

Hominin Mind and Creativity

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In comparison to other disciplines, Pleistocene archaeology has an unusual capacity of getting it wrong most of the time: ever since the mid-19th century, when all archaeologists rejected the coexistence of humans with Pleistocene fauna (e.g. Boucher de Perthes 1846), every important innovation in this field has been universally rejected by all practitioners. This included, for example, the propositions introducing fossil man (Fuhlrott 1859), Palaeolithic "art" (Sautuola 1880), *Homo erectus* (Dubois 1894) and australopithecines (Dart 1925); while the Piltdown fraud (Weiner, Oakley, Le Gros Clark et al. 1953) and the African Eve hoax (Bednarik 2008a), among hundreds of such examples, were readily accepted. This tendency of the discipline to be captivated by fads but precipitously rejecting valid propositions continues to the present time, with such examples as the Flores "hobbit" case or the various controversies concerning rock art dating. Since many aspects of the most popular archaeology memes can be safely assumed to be still false, it would be only prudent to anticipate that the dominant notions about the minds of hominins or of the creativity of our ancestors might also be problematic.

Rather than succumbing to the inconsequential humanist concept of "mind" as referring to "conscious experience" and "intelligent thought", it may be more productive to consider the mind as a system of neural and endocrine processes, how they work, and how their interplay can be described. No entity definable as the human mind exists; like engrams (Lashley 1950), it has no dimensions, weight, appearance, composition or location; hence it has no neuroscientific existence. Similarly, the application of the humanist concept of creativity to the Pleistocene is fraught with difficulties. Ordinarily the term refers to invention or origination of any new thing that has value to society, but we possess no adequately secure knowledge about the circumstances of any innovation or perceived creation of the Pleistocene to justify a discourse on the origins of creativity. In short, before considering the workings of the hominin brain or its presumed reflections in the archaeological record we need to dispel the simplistic and ethnocentric popularisations archaeology has encouraged to arise.

A MODERN MIND

The unscientific nature of most archaeological discourse is evident from, among other things, the misuse of concepts imported from scientific disciplines. For instance the biological concept of *evolution* perceives it as a purely dysteleological process, whereas archaeology applies teleologically guided assumptions of it to culture and technology, illustrating the incommensurability of scientific and archaeological epistemologies. Moreover, notions of cultural variables and their expressions

are merely etic constructs or "observer-relative, institutional facts" (Searle 1995). All Pleistocene "cultures" are archaeofacts - invented entities based on perceived but etic implement types and their relative combinations within assemblages - yet it is obvious that tools do not define cultures. Variables such as palaeoart, which do present authentic cultural dimensions, have been forced into the imaginary schemes created, which are then attributed to a succession of human groups that never existed as identifiable ethnic, political, linguistic or cultural entities (such as "Mousterians", "Aurignacians" or "Magdalenians"). More importantly, none of the dimensions relevant to the construct of "mind", such as intellect, intention, motivation, cognition, meaning or behaviour is recoverable by archaeology, and they cannot be inferred from tools as implied by the underlying "lithocentric" mantra of the discipline.

With so many pivotal attributes of the unstable orthodoxies of Pleistocene archaeology being unreliable or ill-conceived it is not surprising that notions of hominin mind and creativity are just as specious. The dominant view, based on the now redundant replacement hypothesis (that a new species replaced all other humans), is that the "modern mind" can be traced back in the order of 30,000 years, to "anatomically modern humans", being demonstrated especially by Aurignacian palaeoart. Most aspects of this belief are probably false: the earliest rock art and mobiliary art of that period are more likely in the order of 40,000 years old (Bednarik 2007, Sadier, Delannoy, Benedetti et al. 2012, Pike, Hoffmann, García-Díez et al. 2012) and they are perhaps the work of robust *Homo sapiens*, such as the so-called Neanderthals (Bednarik 2007). Moreover, the naive assumption that these Aurignacians, quite apart from not being anatomically modern, thought in ways similar to present-day conspecifics can be shown to be false. All palaeoart was created by non-literate humans, whose brains functioned very differently from those of literate people (Helvenston 2013). In fact, it is only in recent historical times that we became modern (Latoar 1993), and the imposition of modern, literate narratives on properties of incredibly remote societies needs to be questioned at every opportunity. Modern human behaviour is not only determined by the intrinsic neural structures and endocrine systems giving rise to it, these are demonstrably influenced by ontogenic experiences of the individual and their effects on these neural configurations. Cultural (i.e. learned) activity modifies both the chemistry and anatomy of the brain (Malafouris 2008), affecting the flow of neurotransmitters and hormones and the quantity of grey matter (Maguire, Gadian, Johnsrude et al. 2000, Draganski, Gaser, Bush et al. 2004, Smail 2007). Even people of the Middle Ages existed in reality constructs profoundly differing from those of modern literate people, and we can be certain that these differences were far more pronounced in early Upper Palaeolithic times.

What is it that has convinced archaeologists that the Chauvet cave art, for instance, indicates the use of a modern mind? They believe to "communicate" with the palaeoartist (Mithen 1998) because they imagine being able to detect adequate clues in images to determine their meaning, hence it appears to them to have access to the "mind" of the artist. They cannot, however, tell us about the minds of their users, otherwise recent users of "Middle Palaeolithic" stone tools (e.g. Tasmanians) should also lack modern minds. Because they believe they detect interpretable details in an image, they assume that these details must have been placed with the intention of rendering them interpretable by similar "minds". In reality this "identification" process is a form of circular reasoning, reflecting the values, mental constructs and visual responses of the beholder rather than the producer of the rock art motif. Given that the same interpreters would not assume to communicate with, say, a contemporary Aboriginal artist through his rock art, it would seem that this belief stems from the supposed (but unfalsifiable) naturalistic characteristics of the image. It has no scientific justification; it is a communication with the self.

Some commentators have taken the view that the "modern mind" *postdates* the early Upper Palaeolithic (e.g. Humphrey 1998 and debate therein), explicitly rejecting the opinion that neural modernity is indicated by iconographic depiction, or by any other archaeological indices of neural modernity in early societies. Other such cited indicators include projectile weapons, blades, bone artefacts, hafting, elaborate fire use, exploitation of marine resources and large game (e.g.

Spikins 2009), which many archaeologists mistakenly believe to be Upper Palaeolithic innovations. Evidence of these advances can be found not only with Middle Palaeolithic/Middle Stone Age industries of the Old World, but also with Lower Palaeolithic/Early Stone Age technocomplexes. Indeed, if “mind” refers to the state and operation of the neural structures that are involved in moderating behavioural patterns, these must have been essentially modern at least since the end of the Early Pleistocene, i.e. for almost 800,000 rather than 30,000 years (Bednarik 2008a, 2011a). “Modern behaviour” does not refer to the behaviour of modern Westerners, or to that of any other extant human group. It is defined by the state of the neural structures that are involved in moderating behavioural patterns, which ultimately are determined by inhibitory and excitatory stimuli in the brain (Bednarik 2011b). So the question is: what types of evidence would suggest that these extant neural structures had been substantially established, and at what time does such evidence first occur?

If the above list of indicators were symptoms of mental modernity, it would clearly extend well into the Lower Palaeolithic, but there is no good reason to accept these archaeological propositions. Adaptive exploitation of marine resources is mastered by many species, and many carnivores kill prey that is larger than they are. Projectiles are used by various other primates, and hominids and later hominins seem to have used them throughout much of their existence. Elaborate fire use is first demonstrated at 1.7 million years ago (Beaumont 2011), while blades, bone artefacts and composite tools all occur later in the Lower Palaeolithic. They cannot, however, tell us about the minds of their users (consider Tasmanians with their “Middle Palaeolithic” technology). Theory of mind (ToM), level of consciousness and self-awareness would be more relevant, but are not considered because they cannot be excavated. Inferences derived from empirical archaeological knowledge are admitted selectively: if they reinforce the dominant model they are welcomed, if they contradict it they are eschewed (e.g. Rigaud 2007, Rigaud, d’Errico, Vanhaeren et al. 2009). For instance language proficiency is crucial in forming human constructs of reality and cognitive dimensions (Bickerton 2010), and although palaeophysiology and linguistics (Falk 1975, 1983, 1987, 2009, Dunbar 2003) have, for very good reasons, long attributed language to most or all hominins, mainstream archaeology has in recent decades preferred to limit language ability to the progeny of an imaginary “African Eve” for which no credible evidence has ever been tendered. This extreme view illustrates the chasm between archaeology and science: it is biologically absurd that the enormous cost of encephalisation should not have involved significant evolutionary benefits. Given that natural selection can only select expressed characteristics, not latent ones, and that the human brain approached its modern size several hundreds of millennia ago, it needs to be explained what hominins did with these enlarged brains. Just as language can only be selected for after it has appeared (Bickerton 2010), so can larger brain size, and to imply, as archaeological interpretation does, that for millions of years this brain increased relentlessly without being much used is biologically incongruous. It is, nevertheless, the de-facto null hypothesis of Pleistocene archaeology, whereas science would tend to assume that the cost of encephalisation demands significant benefits.

TO M AND SELF-AWARENESS

The cognitive “explosion” or “great leap” around 40,000 years ago postulated by mainstream archaeology (Cann, Stoneking, Wilson et al. 1987, Stringer, Andrews 1988) not only lacks a logical basis; it is contradicted even by the archaeological record. Preferred indicators that today’s human brain possesses the kind of structures that underwrite behavior and cognition are exograms, signs that humans are capable of storing symbolic information outside their brains. Middle Pleistocene (Lower Palaeolithic) examples of exograms have been classified into beads, petroglyphs, portable engravings, proto-sculptures, pigments and manuports (Bednarik 1992, 2003a). Although commu-

nication is possible by various means, it seems unlikely that maritime colonisation almost a million years ago was achievable without an appropriate form of “reflective” language (Bednarik 1999, 2003b). This provides an important anchor point for a realistic timeline of developing human competence in volitionally driven behavior, one of the quintessential aspects of humanness (Bednarik 2011b, 2012). Modernity in human behavior had begun, in the sense that the same neural structures and processes that determine this quality today were essentially in place. If this occurred around a million years ago, as appears to be the case, then the archaeological beliefs are false. If, on the other hand, only fully modern behavior qualifies for modernity, then it arose only in the most recent centuries, and it does not apply to extant illiterates or to traditional societies. It then becomes such a narrow definition that it is useless as a marker of human development. Either way orthodox archaeology misunderstood the advent of the “modern mind” completely.

Homology can provide some preliminary indications from reviewing empirically demonstrated ontogenic development. Intentional behaviour can be detected by infants 5–9 months old (Woodward 1999), while at 15 months they can classify actions according to their goals (Csibra, Biro, Koos et al. 2003). The same abilities are available to chimpanzees and orang-utans (Call, Tomasello 1998), but apparently not to monkeys (Jelkema, Baker, Wicker et al. 2000). Between 18 and 24 months, the child establishes joint attention (Franco, Butterworth 1996), as well as engages in pretend-play, and it develops an ability to understand desires (Wellman, Woolcy 1990, Rapacholi, Gopnik 1997, Wellman, Liu 2004). Again, apes use gaze monitoring to detect joint attention (Hare, Call, Agretta et al. 2000), but monkeys apparently do not. It is roughly at the age of forty months that the human child surpasses the ToM (theory of mind) level of the great apes (Bednarik 2012, 2013). Thus the executive control over cognition unique to humans, together with metarepresentation and recursion, would be expected to have developed during the last 5 or 6 million years. Although the brain areas accounting for the latter two faculties remain unidentified, executive control resides in the frontal lobes. Since the frontal and temporal areas have experienced the greatest degree of enlargement in humans (Semendeferi, Armstrong, Schleicher et al. 2001, Bednarik, Helveston 2012), the faculties facilitating uniquely human abilities would be expected to be most likely found there – although inter-connectivity rather than discrete loci may have been the main driving force of cognitive evolution. It is precisely the expansion of association cortices that has made the human brain disproportionately large (Preuss 2000). It is with the appearance of “metarepresentation”, a representation (Von Eckardt 1999) of a representation (Leslie 1994, Baron-Cohen 1995, Deane 1998, Perner, Gamham 2001), and with recursion that developed human ToM emerges, as these are lacking in the great apes (Suddendorf 1999, Call, Tomasello 1999). Similarly, the apes have so far provided no evidence of episodic memory or future planning (Suddendorf, Busby 2003). Episodic memory, which is identified with autonoetic consciousness, can be impaired in humans, e.g. in amnesia, Asperger’s syndrome, or in older adults (Gardiner 2001). It can be attributed to differential activity in the medial prefrontal and medial parietal cortices, imaging studies of episodic retrieval have shown (Lou, Luber, Crupain et al. 2004).

These homological considerations provided by primatology thus suggest that distinctive precursors of modernity in human behaviour, in the forms of ToM, consciousness and self-awareness, must have been present several million years ago; they can be assumed to have become gradually more established since then (Bednarik 2011a). By the beginning of the Middle Pleistocene, 780,000 years ago, modern human behaviour as a neurological and endocrine process must have been well established, in the sense that the structures involved in moderating behavioural patterns were substantially in place. For instance the earliest evidence of maritime colonisation, from about that time (Bednarik 1999, 2003b), demands that *Homo erectus* then possessed relatively complex communication, presumably in the form of speech. It also implies a variety of technological capacities, such as the use of cordage and knotting (Warner, Bednarik 1996). The neural structures underwriting human behaviour at that time should be visualised as being not significantly different from those of present-day humans of, say, 8–12 years of age that have not been modified by the use of written communication or other forms of exograms (extra-cortical memory records of ideas).

EXOGRAMS

There is no evidence that any extant non-human primate uses, let alone creates, exograms under natural conditions. The symbol systems used by primatologists to communicate with apes are all humanly created, and the question arises whether such symbols could be defined as exograms. This issue appears to help define them, because the use of externally stored memory presupposes the *creation* of exograms. Therefore the language boards and other communication devices of primatologists may define the difference between symbols and exograms: clearly they use referents, but they do not constitute native or naturalised systems of external storage. On the other hand, exograms may not necessarily have referents, as they refer more typically to purely abstract concepts, whereas symbols by definition stand for other entities. Moreover, most symbols are shared with conspecifics, generally via culture, whereas there is a distinctive separation of personal exograms (not shared with conspecifics) and shared exograms (culturally determined).

The concept of external engrams (Lashley 1950) was first applied to non-figurative cave art (Bednarik 1987), before the neologism "exogram" was invented to name them (Donald 2001). Since certain forms in which they occur are readily identifiable on the archaeological record they provide the most comprehensive indices in estimating the cognitive complexity of hominins, but they can also demonstrate the inadequacies of archaeological inferences. For instance it is clear that the faculty of self-awareness in a social animal would logically lead to strategies of consciously expressing individualism. Most such evidence is of a nature possessing very low taphonomic thresholds (Bednarik 1994, but see McGrew, Marchant 1998, McGrew 2004 for apparent "self-decoration" of a chimpanzee), but beads and pendants are notable exceptions (Bednarik 1997, 2005, 2008b) providing glimpses of self-adornment. The several species indicating degrees of self-awareness (De Veer, Van Den Bos 1999, Gallup 1970, 1998, Gallup, Anderson, Shillito et al. 2002, Heyes 1998, Keenan, Falk, Gallup et al. 2003, Mitchell 1993, 1997, 2002) are much the same as those shown to possess von Economo neurons (Seeley, Carlin, Allman et al. 2006, Butti, Sherwood, Hakeem et al. 2009, Hakeem, Sherwood, Bonar et al. 2009). The latter seem to occur in relatively large species with large brains and extensive social networks (Bednarik 2011b), and it may be that constructs of individuality evolved in tandem with these networks. It is difficult to see how social complexity could have developed beyond that of social insects without some level of self-awareness, just as the advent of self-awareness is hard to account for. Since self-awareness can safely be assumed to have been present in all hominin species, it helps account for the earliest known find implying recognition of iconic resemblance, the Makapansgat cobble (Bednarik 1998). Clearly, the pareidolic detection of human features presupposes apperceptive capability, in this instance some 2.95 million years ago. The lack of subsequent, more direct indications of self-awareness for much of the remaining history of hominins is apparent, but in view of the generic coarse resolution of the available record as well as the relevant taphonomy (not to mention archaeological neglect of such evidence) it is to be expected. Nevertheless, considering that from a biological perspective, items of self-adornment should appear early in the Pleistocene, it is rather surprising that they emerge only much later on the available record (Bednarik 1997, 2005, 2008b). And as with any material evidence contradicting their dogmas over the past couple of centuries, archaeologists have here also engaged in their standard response of explaining it away (d'Errico, Villa 1997, Rigaud 2007, Rigaud, d'Errico, Vanhaeren et al. 2009). Numerous examples of this practice include d'Errico's rejection of the Repolust Cave pendants, the Divje Babe I bone flute (d'Errico, Villa, Pinto Llona et al. 1998) or the Berekhat Ram proto-figurine, although upon examination he did concede his error concerning the latter item (d'Errico, Nowell 2000). It is this consistent pattern of premature dismissal or misinterpretation of the most important finds of the time in question, in terms of their explanatory power that detracts greatly from the value of the discipline.



Fig. 1
Late Acheulian proto-
figurine from Berekhat
Ram, Israel

CONCLUSION

The incommensurability of the biosciences and archaeology renders it inevitable that the minimalist explanations archaeology favours contradict the scientific perspective. According to Pleistocene archaeology, hominins prior to 40,000 years ago lacked symbolising abilities and probably had no language. This is neuroscientifically irrational and highly unlikely, given the numerous pelagic colonisations of the second half of the Pleistocene. It would imply that the millions of years of continuous encephalisation would have had severely limited cognitive effects. Yet archaeology's "big bang of consciousness" (Klein, Edgar 2002) is supposed to have occurred at the very same time as the significant reduction of brain volume (by about 13%) within an instant in evolutionary time commenced. This "creative explosion" (Pfeiffer 1983, Mithen 1998) is perceived at the beginning of a hypothetical period called the Upper Palaeolithic, triggering a veritable quantum jump in cognitive and intellectual prowess. This myth attributing the advent of human modernity to the beginning of the Upper Palaeolithic and the arrival of supposedly anatomically modern humans is contradicted by virtually millions of exograms preceding these events either chronologically or technologically. For instance all of Australia's Pleistocene petroglyphs relate to Middle rather than Upper Palaeolithic technologies, and all the world's palaeoart exceeding 40,000 years in age (Bednarik 1992, 2003a, Beaumont, Bednarik 2013) refutes both the "explosion" and the replacement hypothesis it is tied to. The same can be said about evidence of presumed symbolic behaviour, be it the use of pigment (Beaumont, Bednarik 2012), of raptors' feathers (Finlayson, Brown, Blasco et al. 2012) and musical instruments (Turk, Dimkaroski 2011), or the language skills demonstrated by maritime colonisation skills (Bednarik 1999, 2003b). With its accommodative reasoning, intended to preserve the dogma, mainstream archaeology has rejected thousands of early manifestations of human "creativity", and is therefore not in a good position to comment constructively on this topic. Moreover, creativity is no more archaeologically recoverable than intention, meaning or behaviour. This subject is therefore best left to the neurosciences (Bednarik 2011a, 2011b, 2012, Helvenston 2013, Dielenberg 2013).

Similarly, Pleistocene archaeology has consistently failed to provide a credible explanation for the origins of what it calls the human mind, or even come close to locating its advent temporally or spatially. In fact it has consistently scorned or explained away all material finds that might illuminate the issue, and has substituted technological variables for cultural - even using them to deduce cognitive ability. Having failed to define cultures correctly it is in no position to judge the variables the neurosciences need to engage with in clarifying these issues.

In the final analysis one has two choices in exploring questions of the origin of the human "mind" and "creativity". One can admit archaeology's fantasies, tainted by dogma as they are (es-

pecially the replacement hypothesis); or one can choose the more prudent path of science. The first approach places as much distance as possible between modern people and their hominin ancestors, and resists any suggestion of hominin sophistication. It also perceives isolated human populations that were engaged in frequent migrations across largely empty landscapes, a scenario that is evidently false as hominins occupied every possible niche in the course of the Middle Pleistocene, even the Arctic. The second approach, via science, has had very limited attention, and can only offer preliminary findings at this stage. It sees genes and memes travelling by introgression through largely contiguous populations that had progressively occupied new geographical regions. But more relevantly, it starts with the null hypotheses that brain expansion is very expensive and would not have occurred if there were no commensurate benefits involved. Therefore a complexity of hominin cognition roughly proportionate to brain size is to be expected, and the "creative explosion" derives from an archaeological misconception. Since ToM, self-awareness and consciousness were certainly available to all human species, archaeology's minimalist explanations contesting the evidence of hominin cognitive capabilities are incompatible with the most parsimonious null hypothesis of science.

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