma) was divided into pastel, intermediate, and satur ated groups. "Saturated" cases have the highest chroma for given levels of blackness. Pastels have the lowest chroma (in the range of 10 25%) for the same levels of blackness. Intermediate nuances fall between these poles. Blackness and chroma values above the 5th percentile in the 10% intervals are rounded up. Hue groupings were "yellow brown" (<50% redness), "reddish brown" (50 74% redness), and "very red" (≥75% redness). Values with ≥56% blackness were grouped into a "very dark" category, regardless of chroma or redness.

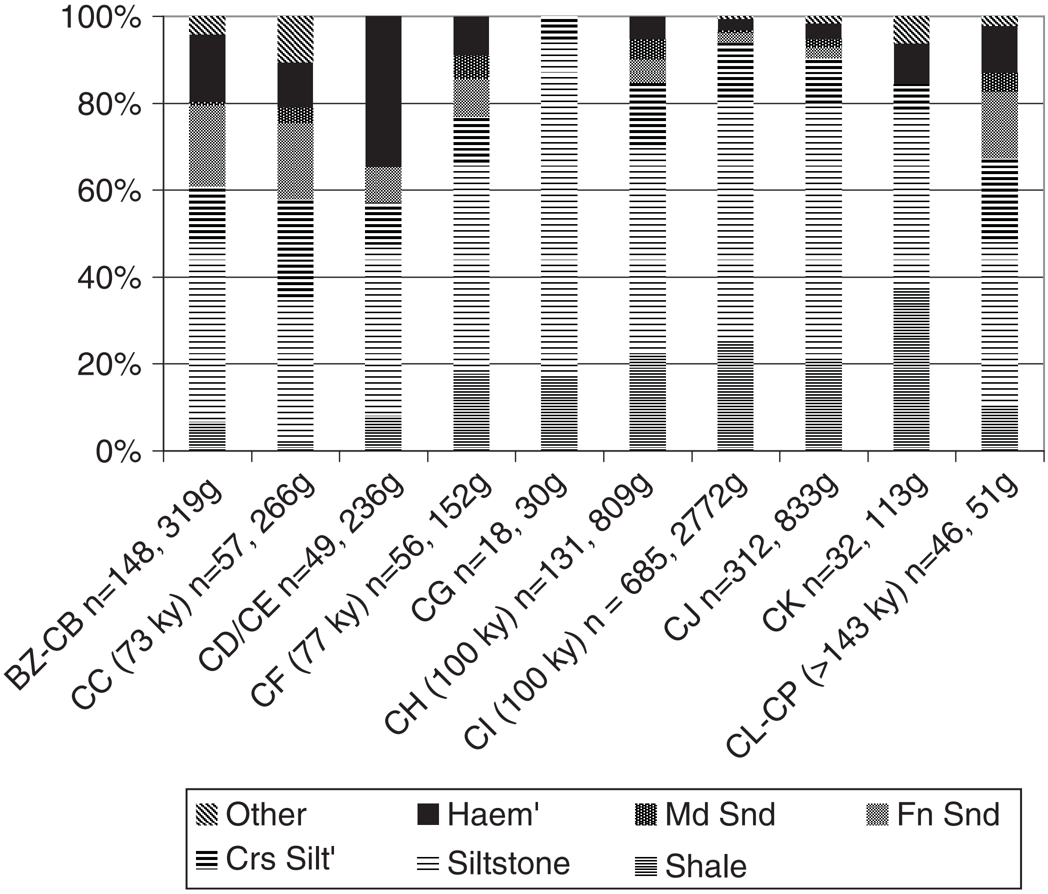

FIG. 4.2 Pigment raw material profiles by excavation aggregate at Blombos Cave (1998/1999 excavations). Percentages based on frequency, column headings also providing total mass (grams).

and fine sandstone, and "intermediate" reddish-brown and yellowish-brown tracking fine-grained sedimentary materials.[11]

When ochre was scarce, Blombos occupants could have abandoned its use; or traveled 15–20 km east to obtain similar material from the lower Goukou Valley; or travelled 35–40 km north (inland) to obtain higher-quality materials (an area commercially quarried for red and yellow ochre). The inland exposures are also Bokkeveld, but, being beyond the

[11] Twenty two of the 23 "very dark" values had ≥70% redness and just four had ≥70% blackness; most can, therefore, be considered extensions of intermediate and saturated reddish brown and very red groupings. Among intermediate yellowish browns (n = 156), 78.2% fall within 10% of the yellow/red cut point, and can be treated as an extension of reddish browns.

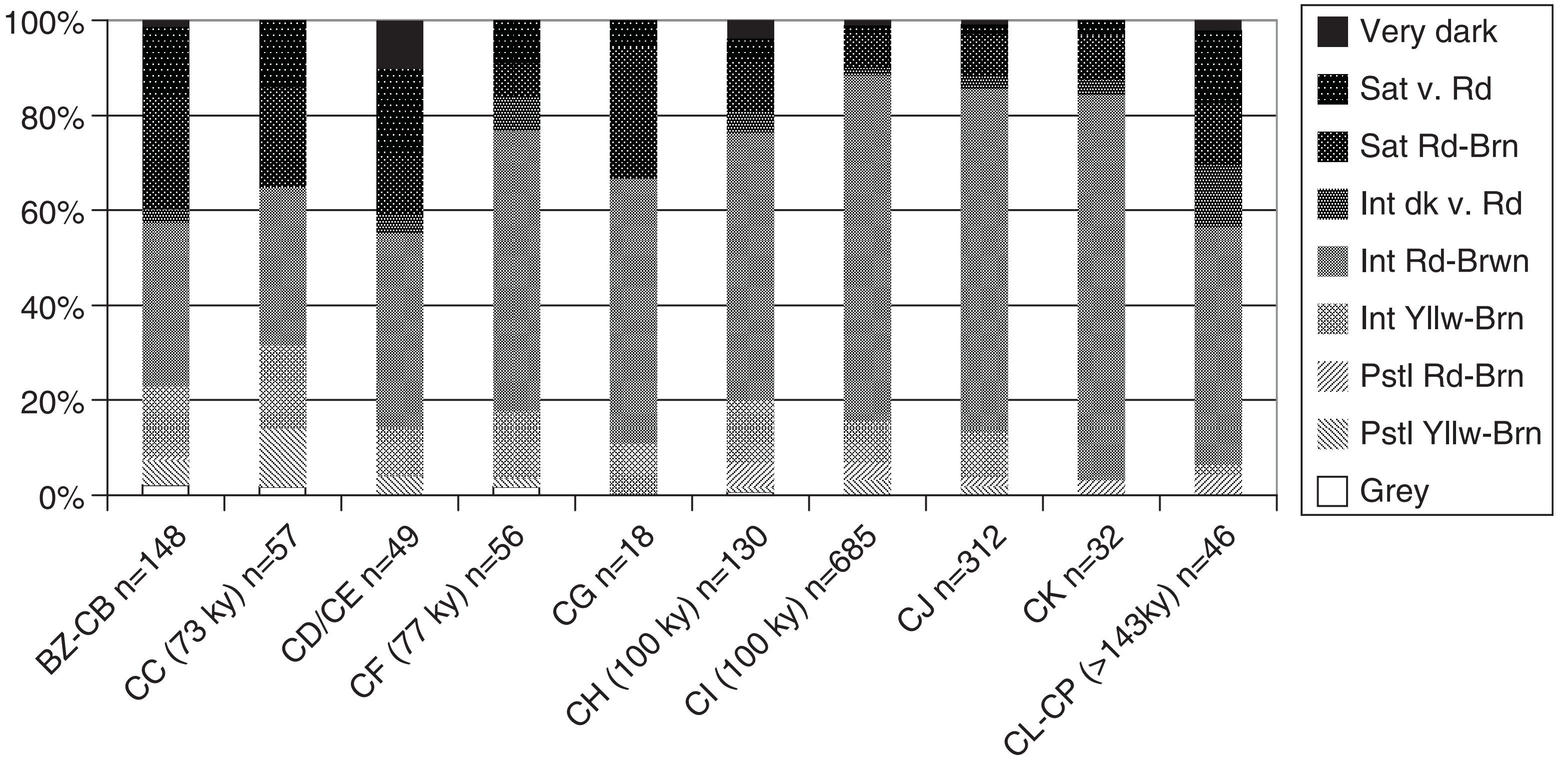

Fig. 4.3 Grouped colour (streak) profiles by excavation aggregate at Blombos Cave (1998/1999 excavations). Percentages based on frequency of grouped Natural Color System (NCS) values.

reach of Cainozoic marine transgressions, they are more deeply weathered, with more pronounced secondary alteration (e.g. hematization). Additionally, sandier expressions of Bokkeveld are more common than to the south (Theron 1972: 18, 58).[12] Judging by raw material and color profiles, the last option was frequently chosen. This complements results from Qafzeh, where local ochre was ignored in favor of more distant, more hematite-enriched material (Hovers et al. 2003).

The incidence of use-wear is strikingly correlated with redness (Figure 4.4). Only about 10% of yellowish-brown pieces were utilized; as soon as red predominates, utilized percentages incrementally increase, peaking at ~50% of pieces with ≥80% redness. Not only were the redder pieces more likely to be used; saturated reds were more likely to be used than intermediate counterparts (Figure 4.5). The pattern persists even in layers such as CI, where local procurement prevailed (peak rates of utilization shift to "intermediate very red" and "saturated reddish-brown," owing to small sample size bias among "saturated very red" [n = 10]). The great majority (82.7%) of "saturated very red" values were moderately dark (≥35%, <56% blackness). The preferential use of what might be dubbed "blood-reds" is borne out by estimates of the intensity of grinding (Figure 4.6). The reddest and the most saturated pieces were more likely to be intensively ground than less red, less saturated counterparts. Intensively ground pieces were multi-faceted, typically with facets converging to a point (e.g. Plate 4.2, 4.3, 4.4a–b), such pieces generally being described as "crayons" (but see Wadley 2005b). Harder pieces could only have acquired this morphology through prolonged processing, probably involving multiple episodes of use. This in turn would imply safekeeping between episodes of use, further supporting the inference of high esteem. The color selection is consistent with that reported from Twin Rivers, from the terminal Middle Pleistocene at nearby Pinnacle Point (Marean et al. 2007), and with Watts' (2002: 10) more subjective observations on a multi-site MSA sample. It also accords with the two previously discussed ethnographic accounts of the best (indigenous) exemplars of what have been glossed as "light" or "light/warm" color terms.

While "saturated very red" pigments (typically fairly dark) were the most valued, the margins of the utilized distribution deserve comment.

[12] Because coastal and inland ochreous exposures are the same substrate, and because Bokkeveld shale formations are mineralogically uniform (Danchin 1970), it is unlikely that geochemical and mineralogical analyses could test this interpretation.

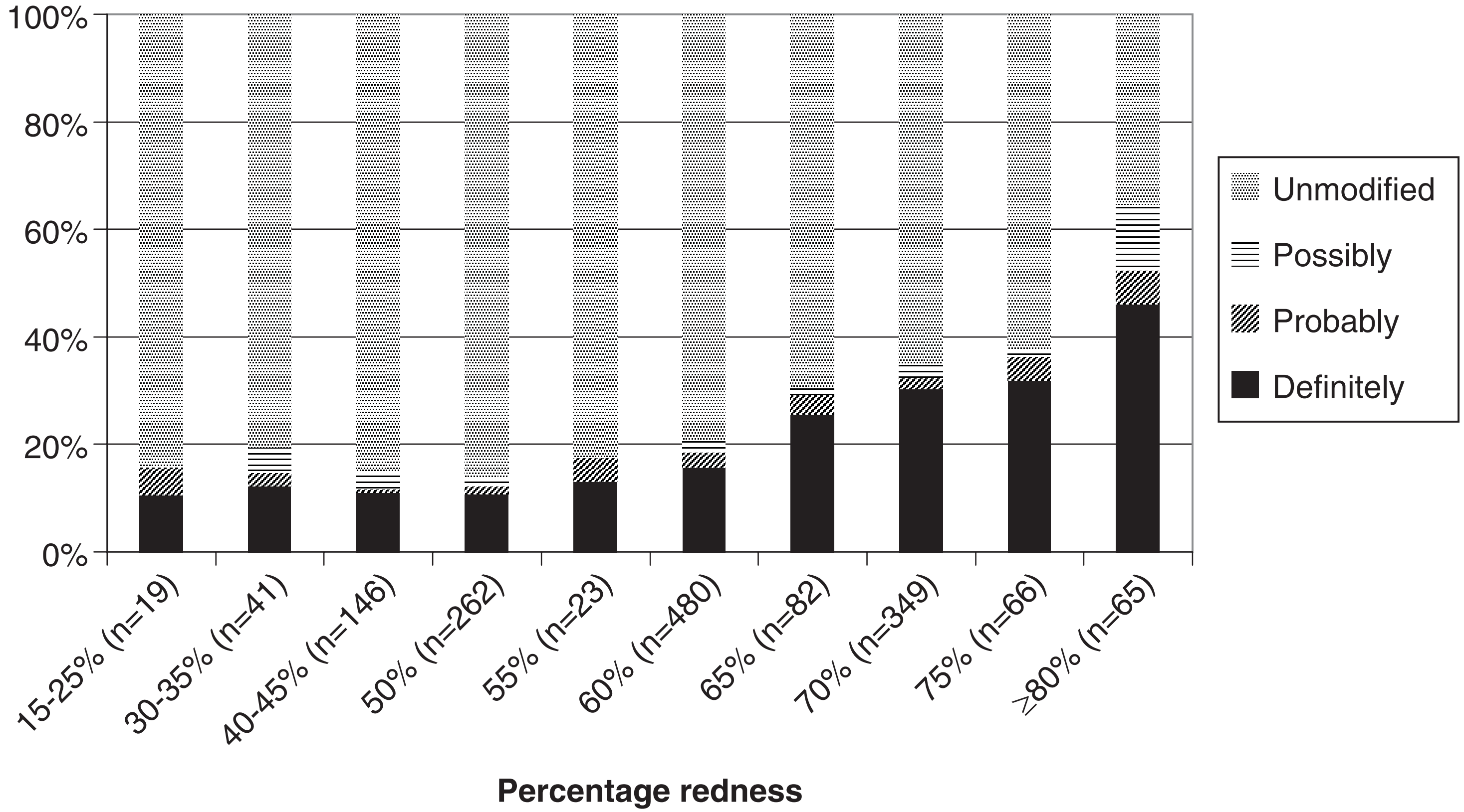

Fig. 4.4 Percentages of utilization confidence assessments by percentage redness (redness as a ratio to yellowness).

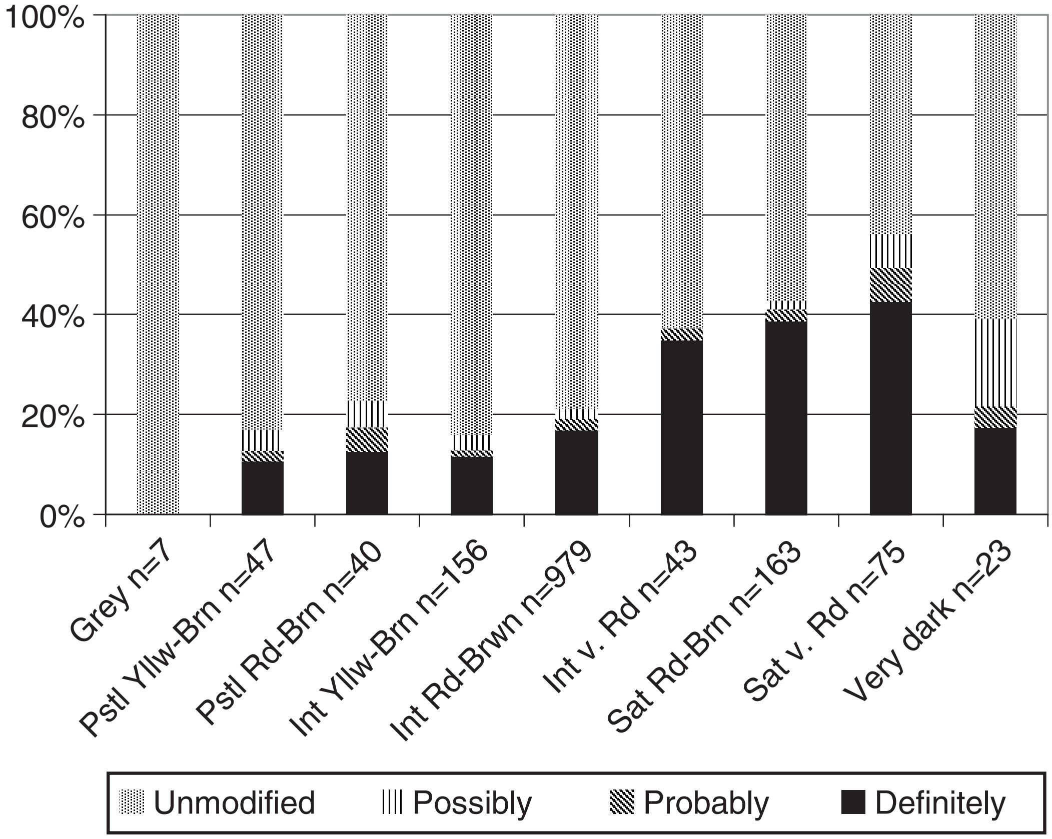

Fig. 4.5 Percentages of utilization confidence assessments by grouped NCS values.

Utilized "pastel yellowish-browns" (n = 5) have ≤25% blackness; lightness rather than hue seems to be the most perceptually salient attribute of this group (which includes two geometrically engraved pieces from CI). Of 18 utilized "intermediate yellowish-browns," three had >60% yellowness, the rest were close to reddish-browns. One of the four utilized "very dark" values had 70% blackness and was described as brownish-black. These three peripheral subgroups are significant in showing that the focus on reds was not exclusive; light, very dark, and yellowish materials were occasionally used. Assuming a color lexicon, such pieces may have been distinguished from the vast bulk of the assemblage; but, as at Twin Rivers, their rarity underlines just how preoccupied MSA people were with red. As with the overall survey, these few pieces do not support the binary oppositions predicted by either the original or the revised versions of BCT theory. Short of invoking untestable propositions about use of white ash and charcoal, the only recurrent opposition that might be archeologically

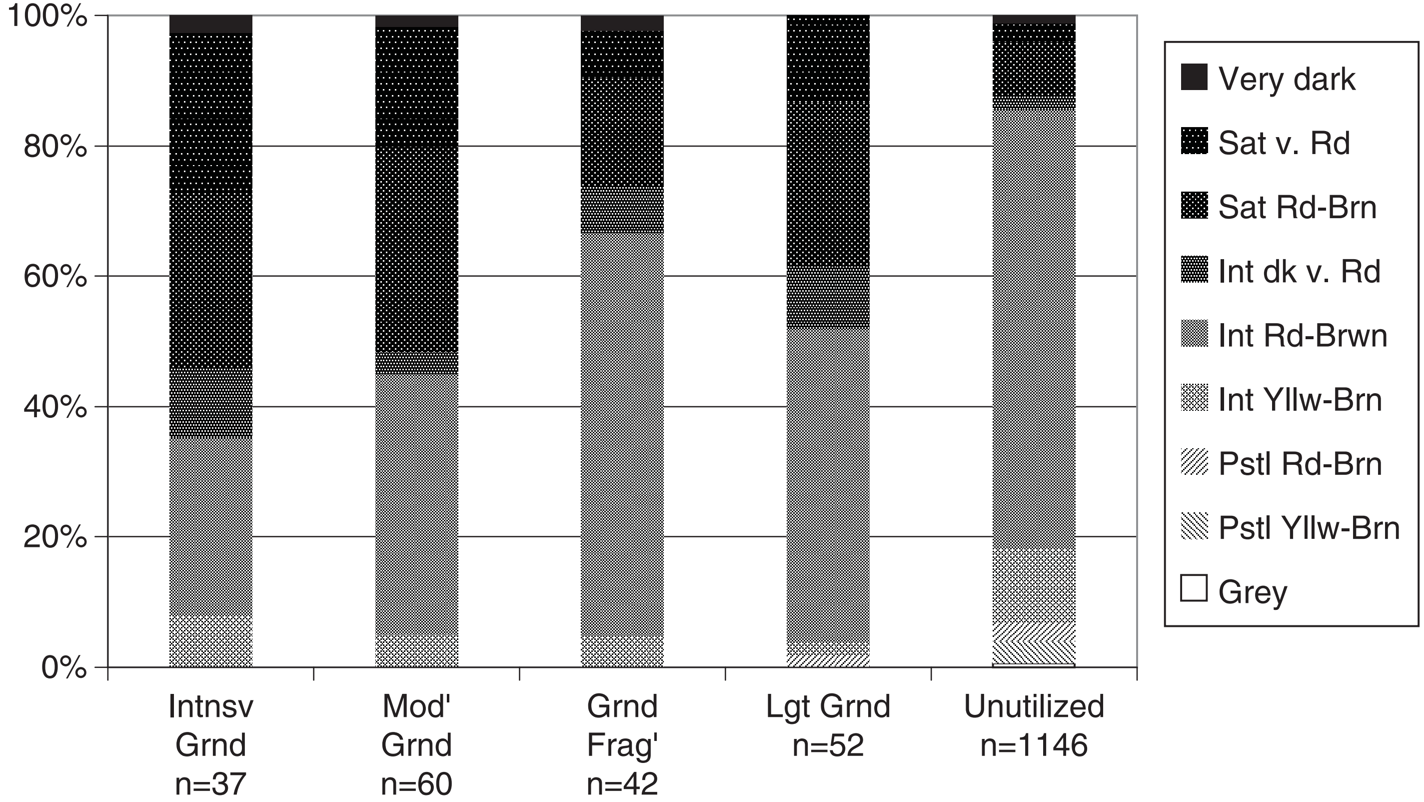

Fig. 4.6 Percentages of grouped NCS values by intensity of grinding compared to unutilized pieces (excludes non-ground forms of utilization and non-definite assessments).

inferred would be “signal on” (ritual display with red pigment) versus “signal off” (no pigment use).

Two final features worth noting are the small size of many utilized pieces, and the high proportion of lightly utilized ones. Of 307 definitely used pieces, 80 were judged to be ≥90% complete. A quarter of these were between 1.5 cm and 2.5 cm long (mean 19 mm, s.d. 2.9 mm, n = 22), just large enough to be held between forefinger and thumb. Some are intensively utilized, others less so (e.g. Plates 4.5, 4.6). That individual episodes of use often only produced tiny amounts of powder is evident among lightly utilized pieces (e.g. Plates 4.7, 4.8). Eleven lightly ground pieces (n = 52) were judged ≥90% complete with single facets; facet widths were recorded for seven of these, providing an average of 2.9 mm (s.d. 0.8 mm). Ten of the eleven cases had ≥70% redness. The high proportion of saturated and very red values among lightly ground pieces (Figure 4.6) suggests that, rather than representing mere trials in the search for the reddest, most saturated pigments, these were used similarly to more intensively ground counterparts. The tiny amounts of powder produced would surely have been insufficient for just about anything other than design purposes.

In summary, MSA people at Blombos preferred saturated red earth pigments. These were more likely to be ground and ground intensively, probably involving multiple episodes of use and curation. At the same time, individual episodes of use often only produced tiny amounts of powder (with similar selective criteria), a practice probably inconsistent with anything other than making designs on the face, body, or some other organic surface. Together with the geometric engravings (from c. 100 ky), this provides good circumstantial evidence for the use of typically “blood-red” ochre in the painting of abstract designs on the bodies of ritual performers, from at least 143 ky. That a nearby assemblage shows identical selective criteria from ~164 ky (Marean et al. 2007), suggests that this cultural tradition was already established by the time of our speciation, between ~150 ky and ~200 ky.

4.11 Discussion

With the exception of the tanning hypothesis, all of the theoretical perspectives and inductive hypotheses considered here have some explanatory merit. The hafting hypothesis partially explains the archeological observations from which it arose. However, until functional properties additional to those of known alternative and cheaper filler/loading agents are demonstrated, it is more parsimonious to infer that this was a case of symbolic considerations influencing a functional choice. As a general explanatory hypothesis, hafting cannot account for large assemblages, the hue and chroma-based selective criteria, or pieces with solitary, small grinding facets.

The cross-cultural findings associated with BCT theory are fairly robust, and few doubt that biology constrains both color categorization and naming. What is contested is whether biology provides sufficient constraints for coordinating perceptually grounded categories codified in language (e.g. Deacon 1997; Jameson 2005; Steels and Belpaeme 2005). The paradox of dark, saturated red being selected as exemplary of what is glossed as a "light/warm" term in Stage I color lexicons remains inadequately addressed. Although not designed to address archeological data, the Middle and earlier Late Pleistocene record of pigment use presents several challenges to BCT theory. Why the overwhelming use of just one color rather than the predicted binary opposition? Why a focus on one term of the predicted pair rather than the other? Why red rather than white or yellow? And why the focus on relatively dark reds?

Deacon's qualified innatism opens the door to cultural factors—specifically ritual—impinging on color lexicalization, but it does no more than this. The projection of wedding rituals back into the Plio-Pleistocene—and with it the implicit antiquity of BCTs—makes it implausible that the pragmatics of color terminology in extant cultures have any bearing on the evolution of color terms.

Hovers and colleagues are oblivious to any contradiction in presenting a thoroughly innatist model, and then (in discussion) invoking Deacon's arguments about the role of ritual in learning symbols. As with Deacon's hypothesized rituals, the pigments probably deployed in Qafzeh mortuary rituals could as readily have been black or white as red.

Like BCT theory, Durkheim's theory of collective representations is non-Darwinian. However, his predictions regarding the form of early ritual performance—involving the painting of geometric designs on the bodies of ritual performers with red ochre—seem remarkably prescient in view of the Blombos engravings. A necessarily circumstantial case has been made for these predictions being met in the late Middle Pleistocene and early Late Pleistocene African record of ochre use. What is missing is an evolutionary account that might account for this blood symbolism.

The five archeological predictions made by the FCC model are met by the evidence outlined above. Several mid-Middle Pleistocene lineages may have engaged in something like "sham menstruation," but habitual collective ritual can only be inferred among our immediate African ancestors, perhaps initially restricted to local populations within the tropics, but becoming generalized across Africa towards the end of the Middle Pleistocene. Not only is there an almost exclusive focus on reds, but blood reds seem to have been especially esteemed. When not locally available, people would go some distance to procure them.

To summarize: Because collective rituals are costly, they demonstrate commitment. A consequence of commitment is the generation of trust. Once you have a ritual community within which there is sufficient trust, you no longer need costly signals for internal use—you can afford to develop cheaper, coded forms of communication. Costly ritual continues to be required for signaling to an "out-group" (e.g. potential mates), and for the incorporation of new members (e.g. girls reaching reproductive age) into the ritual coalition. Human speech communities were born out of the regular performance of such costly displays.

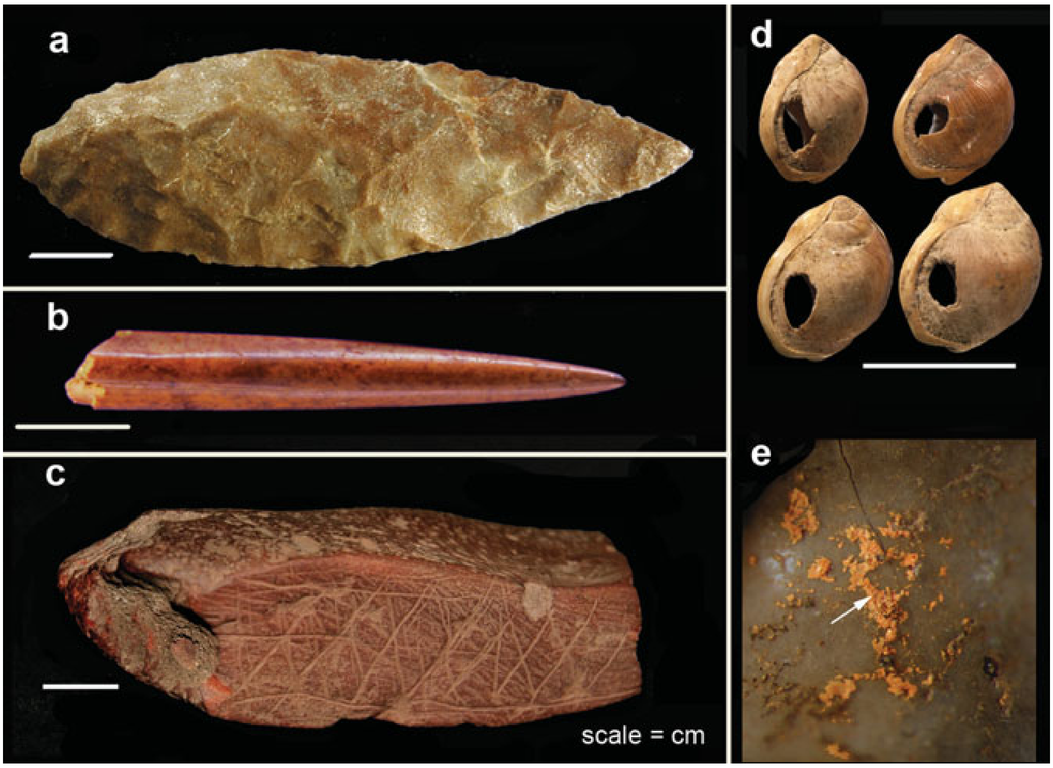

Plate 3 Artifacts from the Still Bay levels at Blombos Cave: a) silcrete bifacial point b) formal bone tool c) engraved ochre SAM-AA 8938 d) *Nassarius kraussianus* shell beads e) ochre deposit on a shell bead (Images by C. Henshilwood and F. d'Errico)

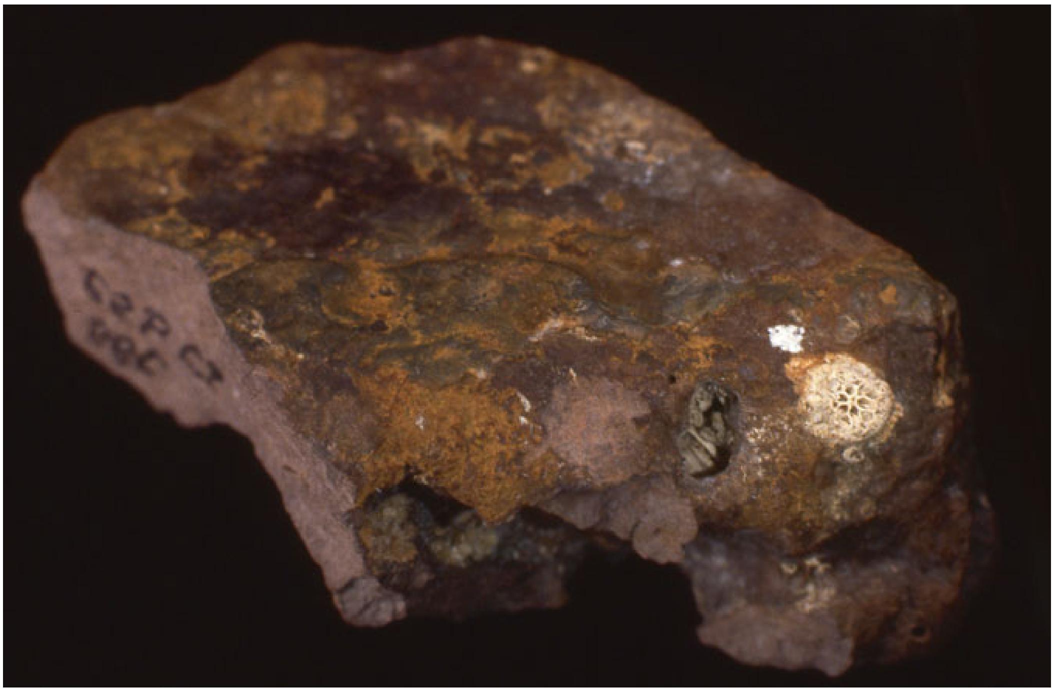

Plate 4.1 CI Siltstone, 56.3g, 73.9mm length, NCS streak 3545 Y60R. Two adjacent pholadid borings, one with both valves of the pholadid *in-situ*. Unidentified tests of marine organisms attached to adjacent surface.

PLATE 4.2 CF Hematite “crayon”. 3.7g, 34.1 mm length, NCS streak 3357 Y80R, 9 facets.

PLATE 4.3 CFC Coarse siltstone “crayon”. 0.6g, 17.3 mm length, NCS streak 3257 Y80R, 3 facets.

PLATE 4.4 (a and b). CI Siltstone 'crayon'. 3.9g, 41.3 mm length, NCS streak 4040 Y75R, 7 facets.

Plate 4.5 CB Coarse siltstone, intensively ground. 1g, 16.9 mm length, complete, NCS streak 3550 Y70R, 9 facets.

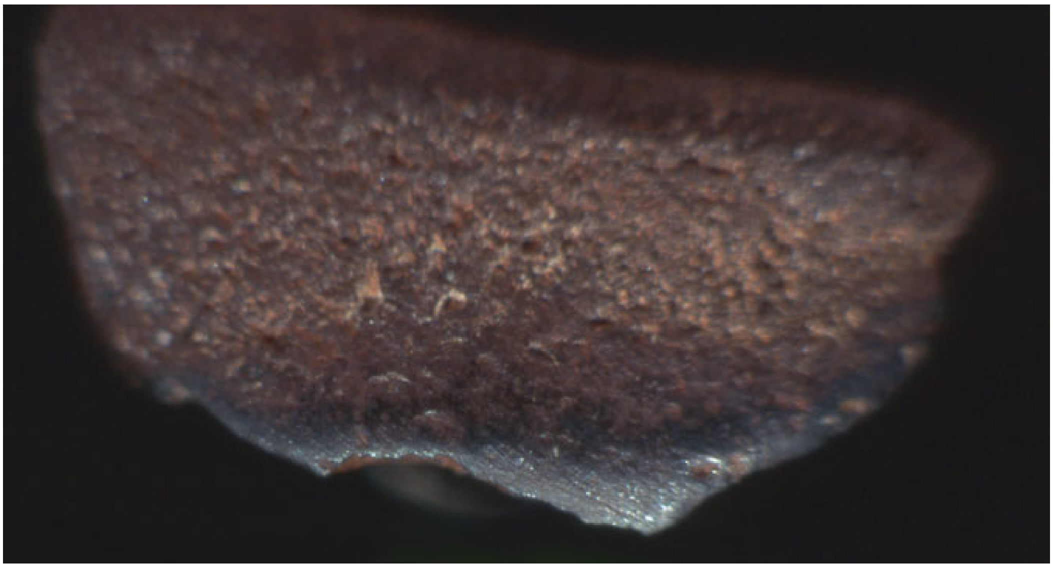

Plate 4.6 CF Hematite, 1.5g, 21.6 mm length. NCS streak 5030 Y80R. Ground on part of one main surface and two edges, illustrated facet 3.2 mm wide.

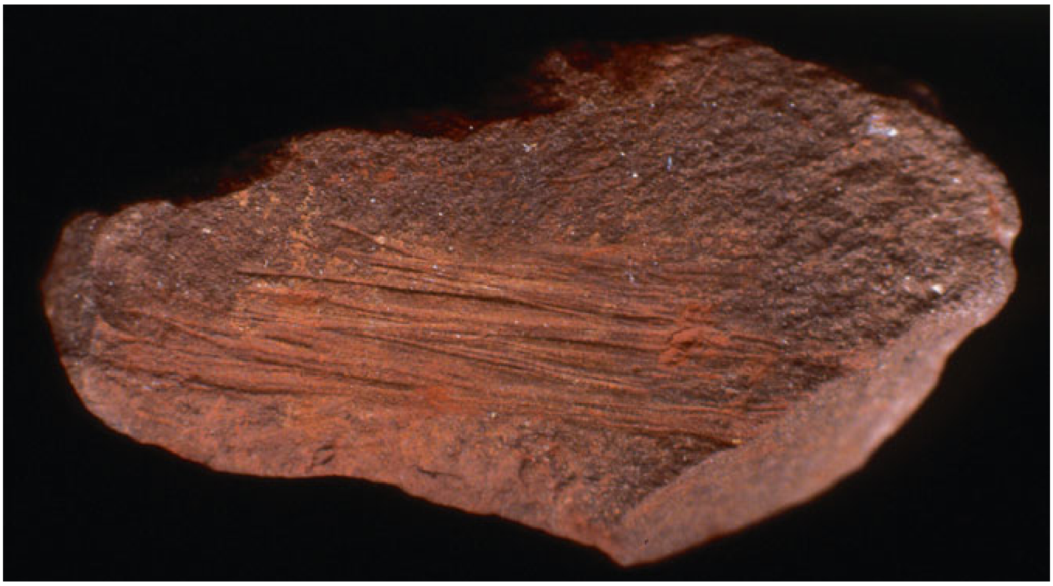

Plate 4.7 CI Coarse siltstone, lightly scraped. 13.6g, 38.3 mm length. NCS streak 3258 Y60R.

Plate 4.8 CGB Shale, lightly (edge) ground 1.3g, 33.9 mm length, NCS streak 3555 Y70R. Facet width 3 mm.