KEYWORDS: ***Exogram – Figure-stone – Fontmaure – Lithic – Pareidolia – Visual ambiguity***

ESCHEWING BEAR TRACKS: FALLACIES, FIGURE-STONES AND FONTMAURE

Richard Wilson

Abstract. Lithics have historically been perceived in terms of 'tools' and 'tool-making'. This perspective, perpetuated by archaeologists and anthropologists alike, cannot be taken for granted and may well represent a fallacy. Since the discovery of chipped-stone artefacts by Boucher de Perthes in Abbeville, France, during the 19th century, the suggestion that many of these items may represent some of the earliest attempts of hominins to produce iconography has been dismissed with contempt. However, parietal rock art prompted by natural features found in caves dated to the Palaeolithic suggests that finding evidence for the production of 'figure-stones' may not be unreasonable. Whilst the proposition that proto-sculptures are evident amongst many European assemblages is often rejected on the grounds of 'seeing images in clouds', pareidolia underpins the identification of all figurative palaeoart. The hypothesis that Middle Palaeolithic lithics do not incorporate iconography is tested with a sample from the Fontmaure occupation site in France. The results suggest the default position adopted by the majority of archaeologists studying lithics, rejecting the incorporation of iconography, is probably incorrect.

*"you ain't just a bear trackin' " is a term that evolved as an outgrowth of experience from tracking bears who are notorious for laying down false tracks and then doubling back on them. If you are not following bear tracks you are not following false trails or leads in your thoughts, words or deeds (*Wikipedia 2014*).*

1. Introduction

Over one hundred and seventy years ago Boucher de Perthes (1846) suggested that the stones he collected represented the 'figure-stones, symbols and tools' of Pleistocene people. Others investigating lithics since have also suggested that his '*Pierre-Figures*' may constitute a real phenomenon (Thieullen 1901; Dharvent 1906; Thieullen et al. 1909; Newton 1912; Regnault 1935; Juritzky 1953; Matthes 1969; Wilson 2010; Harrod 2014). Whilst his 'worthless pebbles' were eventually begrudgingly accepted by the archaeological community (Bednarik 2013a), only the etic-emic concept of 'tools' and 'tool-making' was pursued by Pleistocene archaeologists and lithic analysts. Consequently, debate concerning lithics is usually framed solely in these terms. Although this narrative has been challenged recently by some scholars (Bednarik 2013a; Hiscock 2014; Shea 2014), it continues to paralyse discourse by framing and bounding the discussion of lithics within illusory and arbitrary constraints.

The incorporation of natural rock features in Upper Palaeolithic art is now widely acknowledged (Bahn 2016). Numerous instances provide abundant confirmation that pareidolia played heavily in the production of rock art. The suggestive shape of rock edges and natural surface markings frequently formed a substantial element of the whole composition. In essence, it appears that the emic interpretation of these visually ambiguous features often dictated the subject then depicted. Visual ambiguity was being actively managed by Pleistocene people.

However, whilst the incorporation of rock edges and other natural features in rock art is now broadly accepted, the logical extension of this practice to lithics is still snubbed (Wilson 2010; Bednarik 2016a).

Production of lithics primarily concerns edge modification. One likely place to look for early indications of palaeoart production is where the edges of rocks have been modified. Bednarik, for example, has hypothesised that 'the most archaic art in the world consists of responses to edges or surface aspects, enhancing them or making them more interesting' (Bednarik 1990a). However, since the end of the 19th century archaeologists have ruled that lithics were not a medium for iconography (Wilson 2010). They have discouraged discourse on the subject, dismissing suggestions from amateurs and professionals alike with silence or derision (ibid.), a response all too familiar to Boucher de Perthes who once remarked:

They employed against me a weapon more potent

> than objections, than criticism, than satire or even persecution — the weapon of disdain. They did not discuss my facts; they did not even take the trouble to deny them. They disregarded them (transl. Bednarik 2013a).

The evaluation of lithics in the context of palaeoart production is generally considered to be taboo. In archaeological circles to even suggest the idea is perceived as career-suicide, such is the stigma attached to the concept (Wilson 2010). This consensus rejection of figure-stones is not science at work but argument by authority acting as a systemic filter and having the effect of limiting and distorting subsequent discourse and dissemination.

A rare exception to this deafening silence recently appeared in a short chapter of a book by Bahn and Lorblanchet (2017) considering the world's oldest 'art'. Aside from drawing similarities between some of the illustrations made by Boucher de Perthes (which were notoriously poor) and items from Kostenki, they provide three examples, two of which are *lusus naturae*. The third specimen is an oddly shaped block of flint possibly with some working at either end (although no human agency can be definitively inferred from the photograph or the illustration provided). The authors suggest it has the 'general shape of a female statuette'. The comparison is tenuous at best, and could be applied to millions of misshapen stones. Bahn and Lorblanchet fall far short of presenting a credible case for figure-stones. In fact, they perpetuate the idea that the vague resemblance of one item to a single, also vague and highly conventionalised template is what constitutes the best evidence available for figure-stones. They underscore their lack of conviction by adding a broad caveat: admission that the examples they provide do not provide 'proof' that they represent the deliberate choices of hominins.

With very few exceptions, the a priori default position of Pleistocene archaeologists is that the incorporation of iconography in lithics prior to the 'Upper Palaeolithic' was not practiced, or if it was, then only very rarely (for example Vishnyatsky [cited in Bednarik 2003a] suggested that finds such as the Tan-Tan figurine were 'running ahead of time'). This assumption is based on the perceived absence of figurative iconography and operates as a circular reference to inform the Euro-litho-centric Pleistocene archaeological narrative which maintains that the Lower and Middle Palaeolithic were periods of relative stasis lacking figurative iconography. Their frequently made claim, that figurative representation was essentially the preserve of 'anatomically modern humans' (e.g. Bahn and Lorblanchet 2017), requires that no credible figure-stones can be identified from the massive corpus of lithic evidence from the Early and Middle Palaeolithic.

Theoretically only one example would refute their hypothesis (H_0). However, Thieullen (1907) and others have already attempted this and their examples were rejected on the grounds that they were isolated and other convincing examples were lacking. Repeat examples were demanded.

This paper tests the *de facto* null hypothesis regarding figure-stones (H_0) against the working hypothesis that figure-stones are detectable (H_1). The present null hypothesis that iconography was not incorporated into lithics can be readily tested with the abundance of existing material from Middle and Lower Palaeolithic sites. This paper focuses on those items deriving from the Middle Palaeolithic assemblage from Fontmaure, France. It bears reiterating that identification at species level is not required; it is enough to identify a single zoomorphic or anthropomorphous figure to refute H_0.

1.1. *Tool typologies*

In order to address the study of lithics in the context of palaeoart it is incumbent to consider the dominant archaeological perspective. A brief metamorphological analysis is required. Concerning the classification of lithics, Andrefsky notes:

> Phenomena are classified into types based upon criteria that give each of the types the most internal cohesion and the most external isolation … Classification schemes attempt to produce types with a great amount of within-group similarity and a great amount of between-group difference (Andrefsky 2005).

In other words, the classification of lithics is fundamentally arbitrary. As Bednarik has repeatedly stated, the 'tool' typologies used by Pleistocene archaeologists are 'archaeo-facts' (observer-relative institutionalised facts; Searle 1995). The bases of their taxonomies are those characteristics which are selected not by objectively determined criteria but by 'the anthropocentrising dynamics of human reality-building processes' (Bednarik 2011). Their selection and classification are made according to those crucial common denominators deemed to be important to archaeologists studying lithics. These characteristics should not be expected to tell us anything about Pleistocene people. At the 2010 IFRAO conference one archaeologist relayed a story concerning a Native American who, when asked how he categorised his lithics, replied with words to the effect of 'by colour'. This is a powerful demonstration of the gap between the standard categorisation of 'tool-typologies' regularly ascribed to lithic analysis and the emic categorisation of a contemporaneous indigene. It should also serve to remind us that in terms of understanding the reality constructs of people living hundreds of thousands of years ago, these invented taxonomies are probably irrelevant.

From the etic selection of observational characteristics (such as technical attributes) to the transformation of those artefacts into 'meta-objects' forming the basis of an arbitrary taxonomy, all the way through to the observer-relative interpretations of these abstract 'techno-complexes' ('meta-meta-objects'), the research process systematically distorts raw archaeological data (Consens 2006). The addition of new data to the model simply confirms the framework which, in the case of lithics, is unsupported even by ethnographic evidence.

The archaeological construct of 'lithic technology' provides no insight into the reality constructs of Pleistocene people. Only the hypotheses which test these models and acknowledges their severe limitations have any chance of contributing to Pleistocene archaeology.

The relevance of an etic technological classification system to the cultural and behavioural significance of the artefacts it attempts to describe and define is at best questionable and at worst entirely unproven. The conflation of technological indices as cultural and even biological markers has led to claims such as a '5400 year overlap between modern humans and Neanderthals' based on tool-typologies (Higham et al. 2014). To arrive at such definitive statements based on the constructs of archaeologists is testament to the failure of the discipline to comprehend that the very premise upon which it is based renders lithic analysis as practised inherently unable to adequately inform us about, reliably describe, or even document the extent of hominin populations in the past. Simply put, stone 'tools' are not reliable cultural markers and nor are they biological markers. This case alone serves to underscore the danger of directly importing institutionalised facts from lithic analysts. Shea (2014) for instance, questions whether so-called 'NASTIES' (NAmed Stone Tool industrIES) have added value to archaeology or stifled progress to date.

Empirical data (e.g. measurable metrics) have only a limited value in informing archaeology about the behaviour of Pleistocene humans. This is evident from the meagre progress that the specialist field of 'lithic analysis' has contributed to Pleistocene archaeology relative to the huge number of specimens recovered, the resource consumed in doing so, and the inordinate volume of papers published in the past 170 years. It is also evident from the inability of the discipline to robustly account for the ornate and often highly symmetrical 'handaxes' which evidently serve a purpose beyond functional utility. Perhaps it is precisely because the appearance of such items so very early in the history of human development is totally at odds with the narrative of a Lower Palaeolithic 'culture' without symbolism, that the discipline has been unable, or unwilling, to address the elephant in the room?

Each individual lithic has countless properties which can be measured, yielding observer-relative data including as discussed, those that relate to perceived 'typologies' (which are not testable). In asking what value these research efforts actually bring to Pleistocene archaeology it becomes apparent that much of the data of value relates to measurements relative to some other factor external to the artefact itself, for example in the process of dating sites, analysing distribution patterns, locating raw material sources etc. Even the process of replication cannot test the assumptions made about the artefact on the basis of perceived evidence for use-wear. Indeed, by applying taphonomic logic (Bednarik 1994a) to the results of most lithic analysis it transpires that even less of the data created has advanced the understanding of Pleistocene archaeology. In a sense, archaeologists continue to amass tons of chipped stones which yield very few advances whilst simultaneously destroying sites which would undoubtedly be better understood if left for future investigation with improved technologies and objective insight.

Lest we forget, lithics are purposefully selected for inclusion and illustration in archaeological publications. The selection criteria used will vary according to authors' and publishers' preferences, between assemblages, and countless other variables. The specimens chosen for illustration will rarely reflect a balanced or representative sample of those found. They will be those that are perceived as the best examples to convey the message the author wishes to convey to the reader — such as the 'typology' that they are thought to represent. Inizan et al. (1999) note that 'Prehistorian and illustrator must therefore work together to make the choice of objects that will best represent the results of the study.' Although this may seem obvious, it is worth reiterating that this pre-dissemination process results in a further distortion of the data before the consumption of that information. Typically, the orientation of lithics is usually constrained by the arbitrary standards applied to lithic illustration, generally according to the debitage axis although there are exceptions to this rule. Are we to suppose that Pleistocene people regarded the debitage axis relevant beyond the production stage?

Whilst stone is one of the few materials which has survived in relative abundance from the Palaeolithic, the underlying assumption that all lithics are the products of 'tool-making' cannot be anything other than a distorted perspective. Pleistocene archaeology implicitly proposes that the purpose of lithic reduction is already known and singular where no such evidence exists. Hiscock (2014) ardently rejects the assertion that making tools adequately accounts for the often elaborate and varied forms of lithics observed. For the discipline of archaeology to self-righteously shun the idea that Pleistocene people may have incorporated iconography in the production of lithics is incredulous given that the concept of lithics solely in terms of 'tools' and 'tool-making' is itself not falsifiable and probably a fallacy.

Archaeologists have invented and followed a system of typological classifications which has no real relevance to the past that they attempt to describe. It has hindered debate by conflating technical indices with biological and ethnic constructs or markers. Worse, archaeologists may have ignored perhaps the only legitimate means of eliciting information regarding the nature of human models of reality of Pleistocene peoples by dismissing a framework which provides the potential to begin to understand the articulation between the creator and the artefact, a framework which has support from the cognitive, neurological and biological sciences.

1.2. *Natural features*

There are many examples of natural features incorporated into the rock art of the Upper Palaeolithic: the rock features forming the 'masks' at Altamira, the large 'bison' of Pech Merle, the 'antlers' in the Salon Noir, and the 'human' form painted around a phallus-like stalagmite in Le Portel are just a few. Bahn (2016), for example, notes that the incorporation of natural rock features 'is one of the most characteristic and striking features of Ice Age parietal art'.

'Seeing-in' describes the biological, evolutionary and neurological propensity toward recognising 'hyperimagery' (Hodgson and Helvenston 2010). The conditions for this susceptibility in the hominin visual recognition system are described in detail by Hodgson and Helvenston: neuro-archaeological evidence for hominins responding to key salient features and cues is persuasive. The abilities acquired through selective evolutionary pressures resulted in a highly adapted neurological system capable of successfully managing visual ambiguity and deception (Hodgson and Helvenston 2006, 2010). Hodgson (2003a) also explains how the 'perky effect' and other visual imagery processing (Hodgson 2006) can also account for many of the features seen in Palaeolithic 'art'. He remarks that in a visual system already hyper-sensitised to animal forms, natural features such as cave walls would simulate animal forms. Hodgson (2006) also notes that a significant element of surviving cave art involves the incorporation of natural features suggestive of animal anatomy.

The deliberate inclusion of visually ambiguous features appears to corroborate the suggestion that palaeoart exploits the evolved and established processes of the hominin visual recognition system (such as pareidolia) that were critical to a rapid response to important stimuli and necessary for survival (Hodgson 2003a, 2003b; Hodgson and Helvenston 2006, 2010; Bednarik 2017a). In fact, all rock art takes advantage of this neural ability regardless of the extent to which natural features are involved or whether it may be perceived as 'naturalistic' (Bednarik 2017a). As Bednarik observes, 'Figurative art results from a deliberate creation of visual ambiguity' (Bednarik 2003a). Magritte's famous painting, including the caption 'Ceci n'est pas une pipe' illustrates this point succinctly. The painting is not a pipe — it is a depiction of a pipe. Arguably only a three-dimensional hologram could be entirely naturalistic: all other representational methods are, by comparison, schematic to some degree, and it is the extent to which those graphic devices utilised in figurative representations during the Pleistocene lend themselves to detection and identification by alien-observers that is central to all pareidolic interpretations of Palaeolithic 'art' (Dobrez and Dobrez 2013; Bednarik 2016a, 2017a).

The earliest surviving example found and recognised to-date which infers the propensity to compare a natural feature to another object is the Makapansgat cobble. The transportation of this unmodified item over several kilometres suggests evidence of 'equivalence' at 2.95 Ma (Bednarik 1998; Hodgson 2003b) which is unremarkable in the context of a scientifically informed framework for the development of behaviour and cognition in hominins over time (Bednarik 2015, 2016b).

Perhaps less expected is the apparent hiatus in the 'archaeological record' between this object and the next example widely recognised, the 'Tan-Tan figurine'. The gap between the two objects amounts to a period of time in excess of two million years (Bednarik 2003a). Although some portable objects have been put forward to fill this gap (e.g. Harrod 2014), none are commonly accepted by scholars. This glaring absence should have raised suspicion before now. From a technological and neurological perspective, the early occurrence of figure-stones is predicted. For example, Hodgson writing about the production of 'handaxes' over the course of one million years suggests:

> The skill required to craft such tools is quite sophisticated and would have easily been transferable to the production of geometric marks as well as to the enhancement of naturally-occurring iconic-like objects so as to accentuate the resemblance to a human figure, face or animal feature (Hodgson 2006).

By rejecting the concept of figure-stones since it was first put forward by Boucher de Perthes, archaeologists have almost guaranteed that nothing should fill this gap. Of the few materials that may have survived and may bear traces of iconography, the entire corpus of lithics has been ruled off limits. Contemplating the possibility of iconography being incorporated into lithics is positively discouraged. One archaeologist (Andrew Currant, pers. comm.) referring to an open air site in the United Kingdom had this to say:

> I know a guy who reckons he has a Palaeolithic art gallery ... He actually has a very interesting human occupation site, but nobody will touch his material because he tells them that the artefacts are actually depictions of Neanderthal man made in flint. In short, we can't cope — life is too short and there is too much to look at.

This self-filtering approach, where the production of figure-stones is not even entertained conceptually, let alone considered objectively, ensures that the current dogma is not challenged. It supports the existing bias that systematically distorts the discourse concerning lithics, a discourse which then misinforms the field of Pleistocene archaeology. If iconography was incorporated in Pleistocene lithics it would mean that a substantial corpus of palaeoart is yet to be discovered and documented. Critically, the identification of figure-stones would represent a monumental failure of the discipline to see what was right in front of it all along.

1.3. *Figure-stones*

When presented with potential figure-stones a common response is for archaeologists to dismiss them with claims of pareidolia. Such a reaction does not account for the human propensity towards apophenia,

and more specifically in the context of palaeoart, the role of pareidolia in the visual recognition system of hominins. Besides rejecting the primary information available to a casual observer (visual characteristics), this familiar reaction to potential figure-stones is entirely unscientific: it is made without recourse to logic (since arguably archaeologists often search for patterns in random data) and demonstrates a poor understanding of the function of pareidolia in object detection and recognition.

Of particular pertinence regarding the potential differences between the etic and emic interpretation of lithics are the neural systems used in their processing by the visual recognition system. The findings from clinical and *in vivo* studies suggest that there are discrete category-dependent nodes indicating fractionation of semantic knowledge (Okada et al. 2000). Indeed, Caramazza and Mahon's (2003) results imply that organisation of conceptual knowledge is primarily constrained by object domain. Visual recognition of tools appears to predominantly occur in a left hemispheric network (involving the left dorsolateral frontal cortex) whereas the recognition of animals involves activation bilaterally in the inferior temporo-occipital areas (Perani et al. 1995). Stout et al (2015) have found that both left and right hemispheres are active when knapping 'Oldowan tools' whereas, intriguingly, the right frontal cortex is more active when making 'Acheulian tools'. However, the issue is further complicated by the type of task undertaken: whether it relates to categorisation or action knowledge (decision making) (Gerlach et al. 2000). The neurology of Pleistocene people is suspected to be significantly different from that of extant literate people (Bednarik and Helvenston 2012). The interpretation bias toward 'tools' and 'tool-making' in lithic analysis can only reflect the neurology and conditioning of academics, not the neurology and conditioning of the manufacturer.

Neither does this standard response pay heed to existing evidence documented in the 'archaeological record' which demonstrates that visual ambiguity played a significant part in the production of the Palaeolithic 'art' found in caves. Pareidolia may have occurred at any stage of the *chaîne operatoire*. Both natural surface features and the 'form against ground' could potentially provoke a pareidolic response in the hominin visual recognition system. Susceptibility to pareidolia is not constrained to specific locations or situations, and is certainly not dependent on an 'altered state of consciousness' (although it may be heightened in certain states or situations). Key salient features of animals may have been recognised in many mediums, especially when they appeared to exaggerate salient characteristics or forms (Hodgson 2003a, 2003b; Hodgson and Helvenston 2006; Sinha et al. 2006). As previously noted, the production of all palaeoart appears to exploit the underlying neural structures and processes which have evolved in response to detecting form (Bednarik 2003a, 2017a; Hodgson 2003a, 2003b; Hodgson and Helvenston 2006).

From a neurological perspective the incorporation of visually ambiguous features in the production of rock art is unsurprising. And from a neurological perspective, there are no valid reasons to conclude that this practice may not also have extended to the incorporation of iconography in the production of lithics. In fact, it would be judicious to assume that the production of iconography in the course of lithic reduction processes preceded the remnant examples of managing visual ambiguity that are preserved in caves.

One of the greatest obstacles to the acceptance of figure-stones was unwittingly created by those researchers most interested in the subject, including this author. The band-wagon effect, in no small part encouraged by the widespread use of the Internet, has resulted in hundreds of claims for Palaeolithic figure-stones (Wilson 2010; Bednarik 2016a). Most of these can be rejected either due to a lack of secure provenance or, in the majority of cases, because they show no evidence of anthropogenic modification. The question of whether they are figurative is irrelevant in either case: this author has studied hundreds of such claims, dismissing most on these grounds. However, because most of these claims have no sound basis they have the effect of being counter-productive: they largely serve simply to reinforce the perception of a 'lunatic-fringe' and encourage a response which seeks to deny legitimacy with ridicule.

> … His [Jacques Boucher de Perthes] credibility was low. His problem lay not in the many hundreds of genuine handaxes he had found, but in his exaggerated claims for ancient flint 'sculptures' of horses, bears and humans. In fact these were all natural shapes; his claims laughable (Gamble 2008).

Boucher de Perthes collected this figure-stone (Fig. 1) in Abbeville, France. It presents overlapping flake scars of comparable size and consistency which alone raise doubt in the veracity of the assertion by Gamble

Figure 1. *A figure-stone collected by Boucher de Perthes from Abbeville before 1844.* © Boucher de Perthes: Les Origines Romantiques de la Préhistoire *by Cohen and Hubin, 1989. Reproduced with permission.*

(2001) that all the items collected were 'natural lumps of gravel'.

There are many convincing examples of proposed figure-stones already documented (Wilson 2010). Perhaps the most promising are those originating from the site of Fontmaure, Vellèches, in the Department of Vienne, France. It was Raymond who, in 1909, at a conference on figure-stones in Paris, highlighted Fontmaure and the items in the collection of Hervé (Thieullen et al. 1909). These figure-stones were considered to be amongst the most convincing found to that day. Raymond suggested that the site was of particular interest to those studying figure-stones. One of the items found by Hervé, and illustrated in the conference publication, was proposed to depict either a 'bear' or 'horse' (ibid.: Pl. II, Fig. 2). Raymond correctly suggested that a precise identification was not important. What raised the importance of this specimen above others in Raymond's view was that it was made from 'scratch' and did not include any natural features. Raymond submitted the context and workmanship was irrefutable; it was, he said, 'immune' to the objections raised against other figure-stones (Thieullen et al. 1909).

2. Fontmaure

The site of Fontmaure centres on a freshwater spring. The primary raw material source in the wider region are the large slabs of siliceous Upper Turonian flint running from the northeast of Vienne to Grand-Pressigny (Indre-et-Loire). Fontmaure is distinguished by the unique multi-coloured jasper outcrop appearing there, a secondary Cretaceous microcrystalline quartz. The site is situated approximately 18 km and 45 km away from Grand-Pressigny and La Roche Cotard respectively. The former is well-known for the honey-coloured flint or '*livres de beurre*' (small quantities of which were brought to Fontmaure), and the latter for the proposed 'mask' found there — a piece of flint with a bone inserted through a cavity vaguely resembling a 'face' (Bahn 2016). Roughly 30 km south from Fontmaure is the site of La Grande Vallée, in Colombiers near Châtellerault. A piece of the distinctive jasper of Fontmaure was found there along with several other specimens of 'glossy sandstone' also typical of Fontmaure (Hérisson et al. 2012). Artefacts from La Grande Vallée are dated to a period between 450 000 and 650 000 years ago (ibid.), inferring that the site of Fontmaure was also in use from at least this time.

Figure 2. *The quartzite pebble discovered at Fontmaure, France.*

Discovered by amateur archaeologists in 1905, Fontmaure was described by Montrot in 1937 just before Pradel began his lengthy investigations there (Montrot 1937; Pradel 1942). Pradel claimed there were two distinct Mousterian layers at Fontmaure, later recording a third cultural layer comprising artefacts which he proposed were typologically comparable to those from Abbeville (Pradel 1949, 1962). If they are contemporaneous with the assemblage of La Grande Vallée they might now be described as 'developed Acheulian'. Occupation at Fontmaure may have continued into the Early Upper Palaeolithic. Pieces of jasper of Fontmaure have been found in the 'Perigordian II' levels at Les Cottes and the 'Aurignacian V' at Laugerie-Haute (Bordes and de Sonneville-Bordes 1954). However, the uppermost Mousterian layer has also been described as a Middle Palaeolithic industry with a laminar aspect (Katzman 2010). Despite extensive disturbance at the site it might still be possible to obtain more conclusive dates than those arising from stylistic determinations, or indirectly from other Palaeolithic sites. For the moment, and in the absence of secure dating, it is probable that the Fontmaure site represents multiple occupations from the Middle Pleistocene through to the Late Pleistocene.

2.1. Figure-stones

Despite writing numerous papers about Fontmaure (Pradel 1944, 1945, 1947, 1957, 1963, 1965a, 1965b, 1966a, 1966b, 1973; Pradel and Tourenq 1967, 1972), Pradel quietly published only one article concerning a possible figure-stone in 1971 in the *Bulletin for the Friends of Grand-Pressigny*. The small spherical quartzite pebble which resembles a simple smiling emoticon came from the "middle" Mousterian layer (Fig. 2). Pradel (1971) concluded that one of the 'eyes' was modified.

He also drew parallels with the use of natural features in cave art, but remained cautious, remarking that this was 'just one piece of a jig-saw puzzle'. His restraint was a result of the conditioning and training he had undergone. He closely adhered to a strictly defined terminology and typologies which even to this day dominate the discourse on lithics. This may in part explain why he did not appear to note the high frequency of figure-stones observed by others attracted to the site prior to and following his research (Thieullen et al. 1909; Wilson 2010). This is unsurprising: there are numerous instances where rock art has been missed simply because the people involved did not expect to encounter it (Bednarik 2001).

In 2002, van der Made reported in *Rock Art Research*

on a bead from the Fontmaure site. He also identified a possible pendant or bead of a calcite concretion. About the material at Fontmaure van der Made noted:

> … a large number of stones of iconographic forms have been collected. Mostly they are naturally formed stones which exhibited already a certain iconic feature and which were chipped artificially on one or more spots, apparently to improve the image … However, they have not yet been studied by mainstream archaeology (van der Made 2002).

Figure 3. *Items found by Tedde Toet. Left (TB#366) and middle (TB#365) geofacts, right (TB#368) modified Upper Turonian flint. Private collection of Tony Berlant.*

Two years earlier an exhibition held at the Museon Den Haag in the Netherlands presented a collection of lithics from Fontmaure including many proposed figure-stones. A selection of the exhibits featured in an accompanying pamphlet titled *Gedoogd verleden* (permitted past). The subjects identified included 'bears', 'bison', 'birds', 'fish' and 'humans'. Many were collected by amateur archaeologist Tedde Toet, although the exhibition also included contributions from the collections of Piet Bakker, Marie-France Durand, Pieter Huisman and Niek van Rijswijk, among others. The exhibition was ignored by the mainstream archaeological community in the Netherlands and Toet died shortly afterwards. Toet had sought to complete the jigsaw puzzle that Pradel had alluded to by searching for depictions of humans at Fontmaure. He was convinced that the items he found were representations created by Neanderthals. More recently Berlant and Wynn curated an exhibition 'First Sculpture: Handaxe to Figure Stone' at the Nasher Sculpture Centre, Dallas (Berlant and Wynn 2018a), including items from Fontmaure.

Figure 4. *TB#367 a massive modified boulder collected by Tedde Toet. Private collection of Tony Berlant.*

2.2. Form and typology

Anyone who has closely studied the site of Fontmaure will know that its attribution to the Mousterian of Acheulian Tradition (MAT) belies the true character of the site. While formal 'tool-types' such as 'bifaces' are found they do not constitute the bulk of material which is atypical; the MAT label is insufficient to account for the majority of the assemblage. To the astute observer, several anomalies beg for parsimonious explanations. While the 'bifaces' are often made from the more homogenous and colourful jasper, larger pieces of comparable material which may have served to make more 'tools' have been modified but not spalled. Atypical retouched pieces range in size from millimetres to a metre. TB#367 (Fig. 4) is a boulder which has not been quartered into manageable parcels but knapped across one side only. On the opposite side the cortex has been left entirely intact. Both sides resemble a 'face'; it has a staggering mass of over 80 kg. Likewise, sandstones in boulder sizes have been modified whilst smaller material of a similar nature is readily available, undermining the suggestion that the production of useable flakes is an adequate explanation for some of the reduction, or modification, observed. The material utilised ranges from homogeneous to inhomogeneous, from chalky and coarse-grained to glossy and fine-grained. The sandstone varies in a similar manner, often with a high quartz content. Rarer colours, striped or otherwise unusual pieces are invariably retouched (see Fig. 5). Specimens frequently include incorporations of fossils,

Figure 5. *FS#037 is a typical atypical piece of colourful jasper, modified and instantly recognisable as a 'bear'.*

holes and other natural features including colour, i.e. visual cues.

2.3. Form, edge modification, and the detection of iconography in lithics

As proposed here, whilst the form of lithics is often the subject of analysis, these forms are not usually considered in a context of palaeoart. Since modification of the edges of lithics appears to be central to the activity being practiced it is prudent to expect that the edges of lithics were of significance. This significance may or may not be related to the technological function of a lithic, or it may extend beyond functionality to other utilitarian and even non-utilitarian purposes. Theoretically all objective lithics are exograms: they are externalised memory traces in three-dimensions. They thus have the potential to be simultaneously functionally utilitarian, symbolic and iconographic; of course, they may also be none of these or something entirely different besides! Regardless, an open-minded approach to investigating concept-mediated mark-making from the basis of edge-modification and figure from ground cannot exclude lithics from consideration, but rather must process them accordingly, paying attention to their defining and observable features, including, but not limited to: their two and three-dimensional forms, macroscopic surface features, patterns of modification, and any other significant characteristics.

Here, lithics are contemplated within a context of 'art'.

> [Art] is the phenomenon in human experience of which there can be no crucial common denominators for phenomenon categories that are inaccessible to humans; art consists thus of the collective phenomena about which we can objectively argue (Bednarik 1994b).

The detection and identification of iconographic exograms amongst lithics has a legitimate basis since it concerns the recognition and identification of crucial common denominators (CCDs), which can be explicitly described in objective terms and are accessible to extant humans.

The identification of iconography in lithics can potentially be premised upon widely variable orientations and/or very selective interpretations of isolated aspects. Although these interpretations may have emic validity this flexible approach is open to criticism of confirmation and selection bias. In contrast, considering edge modification and the identification of iconography with reference to 'figure from ground' by restricting analysis to the outline of either ventral or dorsal views provides a standardised and consistent basis for comparison across most objective pieces without inviting suggestions of manipulation.

The subject of the earliest figurative depictions by Pleistocene hominins has been theorised by Hodgson (2003a), Bednarik (2003b) and others (e.g. Watson 2011) to have principally concerned dangerous animals, or those that played an otherwise important or influential role in their environmental niche, including of course hominins themselves. The detection of face-like objects and animals is deeply rooted in the evolution of the neural architecture of hominins and the propensity to do so is amply supported by the scientific literature. The detection of symmetry in the lateral occipital area of the visual recognition system (Bona et al. 2014) and early activation in the face specific cortex (Hadjikhani et al. 2009) are just two examples from many that serve to underscore this tendency. Consequently, face-like objects may be the class of figure-stone most likely to be identified simply because there is a universal tendency to recognise human faces from the visual field because of the significance from birth of face-like objects to the hominin system.

Cervico-dorsal contours are also preferentially selected for by the hominin visual recognition system as evidenced in much rock art. As Hodgson (2003a) explains, biologically, those modules of the brain concerned with the perception system evolved for the identification of objects and therefore dictate a certain kind of learning. 'Art' shares and exploits the same visual mechanisms which constrain the perception system. Areas V1 to V4 of the brain appear to be involved in the extraction of figure from ground (Hodgson 2003a).

Not to be confused with 'seeing-in', Dobrez and Dobrez (2013) write about 'seeing-as' wherein recognition (or identification) of iconography at a basic level occurs almost immediately, based on a holistic interpretation of the form including salient information, describing this as the 'canonical form'. Whilst they accept that there are circumstances where canonical forms of different objects may concur with each other causing confusion and misidentification, they do not consider this a major obstacle in the study of rock art. Recognising that 'superordinate' (e.g. animal) recognition offers only limited information they theorise that recognition can commonly be secured at a basic or 'ordinate' level (e.g. feline), but rarely at a 'subordinate' level (e.g. puma). Recognition then is the holistic processing of sufficient key, or salient, characteristics which can be positively identified to correspond to features recalled from an internally held frame of reference by the interpretant to allow for identification at a superordinate, ordinate or subordinate level. Hodgson (2003a) elaborates on this point further, also noting that the amount of visual information required is relative to the level accessed and resolved primarily by a typical outline contour. Dobrez (2013) asserts that there are 'perceptive universal characteristics not limited to time and space'. In other words, Dobrez suggests that it should be possible for culturally unconnected persons to detect some exograms from the Pleistocene record if the medium conveys enough perceptible information to transcend time. For example, one such case put forward by Dobrez is the detection of motion, or action. Exograms incorporating motion may be more easily detectable to extant humans.

Anticipating that the biological and evolutionary

propensity towards depicting animal forms (evident for example at Chauvet) was not an isolated occurrence but simply represents the truncated remnants of a wide range of mark making behaviour, it is prudent to expect that other traces of concept-mediated mark making may follow a similar pattern. If this is the case, they would also be open to identification by extant humans since they may utilise graphic conventions which are accessible at an ordinate level.

The identification of all palaeoart is pareidolic at root, therefore all identifications proposed here are enclosed within apostrophes in recognition that they are observer-relative interpretations and cannot be tested. It may be possible to recognise exograms incorporated in lithic assemblages but it is not possible for any interpretant to test the accuracy of that identification. Whilst the identification of such specimens may invite eternal debate concerning their emic legitimacy, the application of a methodology such as that applied to engravings (Bednarik 2006) can identify whether the object has been modified, and analysis of arrangement (Bednarik 2007) can assist in the detection of deliberation and intentionality.

Newton (1912) suggested long ago that it would be 'the patterns of nature' that early hominins would begin to imitate and this suggestion has been repeated since by others (Oakley 1973; Feliks 1998). Although it has been suggested by Groenen (1994) that 'animal templates' were soundly refuted, the emic legitimacy of animal forms stands in stark contrast to the etic stone artefact types routinely referred to by Pleistocene archaeologists which have no known correlates to the cultures they attempt to describe. Animal forms, however, do have support in the many petroglyphs and pictograms of the Palaeolithic, and indirectly from neurology and ethnology.

To date, only a handful of 'bear' petroglyphs and pictograms have been found in caves dating to the Palaeolithic. There is also the clay headless 'bear' found in Montespan cave, in addition to the few portable palaeoart items which apparently depict 'bears'. However, there is accumulating evidence suggesting bears may have played an important part in the lives of people living during the Pleistocene, particularly the so-called 'Aurignacian' (Bednarik 2010). How likely is it, then, that specimen FS#037 (Fig. 5) should be found amongst the assemblage of Fontmaure? Whilst many mimetoliths occur naturally, what is the probability that FS#037, which is modified, might simply resemble a 'bear' by chance? Whilst the author has theorised that visually-ambiguous features may have been recognised by Pleistocene people, would the hominins at Fontmaure have identified the iconography now apparent to an extant human in this artefact? To answer these questions we need to examine many more lithics from Fontmaure. If iconography cannot be detected more frequently than it may be expected to be found in a random sample of geofacts, then it cannot be suggested that the production of iconography occurred intentionally. Nor can we suggest that hominins were likely to have recognised the 'bear' perceived in Figure 5. This paper reports the results of observations made from thousands of lithics and which are representatively documented here in a smaller sample (n=501). N.B., scales provided are 20 mm unless otherwise noted.

Detection of iconography	Cores	Flakes	Unmodified	Total	% of total
Yes	75	375	17	467	93
No	1	32	1	34	7
Total	**76**	**407**	**18**	**501**	**100**

Table 1. *Detection of iconography in Fontmaure sample.*

3. Figure-stones from Fontmaure

3.1. Detection of iconography

The results from observations by the author of over 500 examples are shown in Table 1. They are both reproducible and open to refutation; finding a similarly high frequency (over 90%) of iconographic items in a sample of rocks fractured only by natural forces would indicate that the results are not statistically significant. The author has attempted to do this on multiple occasions without success, indicating far lower frequencies. Naturally occurring and convincing iconography occurs at a much lower frequency on the basis of form against ground. However, on a selective and macro-micro level, mixed subject iconography can be found in almost all rocks: undermining the credibility of the numerous 'figure-stone collectors' who propose intentionality inferred from such pareidolic identifications. These fantastic interpretations reside solely in the interpretant and belong firmly in the realm of fantasy.

Table 2 shows the ordinate subject identified in each example. The objectivity of these identifications could potentially be tested by asking unprimed subjects to find a likeness to a single randomly chosen subject from a fixed list of subjects (including bears and humans), in as many of the examples as possible, randomising the order of images and orientation.

The basis for the identifications given in Table 2 are explained and expanded upon in the next sections. Upon embarking on this research the author did not set

Identification at ordinate level	Modified	Unmodified	Total	% of total
'Whole bears'	*170*	*6*	*176*	*(38)*
'Bear heads'	*207*	*2*	*209*	*(45)*
'Cave bears'	*12*	*0*	*12*	*(3)*
'Bears' (total)	389	8	397	85
Anthropomorphs	16	5	21	4
Zoomorphs	45	4	49	10
Total	**450**	**17**	**467**	**100**

Table 2. *Identification of subject in iconographic sample.*

Figure 6. *Stereotypical bear poses. Left: about to drink. Right: walking with head held below shoulders.*

out expecting to identify depictions of bears. Rather, following the work of Pradel and Toet, it was anticipated that anthropomorphs would be more readily observed since this subject matter is expected to be more amenable to detection by an alien observer, especially given the tendency for humans to recognise face-like objects. The high frequency of 'bear' exograms subsequently identified stands in stark contrast to the relatively low frequency of other subjects marking a tangible, observable characteristic of the Fontmaure assemblage. The inflexibility of the subject and the content of that subject were entirely unexpected.

3.2. Bears

The cervico-dorsal contour of a bear is distinctive due to several salient features, not least of which is the shoulder hump. The body postures of bears are equally distinct: often hanging their head below the shoulders or with nose to the ground (see Fig. 6).

Figures 7 and 8 provide an example of a range of lithics, varying widely in size and form, defined here as 'bears'. They have all been examined and show evidence of modification. Their identification as 'iconographic' and interpretation on an ordinate level as 'bears' is made on the basis that the contours created by the figure from ground resemble the characteristic cervico-dorsal contours of bears. The style, quality and detail of depiction vary across the sample analysed. This may in part be driven by material constraints, skill or a reflection of other factors such as expedience or convention. It may have been enough to imbue a stone with a likeness rather than sculpt a masterpiece. Brandl (1972), Lewis (2017) and others have noted that iconographic representations can vary from photographic realism to highly stylised: the same coarse observation is deduced here. For instance, Figures 8Q and 8W are both quite life-like (naturalistic), whereas Figures 7F and 8O are cartoon-like in appearance. Examples range from invasively and bifacially flaked, such as Figure 7T, to mostly natural in shape — but still demonstrating some definitive evidence of workmanship (e.g. Figs 7B and 7F). Note that Figure 8D, utilising a natural concavity, appears to be a partial depiction, showing only the 'fore limbs' and 'paws', 'head' and a short portion of the 'neck'.

A common thread is the use of a particular graphic device; the schematic emphasis suggesting the 'shoulder hump'. The 'hump' is disproportionate in some cases (e.g. Figs 7K, 7R, 7T, 7U, 8V, 8Z and 8AG), distinct (Figs 7N, 7C, 7F, 8E and 8W), or merely suggested in others (e.g. Figs 7A, 7H, 7L, 8I and 8Q). However, this feature is entirely absent in some cases (e.g. Figs 7E, 8S and 8M) but the overall form still suggests a 'bear'. Several specimens simply evoke the undulating characteristic of the cervico-dorsal contour (e.g. Figs 7J and 8O), whilst others emphasise the rounded shape (e.g. Figs 7G and 8M) in a cartoon-like manner. So, too, the depiction or suggestion of 'ears' (e.g. Figs 7E, 7K, 7L, 7N, 7Q, 8E, 8J and 8Q) is not a fixed criterion. As a group, there is no single set of criteria that confirms their identification as 'bears'. Body size and proportion may fluctuate; for example, the 'head' of Figure 8AA is disproportionately large, apparently emphasising this aspect, whilst the 'heads' of Figures 8V and 8Z are small relative to their 'bodies' and this convention appears to be more common throughout.

Although several specimens do appear to suggest the rear and fore 'limbs' (e.g. Figs 7F, 7G, 8A, 8B, 8Z and 8AI), more often than not limbs are absent. The mistermed 'Venus figurines' often lack extremities too, and it has been suggested by Bednarik (1990b) that technological limitations may have been the primary reason why limbs were not generally depicted. The most parsimonious explanation is that the extremities are more difficult to manufacture and this is borne out by experimentation. Indeed, where 'limbs' are depicted or partially suggested they tend to be based upon a natural feature, such as a concavity, utilised or selected specifically for this purpose. It bears repeating, that in terms of object recognition and the hominin visual recognition system, it is the cervico-dorsal contour which provides the most significant information towards the process of identification. Feet and limbs are often obscured in a natural environment by topographic features such as undergrowth etc. Likewise, depiction of a distinct 'tail' is infrequently observed (e.g. Figs 7E, 7F, 8A, 8AE and 8AF); possibly because this feature is not a prominent aspect nor critical to identification.

Salient features are not constrained to physiological characteristics; they extend to behavioural traits too — which can also be depicted. Those that suggest action then, as per Dobrez (2013), should be more readily amenable to recognition — especially if the behavioural traits signified are stereotypical. Behaviours which are typical of bears include; charging, fighting, fishing, flattening of ears, surveying the environment from high points, playing, roaring, clawing, scratching and mating. Of the artefacts tentatively identified as 'whole bears' over half (97 of 171) are identified as a 'bear looking downward' (e.g. Figs 7I, 7J, 7K, 7L, 7N, 7O, 7P, 7Q, 7R, 7S, 7T, 7U, 8W, 8AA, 8AE, 8AG, 8AH and 18). These forms may, for example, be depicting an animal drinking, grazing or looking for fish. Whatever the precise actions are, the characteristics of those actions are suggested to be indicative of bears. Figure 7M brings to mind a 'bear standing on a mound', perhaps surveying the area. Again, this action is typical of a

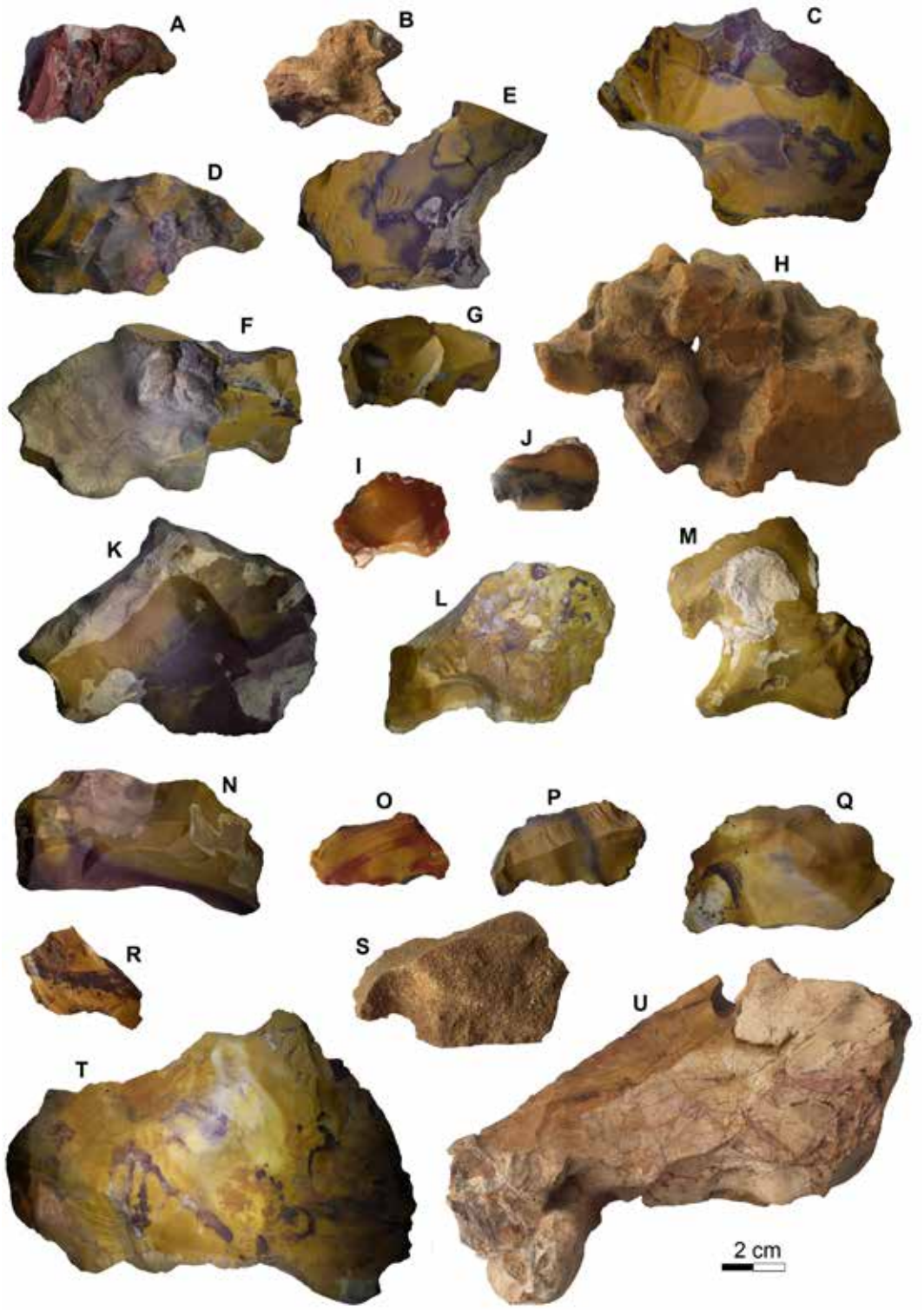

Figure 7. *A) FS#027, B) FS#542, C) FS#011, D) FS#161, E) FS#018, F) FS#010, G) FS#059, H) FS#164, I) FS#581, J) FS#513, K) FS#020, L) FS#022, M) FS#024, N) FS#148, O) FS#505, P) FS#159, Q) FS#145, R) FS#508, S) FS#543, T) FS#136, U) FS#165.*

behaviour frequently observed of bears.

Perhaps the most interesting, and least expected observation, is the identification of 'mating bears'. The large, thick, tabular sandstone specimen PB#250 (Fig. 8AF) is modified by substantial removals along the entire 'cervico-dorsal contour' of the 'male', and the 'neck' and 'ears' of the 'female'. This 'action' type is observed less frequently than it is depicted proportionately in Figure 8 (fourteen items), but where it is identified these examples often incorporate a peculiar natural feature of the rock (for example Figs 8G, 8L and 8U).

In all cases, the precise action identified is irrelevant since all interpretations are etic; however, they do lend weight to the identification of the subject. This paper does not attempt to extract meaning from these identifications; rather, the recognition of a specific action or

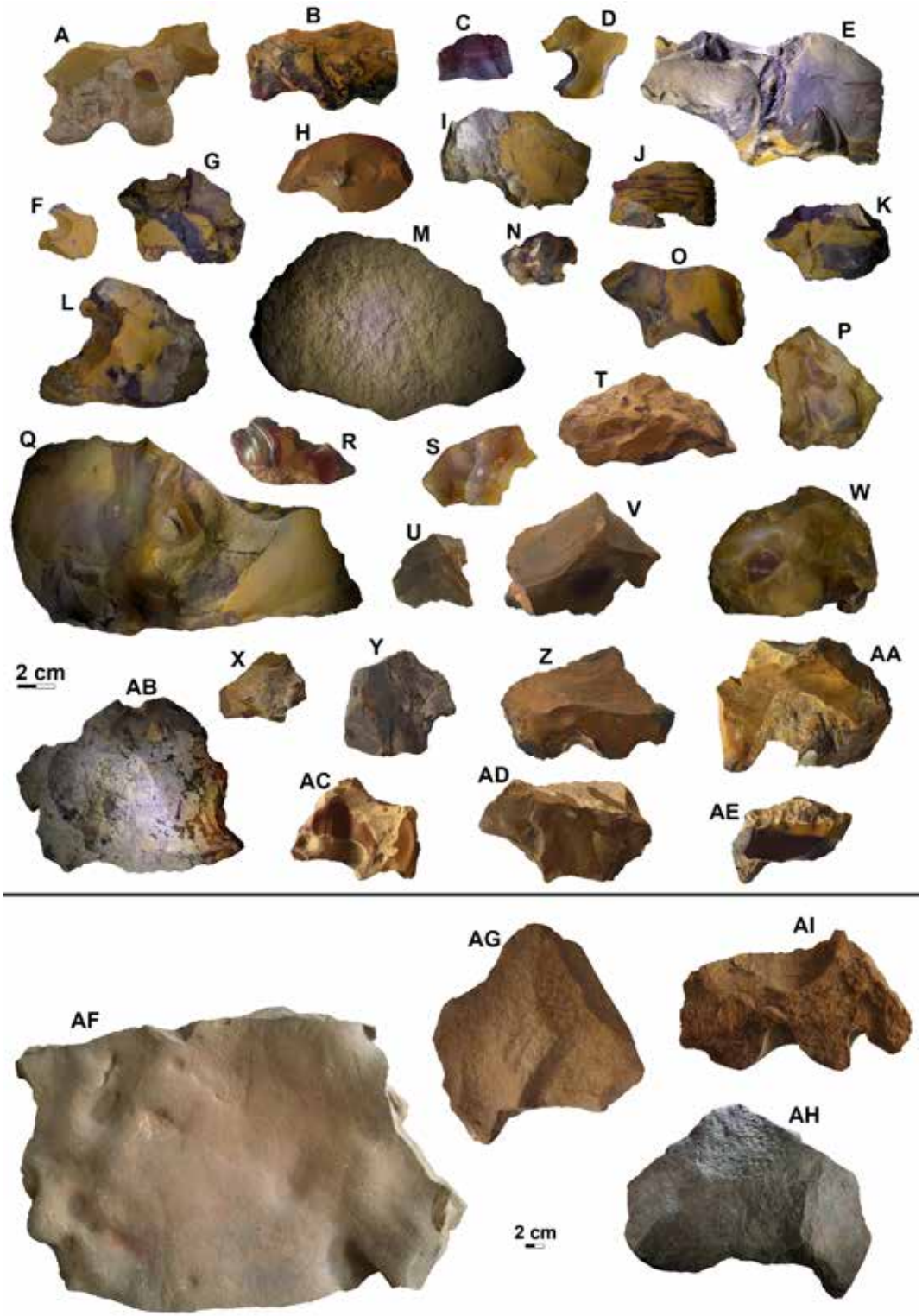

Figure 8. *A) MH#391, B) FS#592, C) FS#121, D) FS#056, E) FS#008, F) FS#081, G) FS#153, H) FS#595, I) FS#051, J) FS#151, K) FS#147, L) FS#143, M) FS#152, N) FS#055, O) FS#150, P) FS#146, Q) FS#042, R) FS#583, S) FS#026, T) FS#195, U) FS#582, V) FS#197, W) FS#009, X) FS#369, Y) FS#207, Z) FS#196, AA) FS#520, AB) FS#144, AC) FS#465, AD) FS#599, AE) FS#546, AF) PB#250, AG) FS#156, AH) FS#605, AI) PB#610.*

pose is part and parcel of the holistic interpretation of the 'canonical form' (Dobrez and Dobrez 2013). In other words, it is the combination of salient characteristics (both action and anatomical features) which leads the observer to an ordinate identification.

3.3. Incorporation and retention of natural features

The preservation of natural forms attests to the intentionality of the iconography identified. FS#523 (Fig. 7B) is a small core which is minimally flaked. Another core, FS#010 (Fig. 7F), retains approximately 70% of the cortex. The natural form of the cobble, evoking suggestions of 'limbs' is central to the allu-

sion of a 'walking bear' and removals are limited to the 'head' and 'tail' areas. The use of unusual formations is underscored by FS#164 (Fig. 7H), a knobbly cobble with limited removals. The only area which could serve functionally as a tool (the 'muzzle') is delicate and shows no indication of use-wear.

Figure 9 illustrates the modifications made to FS#369 (see also Fig. 8X) and the elements that have been left untouched. This primary flake has been reshaped and retouched. Figure 10 shows the detail of the natural protrusion apparently suggesting the 'head' of a 'bear'.

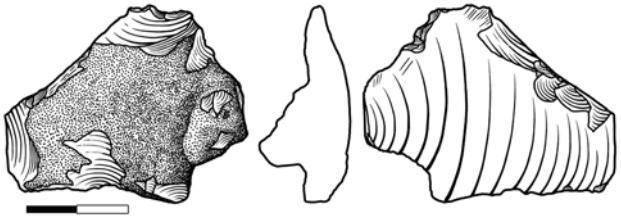

Figure 9. *Illustration of FS#369 (see also Fig. 8X).*

The retention of the protuberance is fundamental to the 'bear' iconography perceived. Giving the appearance of a 'bear's head' looking backwards, including a naturally occurring indentation which provides the impression of an 'eye', and a stepped removal suggesting an 'ear'. Two further removals, one across the 'jaw', the other above the 'eye' appear to have been made in order to reduce the protrusion closer to the shape identified as a 'head'.

Figures 7M, 7S, 8N, 8V, 8W, 8AA, 8AI and 8AF preserve distinct natural concavities resembling the curve from the lower jaw line to the chest, particularly apparent in FS#056 (Fig. 8D). In other examples, this concavity has been deliberately created (e.g. Figs 7J, 7L, 7P, 8A, 8S, 8Z, 8T, 8AG and 8AH).

Figure 10. *Detail of the 'head' of FS#369.*

3.4. Analysis of arrangement

Specimen FS#040 (Figs 11 and 12) is a tertiary flake struck from a core of good quality (homogenous) jasper. It measures approximately 70 mm in length, 45 mm in width and has a maximum thickness of about 15 mm. FS#040 is unquestionably of anthropogenic origin, the ventral face displays pronounced ripples resulting from the primary conchoidal fracture. The dorsal face displays at least three major flake scars which must have preceded its separation from the core. The striking platform has subsequently been removed. The left lateral edge retains a chalky element of the jasper and the distal end has been truncated. A small remnant of the invasive flake scar creating the concavity in the adjacent right lateral edge can still be distinguished. Overlying this substantive removal is a series of smaller, steep overlapping removals (retouch). FS#040 is continuously and alternately retouched from point A to point B (Fig. 11). No obvious macroscopic or microscopic evidence for use-wear can be observed in the principal notch.

By analysing the arrangement of features the following statements may be made about FS#040: 1) it is modified by human agency; 2) the notch implies deliberation; 3) the retouch from A to B is intentional; 4) the key visual salient features ('short muzzle', 'steep forehead', 'flat cranium' and 'ear') are connected; and 5) the graphic pattern evident in arrangement, a 'cave bear head', is recognised in other ancient exograms. The outline of FS#040 is comparable to the head of the 'cave bear' depicted at Chauvet in the Pont' de Arc. For instance, compare the detailed indication of a small 'tuft' along the bottom jaw line seen in FS#040 (Fig. 12) and the 'bears' painted at Chauvet.

Two further examples are provided for direct comparison. FS#006 (Fig. 13) is a somewhat larger piece of jasper

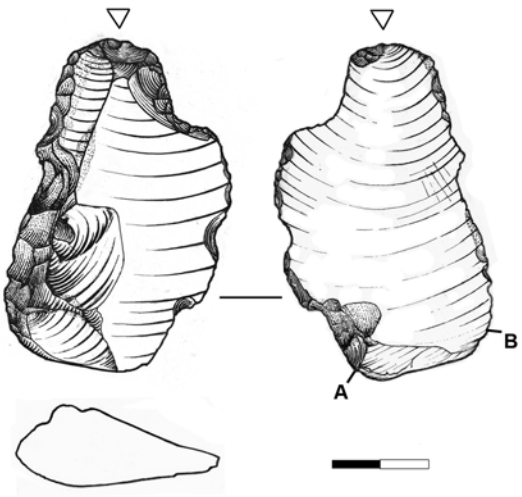

Figure 11. *FS#040 retouched from A to B clockwise.*

Figure 12. *FS#040 dorsal view, 'cave bear head'.*

Figure 13. *FS#006 dorsal view, 'cave bear head'.*

Figure 14. *PB#252 modified sandstone, 'cave bear head'.*

Figure 15. *Zoomorphic pendant-like objects. Left PB#251, middle FS#580, right FS#407.*

(over 20 cm) and is invasively retouched. Although the 'ear' is more pronounced than in FS#040, the short but 'thick-set muzzle', 'steep forehead' and 'flat cranium' also suggest the distinctive features of a cave bear. Again, the 'notch' shows no evidence of use-wear and utilisation of that edge can be ruled impractical on account of the convexity in the ventral plane. PB#252 (Fig. 14) is fashioned from sandstone and much larger (see scale). A natural feature suggests the impression of a 'mouth' — again showing a marked resemblance to the 'cave bears' depicted at Chauvet. Based on the same key characteristic criteria, items FS#019, FS#035, FS#070, FS#073, FS#091 and FS#112 are also categorised as 'cave bears'.

As previously noted, examples of pendant-like items have been reported before by van der Made (see also *Gedoogd verleden*). Three supplementary items are provided here (Fig. 15): PB#251 (a flake of chalky jasper), FS#580 (a calcite concretion) and FS#407 (a flake of glossy and translucent jasper). The coloration of the jasper suggests the 'nose' of PB#251 and a hole calls to mind an 'eye'. The shorter 'muzzle' of FS#407 is mirrored in the short 'muzzle' of the modified end of the calcite concretion (FS#580 to the left), the 'eye' is represented by a delicately preserved cavity.

Figures 16 and 17 exemplify representative specimens from the Fontmaure sample identified as 'iconographic'. They are all suggested to be depictions of 'bear heads', although some may be misidentified other 'carnivores' (e.g. Fig. 17J). Those illustrated have been selected as representative of the range of styles, sizes and quality of depictions observed in the sample (note the changes in scale size). They are made on a range of raw materials; from chalky jasper (e.g. Figs 16T, 16U, 17I, 17J and 17Z), to sandstone (e.g. Figs 16W, 16Y and 17N), through to Upper Turonian flint (e.g. Fig. 17AJ).

Again, these proposed exograms appear to range from life-like accuracy (e.g. Figs 5, 16F, 16O, 16W, 16AD and 16AG), to those that appear stylised (e.g. Figs 16AA, 17A, 17X), to cartoon-like (e.g. Figs.16A and 16H), or 'basic' representations (e.g. Figs 16S, 17W and 17AG). It is difficult to distinguish confidently between depictions of 'juvenile bears' and 'cave bears' since both have proportionately shorter and wider muzzles. Those noted as 'cave bears' (e.g. Figs 16P, 16T, 16U, 17A, and possibly 17V, 17X and 17Z) are separated on the basis of having 'steep foreheads' and 'flat craniums' which are characteristic of cave bears. The majority of the 'bear heads' identified, however, have a distinctly sloped 'forehead', curved 'cranium', narrower 'muzzle', and receding 'lower jaw' more closely resembling the extant brown bears.

The examples illustrated range from invasively modified, to barely modified 'objectives' (retouched debitage). For instance, FS#174 (Fig. 17U) would usually be classed as a 'biface'. It is bifacially worked; intricately, alternately and continuously struck around the entire circumference. The dorsal plane provides a three-dimensional effect; however, the ventral plain is somewhat less convex. Whereas, the shape of FS#199 (Fig. 16AB) alone is suggestive of a 'bear' and the modification is minimal. The impression of a separation between the 'forehead' and the 'muzzle' by an obtuse angle, is often simply created by the natural form of

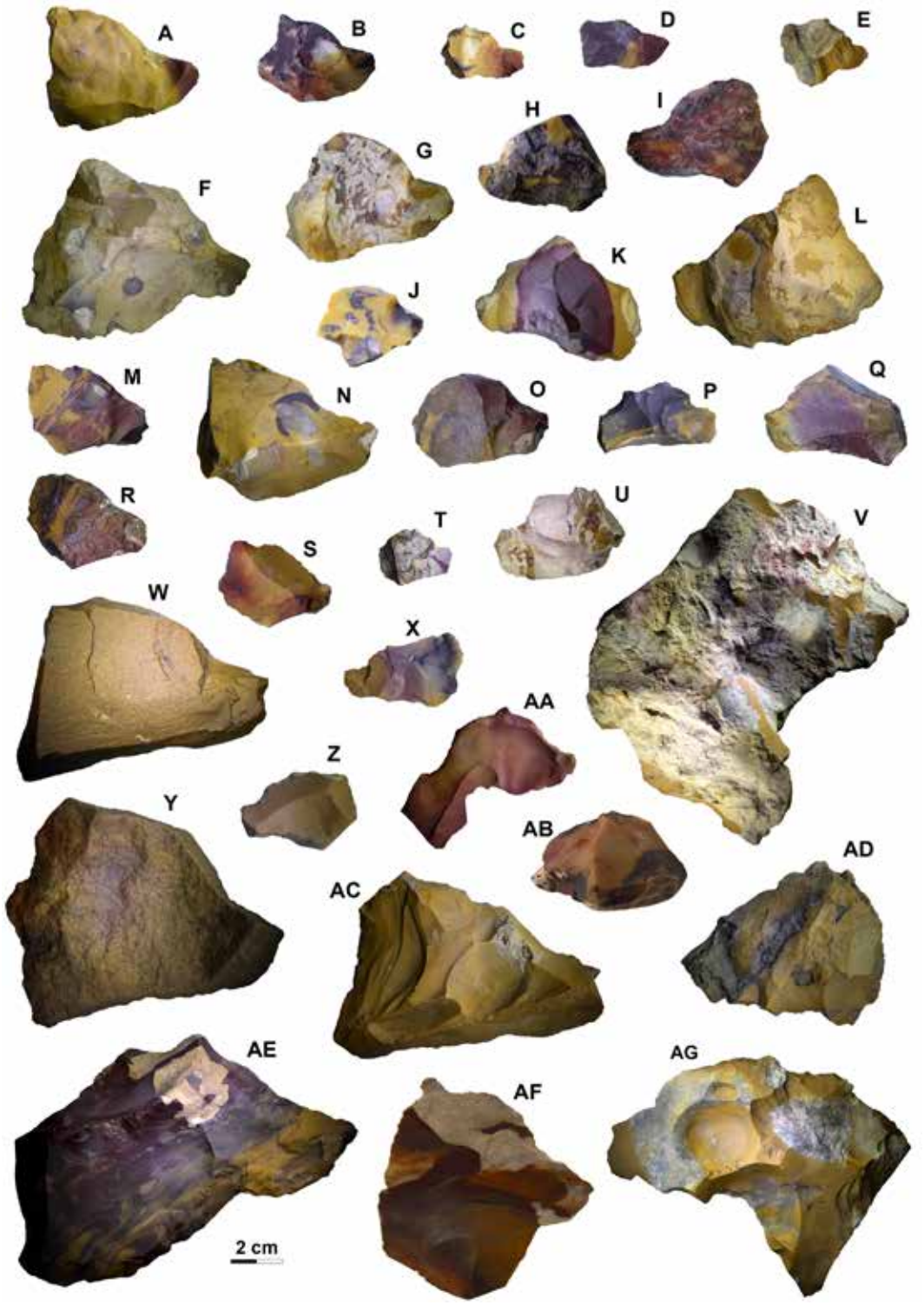

Figure 16. *A) FS#049, B) FS#098, C) FS#091, D) FS#110, E) FS#182, F) FS#015, G) FS#067, H) FS#062, I) FS#061, J) FS#038, K) FS#068, L) FS#012, M) FS#064, N) FS#029, O) FS#039, P) FS#070, Q) FS#032, R) FS#157, S) FS#109, T) FS#035, U) FS#037, V) FS#095, W) FS#004, X) FS#003, Y) FS#149, Z) FS#019, AA) FS#074, AB) FS#199, AC) FS#007, AD) FS#045, AE) FS#002, AF) PH#163, AG) FS#097.*

the rock. However, it is also often entirely modified: seemingly for the purpose of depiction.

Often colour spots in the jasper appear to have been utilised to represent an 'eye' (e.g. Figs 16F, 16L, 16M, 16N, 16P, 16R, 17J, 17O, 17T, 17AE and 17AI), in others there is just the suggestion of an 'eye' formed by a flake removal (e.g. Figs 16O, 16W, 16X, 17F and 17AJ), in others a natural concavity has been used (e.g. Figs 16AC, 16AD, 17H, 17N, 17S and 17AG; see also Fig. 15), and occasionally a quartz or chalcedony inclusion has been used (e.g. FS#188, not illustrated).

Another graphic device which can be discerned across the sample is the use of a lighter, darker or different colour band for the 'muzzle' or 'face' (e.g. Figs

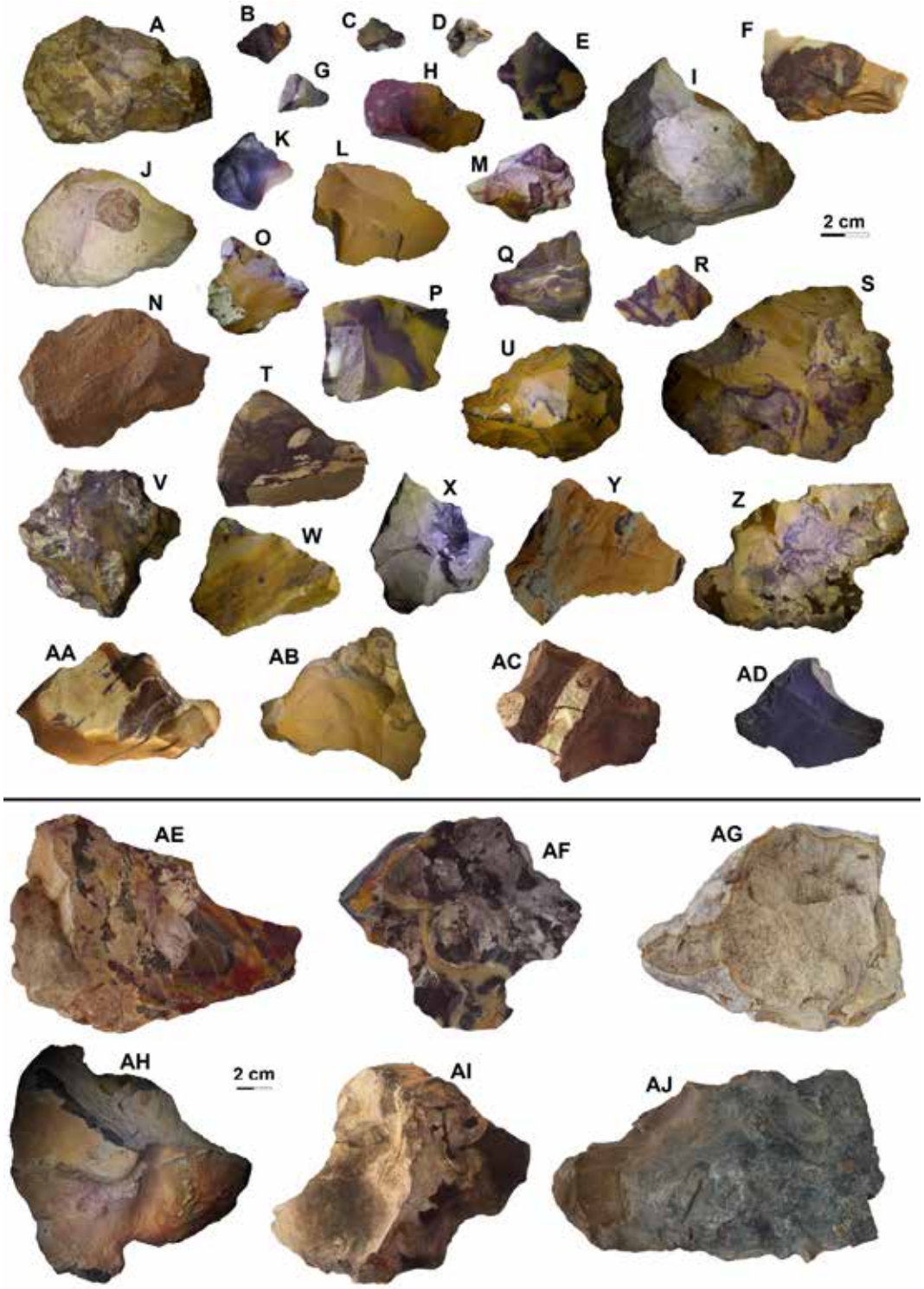

Figure 17. *A) FS#180, B) FS#183, C) FS#186, D) FS#185, E) FS#158, F) FS#603, G) FS#184, H) FS#100, I) FS#167, J) FS#013, K) FS#176, L) FS#047, M) FS#179, N) FS#224, O) FS#178, P) FS#048, Q) FS#041, R) FS#120, S) FS#105, T) FS#217, U) FS#174, V) FS#090, W) FS#066, X) FS#175, Y) FS#169, Z) FS#171, AA) FS#601, AB) FS#050, AC) FS#602, AD) FS#119, AE) FS#142, AF) FS#139, AG) FS#132, AH) FS#137, AI) FS#166, AJ) FS#187.*

5, 16A, 16B, 16C, 16D, 16F, 16L, 16P, 16Q, 16X, 16Y, 16AB, 16AD, 16AE, 17F, 17K, 17M and 17T). A similar effect is produced by the removal of flakes leaving the cortex in place (e.g. Fig. 17AJ).

The 'nose' may be modified in such a way as to be quite pronounced (e.g. Figs 16N, 16Q, 16W, 16AC, 16AF, 16AG, 17N, 17P, 17X, 17AB and 17AE), or subtle (e.g. Figs 16F, 16L, 16O, 16Z, 16Y, 17AD and 17AG). In some cases, the 'nose' is simulated by another colour change in the jasper (e.g. Figs 5, 16K 16AE and 17J). The workmanship defining the 'nose' of FS#004 (Fig. 16W) is intricate, corroborating the intentionality of the iconography identified in this glossy sandstone specimen.

Unsurprisingly, 'ears' are observed more often in

the group of 'bear heads' as opposed to the whole 'bears' (Figs 6 and 7), although they are also absent in some cases (e.g. Figs 16I, 16O, 17H, 17J, 17P and 17U). They can be rounded and well defined (e.g. Figs 16F, 16K, 16L, 16S, 16V, 16AF, 17F, 17Y, 17AB and 17AE), or pointed (e.g. Figs 16B, 16N, 16AA, 17I and 17X). Once more, the deliberate shaping of 16AF and 17F attest to their intentionality. Absence of evidence for use-wear contradicts the simplistic suggestion that these are borer-type tools. Occasionally two 'ears' are suggested (e.g. Figs 16T, 16U, 16AE and 17AA).

Another stereotypical behaviour of bears is their characteristic roar. A 'roaring' action can be readily distinguished in Figures 17P and especially in 17AF. Other examples not illustrated include FS#048, FS#139, FS#498 and FS#500. Item FS#090 (Fig. 17V) also appears to show the 'mouth' open, albeit not as wide as the aforementioned examples. Yet again, the detection of a distinguishing action in conjunction with features characteristic of bears substantiates the etic identification at an ordinate level. Such a high frequency of consistent examples cannot reasonably be construed as coincidental.

3.5. Congruence

FS#138 (Fig. 18) is a large thick flake of 'good quality' (fine grained and homogeneous) jasper. Some cortex remains in place and there are a few chalky inclusions in places. Nevertheless, substantial spalls could have been extracted from it to produce a small biface or two — typical of the type found at Fontmaure. However, there is no suggestion that efforts have been made to do so. There are no battered platforms bearing witness to failed attempts to spall. Rather, the reduction and retouch is largely concentrated (although not limited) to one area (Fig. 18 right). Furthermore, those modifications that have occurred are unlikely to have produced usable flakes and are therefore interpreted as attempts to reshape the objective piece as opposed to intentional production of blanks.

This piece offers at least three, possibly more, images of a 'bear'. As shown (Fig. 18 bottom), a darker element of the jasper corresponds to the 'nose', the absence of cortex provides the impression of an 'eye' and the general shape the 'head'. The 'ear' of this view also doubles as the 'muzzle' of a second 'bear head' (Fig. 18 right). Rotated further (Fig. 18 left), it suggests a 'bear looking downwards' (to the left) with the characteristic tuft of hair exaggerated, and possibly also a 'roaring bear head' (to the right).

Multiple images on one item, such as those identified in FS#138, are common and generally demonstrate subject congruence. However, there are exceptions, combinations also recorded include; 'bear' and 'human', 'bear' and 'bird', and 'bear' and 'fish'. The most common transformation is from a 'bear head' to a 'bear looking downward'. The 'biface' FS#174 (Fig. 17U) identified as a 'bear head' also depicts a 'bear looking downward' when rotated by approximately 220° clockwise. A similar example can be observed in FS#049 (Fig. 17A). Further examples of this practice include Figures 16C, 16E, 16L, 16S, 17R, 17X, 17AA and 17AB.

By rotating FS#178 (Fig. 17O) 90° counter-clockwise it becomes another 'carnivore head', perhaps a 'fox' or a 'bear'. The 'mating bears' perceived in FS#144 (Fig. 8AB) become the 'jaws' of a 'roaring bear head', as does FS#153 (Fig. 8G), and the 'female bear' of FS#081 (Fig. 8F) also forms a well-defined 'bear head'. Variations on these combinations abound, some of which are illustrated in Figure 19.

The 'forehead' of FS#171 (Fig. 17Z) incorporates the 'nose, face and ear' of another 'bear'. FS#095 (Fig. 16V) has a 'bear head' profile on either end as do others, for example FS#083, FS#172, FS#345, FS#409, FS#476, FS#491 and PB#496 (not illustrated) and Figures 16E, 17B, 17L and FS#580 (Fig 15).

Figure 18. *FS#138, left 'bear looking downward', right 'juvenile bear head', below 'adult bear head'.*

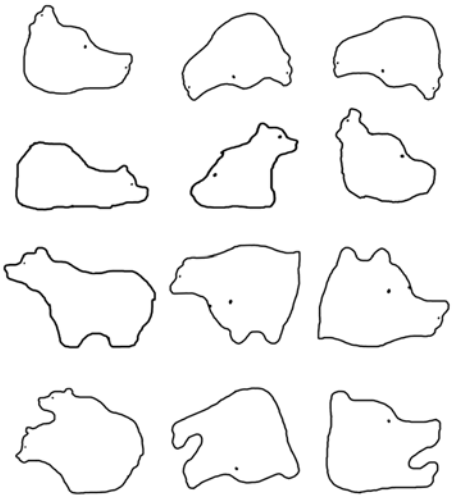

Figure 19. *Examples of the transformations observed.*

One of the items collected by Toet (TT#373, not shown) is a well-made biface measuring approximately 14 × 10 × 3 cm that retains natural features of the cortex suggesting the 'legs' of a 'bear' seen from the side. These two protrusions could easily have been removed rendering a perfectly symmetrical teardrop shape. FS#584 (Fig 20) has likewise been bifacially reduced from a primary flake of homogenous jasper. An irregular natural feature of the cortex has been kept intact and cautiously modified; the result resembles the 'head' of a 'bear' (Fig. 20 bottom). It should be noted that these examples are not isolated; rather,

Figure 20. *FS#584, a primary flake bifacially flaked and preserving an irregular feature resembling a 'bear head'.*

Figure 21*. Two 'faces'.*

they are typical of the artefacts to be found at Fontmaure.

3.6. Anthropomorphs

Twenty-two artefacts in the sample were identified as anthropomorphous in form (~4%). Whilst it may have been easier to focus solely on these forms in order to demonstrate the production of figure-stones occurring at Fontmaure, the author decided not to adopt this approach for two reasons. Firstly, whilst modified anthropomorphous specimens are observed at Fontmaure, the frequency of such items is relatively low and not representative of the more common theme observed ('bears'). Secondly, it could be suggested that the identification of human faces simply reflects the pareidolic tendencies of extant humans rather than a tangible phenomenon.

The three items shown in Figure 3 are all large pieces (over 30 cm in height or width) and the natural features present visual cues which are readily interpreted by the human neural system as anthropomorphous. Whilst two of these appear to be mimetoliths (naturally occurring figure-stones), the flint piece (31.7 × 19 × 11.4 cm) has been carefully separated in order to frame the features recognised (Berlant and Wynn 2018b). Figure 4 challenges the assertion that modified figure-stones are simply incorrectly identified 'tools'. Such a large source of raw material left mostly intact suggests that availability of material took second place to iconography.

FS#130 (Fig. 21) appears to present two 'human faces'; to the left, a caricature-like representation comprising a 'nose' utilising the coloration of the jasper to represent an 'eye'; and to the right, a naturalistic representation, produced by selective removals retaining the cortex in places.

FS#131 (Fig. 22) is a small thin piece of dark blue jasper, bifacially flaked, retaining the chalky white cortex in an arrangement which is readily interpreted as a 'face'.

FS#168 (Fig. 23 left) is a sandstone specimen approximately the size of a human head with two natural hollows, one of which goes all the way through the piece. These hollows invariably evoke the suggestion of 'eyes'. Removals across the top and left lateral edge have reduced the shape of the piece — presumably to more closely resemble an approximation of a 'human head'. The 'figurine' TT#361 (Fig. 23 right) was collected by Tedde Toet. It is also a sandstone spec-

Figure 22*. Anthropomorph biface in blue jasper.*

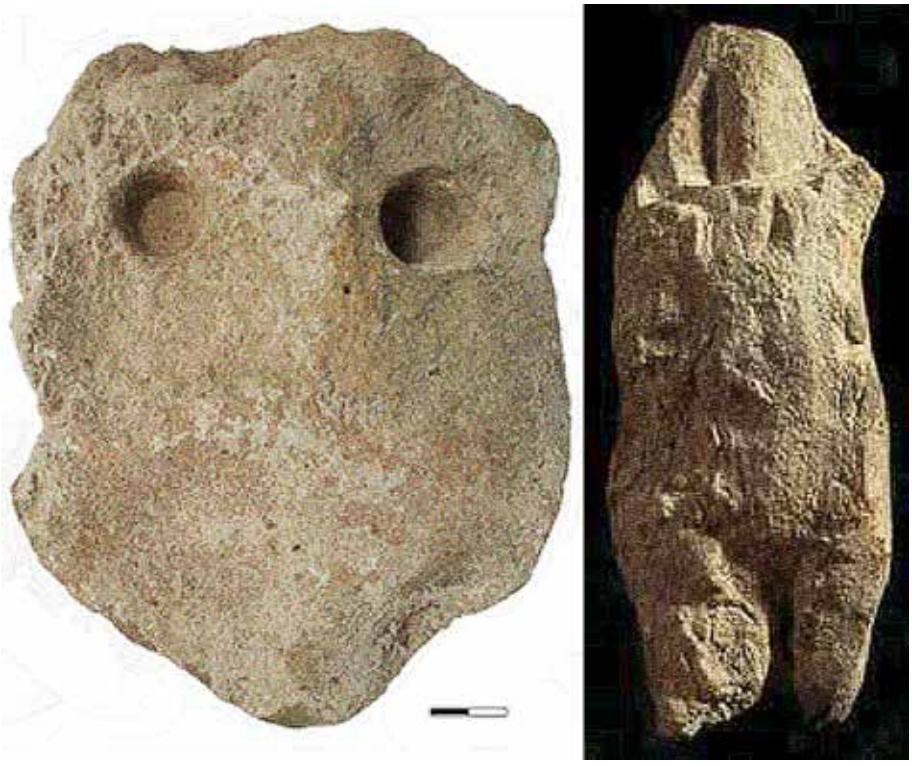

Figure 23*. (Left) FS#168, sandstone specimen categorised as anthropomorphous; (right) TT#361 sandstone 'figurine' approximately 30 cms in height: whereabouts unknown.*

imen (approx. 30 cm in length) and was displayed in the exhibition at the Museon Den Haag. It appears to be worked but unfortunately this cannot be confirmed because it has reportedly been lost.

3.7. Zoomorphs

Many items in the sample examined were observed to be zoomorphic, including those where the species was either not 'recognisable' or uncertain. The range of possible subjects include, but are not limited to: 'bison', 'deer', 'felids', 'fish', 'horses', 'mammoths' and 'wolves'. Again, it bears repeating that an ordinate identification is not required to refute H_0, convincing examples of iconography would suffice to establish beyond reasonable doubt that the intentional production of figure-stones occurred during the Middle Palaeolithic.

Figure 24. *FS#129, a jasper specimen identified as zoomorphic: possibly a 'bison'.*

Figure 24 (FS#129) shows a thick primary flake bifacially retouched and retaining an element of the cortex which could feasibly serve to represent the 'limbs' of a 'bison'. Both bison and mammoth-like forms have also been observed in larger pieces fashioned from sandstone; again, including natural hollows which are positioned such that they are readily interpreted as 'eyes'.

The thin flake FS#016 shown in Figure 25 has been purposefully retouched whilst retaining an element which strongly suggests the 'ear' of an 'animal'.

Figure 25. *FS#016, a possible 'feline' representation.*

3.8. Geofacts

Amongst the many Middle Palaeolithic manuports of the Mousterian is a spherical geode found in Cioarei Cave which is thought to have been brought there around 48 ka years ago (Bednarik 2017b). Fontmaure has also yielded half a quartz geode collected by van der Made (pers. comm. Vos 2018) which is presently in the collection of Matthijs Vos. Seventeen geofacts were examined in this sample: four examples are discussed here to illustrate the pattern observed. Characteristic of the items occurring in concentrations at Fontmaure, FS#606 (Fig. 26) is a piece of sandstone strongly resembling a schematic 'human' face with two 'eyes' (probably natural cavities), a 'nose' that may have been modified, and a distinct line beneath this protuberance suggesting a 'mouth'. Although the overall form of this piece is without doubt natural, there are numerous patches of yellow and vibrant red ochre in crevices on the front, back and sides. The painting of items such as this strongly suggests that this resemblance was noted.

Figure 26. *FS#606, human face-like geofact. Insets show examples of the red (left and middle) and yellow (right) ochre traces observed (mm scale).*

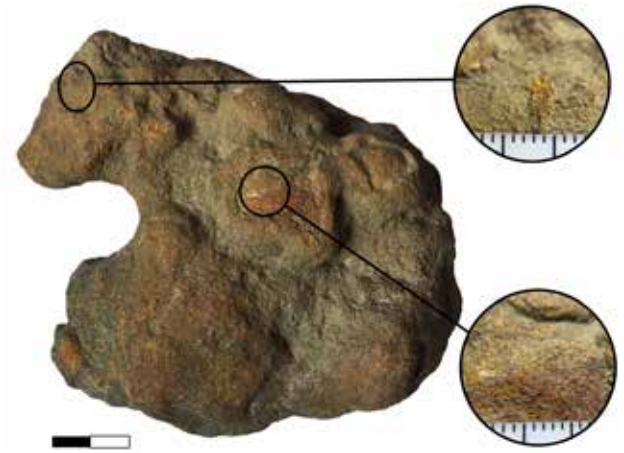

Figure 27. *FS#607, 'mating bears' geofact. Insets show details of some of the red and yellow ochre traces (mm scale).*

A 3D model of FS#606 which better illustrates the anthropomorphous form of this specimen can be downloaded from *http://www.palaeoart.com*.

Likewise, FS#607 (Fig. 27) is entirely natural in

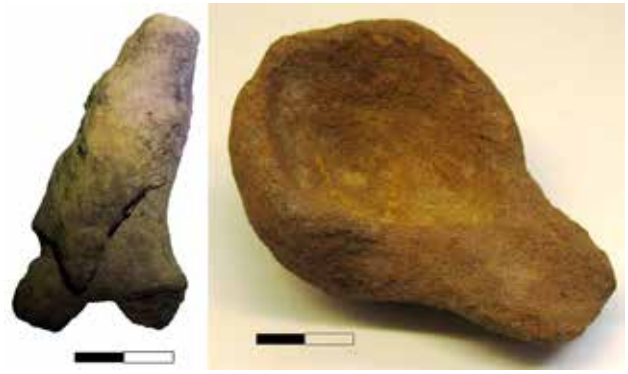

Figure 28. *(Left) FS#177, 'human figurine', a fossilised sponge retaining substantial elements of yellow ochre; (right) MH#260 is a palette-like concretion with traces of yellow pigment residue held at the Museum of The Hague.*

typical of such items found at Fontmaure. The 'head' is truncated perpendicularly with a single fracture, possibly by natural forces. The left 'leg' has also been truncated by a single fracture at an angle consistent with direct percussion. Moreover, the right 'leg' is truncated by two bifacial fracture planes inferring that at least this modification may have been intentional. A natural feature is suggestive of an 'arm' and again, there are substantial deposits of yellow ochre adhering to the specimen.

The palette-like fossil concretion (Fig. 28 right) with yellow ochre residue attests to the intentional use of ochre at Fontmaure.

Another fossilised coral is shown in Figure 29 (PB#611), the visual characteristics of which resemble a 'bear' with four 'legs'. One frond has been removed and the remaining stub suggests the short 'tail' which is characteristic of bears. Small indentations suggest the 'eyes' which may have been modified, but weathering precludes definitive confirmation.

Figure 29*. PB#611, a fossilised coral resembling a 'bear'.*

3.9. Fossils and framing

Extant humans are ubiquitously drawn towards bright colours or dazzling objects and the occupants of Fontmaure do not appear to have been an exception to this rule. Unusual colour combinations, fossils, fossil impressions, chalcedony and quartz crystals often appear to have been cautiously worked, implying that they were deliberately chosen and valued for their uncommon properties. Likewise, several bifaces have been found at Fontmaure with holes running through them, again, witness to the aesthetic or perhaps symbolic value. This behaviour was clearly not restricted to the hominins using Fontmaure, many 'handaxes' of a similar nature have been uncovered, including the 'West Tofts handaxe'. Figure 30 shows an unusually formed and brightly coloured piece of jasper that has been intricately retouched whilst keeping the hole intact (see also Fig. 7H). This practice underscores the value attributed by hominins at Fontmaure, and elsewhere, to visually salient features.

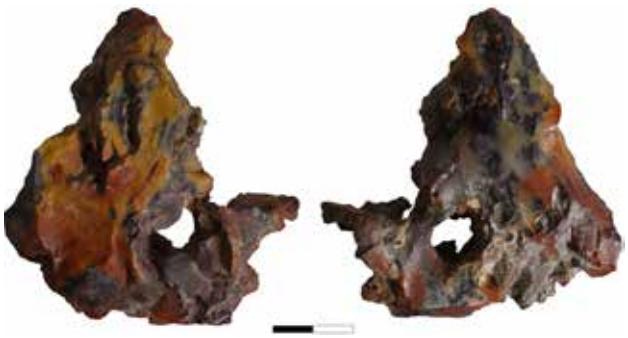

Figure 30*. An irregular and multi-coloured piece of jasper carefully worked whilst preserving the hole.*

form and also presents patches of yellow and red ochre spread over the piece. The form of this specimen matches other modified pieces including Figs 8F, 8L, 8U, 8AB and 8AF, and it is therefore suggested that it may represent 'mating bears'.

FS#177 (Fig. 28 left) is a fossilised sponge. All three extremities are truncated. This piece is suggested by the author to resemble a human figurine and is quite

4. Conclusions

4.1. Caveats

Before summarising the observations, the author would like to explicitly note the inherent limitations of this report. This paper is no more than a preliminary study for assessing the feasibility of carrying out a more rigorous future research project. The author hopes that the present study will inspire others to carry out a more formal investigation into assessing the plausibility of figure-stones. As noted in section 3.1, this could involve a group of naïve observers set against a group of primed observers in a blind study including a control group. Further, direct comparisons could be made, as the author has, against random samples of unmodified rocks to determine the frequency of convincing iconography, thereby providing a baseline for the pareidolic effect. The sample analysed from Fontmaure is not strictly random in a scientific sense but is suggested to be largely free of confirmation and selection bias. It is presented as a representative sample of the range of material found there, including more formal 'tool types' such as 'blades', 'burins', 'awls' and 'bifaces'. A non-invasive controlled experiment at the

Fontmaure site might take advantage of the numerous lithics unearthed in mole-hills but even this should not be expected to produce a truly random sample since large items would not surface. Additionally, substantial sorting by hominins appears to have already occurred wherein items displaying naturally occurring iconography (many of which are a considerable size) have been moved about the site to specific areas.

4.2. Discussion

Numerous different examples ranging widely in mass have comparable characteristic features comprising standardised forms. In other words, the forms identified have consistent traits presenting within-group similarity. The sheer size of items such as those shown in Figs 3, 4, 8AF, 8AG, 8AH, 8AI and 14 refute the suggestion that the shapes are fortuitous atypical 'tools'. For example, one commentator has suggested that the items presented in Figs 11–14 could simply have been 'notched or waisted for the purposes of hafting'. Whilst this may be a reasonable conclusion in respect of FS#040 (Figs 11 and 12) no evidence of hafting is apparent. However, in the case of FS#006 (Fig. 13) which is several times larger (see scales), this seems unlikely and in the case of PB#252 (Fig. 14) which is several times larger again, it is highly improbable. Whilst the majority of the sample presented is identified from a technical perspective as flakes, it bears noting that these specimens are rarely thin flakes, but more often thick blocks of jasper which have subsequently been reduced. Due to the heterogeneous nature of jasper from Fontmaure, often these flakes present wide cross-sections with obtuse or near-obtuse edges. However, this does not appear to have deterred hominins from exploiting them.

These persistent forms are consistently observed across raw material types and a preference for these forms appears to have extended to the sorting of naturally shaped rocks which have subsequently been marked with the application of ochre pigments. Poor quality and porous, chalky pieces of raw material are frequently utilised, as evident from the deliberate flaking observed (for example see Fig. 17AG made from a very poor quality flint). Figure 31 illustrates another example of a large sandstone specimen presenting typical Fontmaure coloration and evidence of a deliberated knapping sequence consistent with the preservation of chosen features which are characteristic of a 'bear head'. These forms are regularly observed in coarse sandstone, ranging in size from small (less than 5 cm) to large (greater than 30 cm) and their selection and subsequent shaping for 'tool-use' therefore seems unlikely. Chalcedony, naturally formed holes, fossil inclusions, breaks and faults are also incorporated in many specimens. Again, such observations strongly support the contention that the intent was not solely confined to producing 'functional tools'.

Time and again, these forms correspond with the etic observation that they resemble 'bears', and less

***Figure 31**. Sandstone specimen collected by Tedde Toet resembling a 'bear head'. Approximately 37 cm in length. Private collection of Tony Berlant.*

frequently other 'zoomorphs' or 'anthropomorphs'. Although the iconographic status of some specimens shown here may be contentious, they are included for the purpose of presenting a balanced and faithfully representative sample. It should not only be assumed that the technical skill and feasibility of the reduction process would constrain the quality of depiction but also artistic talent. Theoretically, plotting the artistic skills of a large group of people would produce a bell-curve with most individuals producing works of mediocrity and fewer creating compelling or true-to-life representations. Likewise, the samples illustrated reflect the broad range of artistic ability to be found in the lithics at Fontmaure. The grouping of persistent diagnostically characteristic features as identified in section 3 are observable at such a high frequency, and in many cases in minute detail, that they cannot credibly be rejected on the grounds of the author 'seeing images in clouds'. The constancy of these forms suggests that they have significance beyond mechanical functionality. Based on these observations it is reasonable to assume that the actual incidence of intentional iconography may be higher still, since these 'identifications' lack emic insight.

The perception of 'bears' in so many of the sampled examples portraying a range of stereotypical behavioural characteristics specific to bears suggests a content which is quite inflexible. The stereotypical poses are universally recognisable across time and the exaggerated, often cartoon-like appearance agrees with Hodgson's suggestions that Palaeolithic art is typified by these traits (Hodgson 2003a). 'Internal' congruence (where more than one depiction of the same subject is

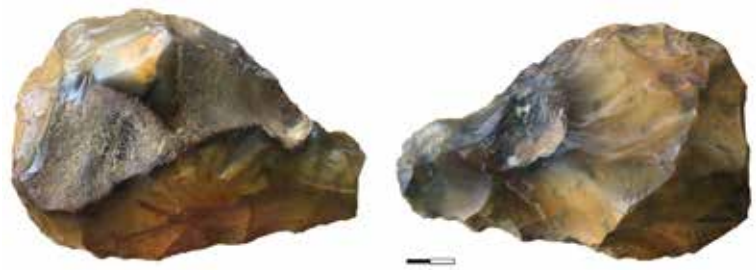

Figure 32. *Lower or Middle Palaeolithic biface retaining elements of cortex and resembling a 'bear head'. From the University College of London, provenance unknown.*

Figure 33*. PH#000 Large nodule of Upper Turonian flint from Grand-Pressigny, France bifacially worked and resembling the head of a 'bear'.*

recognised in the same specimen) is observed in over eighty items and goes some way to corroborate the subject identified at the ordinate level.

The results of the author's etic observations imply that the same subject depiction (bears) has been consistently incorporated into the production of debitage at Fontmaure. Although these observations are the subjective deductions of the author, other observers have reached the same conclusion independently of the author.

For the reasons outlined above, it is irrational to conclude that the iconography identified in FS#037 (Fig. 5) is simply a result of pareidolia by the observer. Neither is it probable that this specimen represents a one-off or chance occurrence. The microlith FS#037, whilst retouched, has obtuse edge profiles which are not amenable for cutting or scraping. It is also manufactured from a piece of inferior quality, chalky jasper, which is irreconcilable with the suggestion that it was intended as a 'tool'. The 'nose' is demarcated by the colour of the jasper, as is the 'muzzle'. The 'eye' appears to be modified and the outline contour is diagnostically characteristic, including a sloped 'forehead' and 'ear'. It is suggested that the standardisation of forms identified in the whole sample — 'bear head' and 'bear' — can reasonably be assumed to be representative of a palpably real pattern. Should the almost obsessive fascination with bears observed at Fontmaure be a real phenomenon then it is well supported from evidence arising from a long list of Middle and Early Upper Palaeolithic sites where cave bear remains have been deliberately deposited by hominins: often arranged purposely such as those at the Caverne des Furtins, France, and in the Salle du Crâne, Chauvet Cave, France (Bednarik 2017b). As Hodgson and Helvenston (2010) have emphasised, hyperimagery, whilst related to pareidolia, is not equivalent. Hyperimages are projections (i.e. exograms) primed by either ancestral factors or ancestral factors reinforced by socio-cultural input related to the tracking and hunting of animals.

At the very least, the forms identified here are no less valid than the typologies identified by archaeologists. At best, the working hypothesis outlined in this paper refutes the default position of mainstream archaeology that iconography was not incorporated into the production of lithics during the Middle Palaeolithic — a period firmly associated with robust hominins. These people, who have previously, and erroneously, been suggested to either have been incapable of figurative production, or were otherwise disinterested in producing exograms, were evidently routinely incorporating iconography into their lives. Just as visual ambiguity in caves undoubtedly prompted the production of some Upper Palaeolithic palaeoart, so too did the smaller rocks that were so much a part of their everyday lives. The observations presented here add to the existing evidence that robust *Homo sapiens* (e.g. so-called Neanderthals) were routinely producing exograms (Bednarik 2014). Since lithics are relatively immune to the effects of taphonomy these findings also lend further weight to the argument that the full extent of figurative production on non-recoverable materials pre-dating the Upper Palaeolithic cannot be ascertained without recourse to the selective effects of taphonomy.

Walther Matthes (1969) has provided convincing examples of the same practice at several Lower and Middle Palaeolithic sites (including Wittenbergen and Sülldorf). The production of iconography has also been tentatively identified at other well-established Palaeolithic occupation sites, including Limburg (Netherlands), Long Valley Wood (England) and Grand Pressigny (France); the latter site is already firmly linked (by the transportation of raw material) to the activity occurring at Fontmaure (see Fig. 33). Whilst the implication of the evidence from Fontmaure is that the high frequency of iconography noted was prompted in part by the visual characteristics of the jasper, it is evident that at Grand Pressigny this effect had less influence and did not preclude the production of iconographic material.

Based on preliminary observations, and the preferences of the hominin neural system, the author predicts that earlier evidence, from the Lower Palaeolithic, will demonstrate a lower frequency of iconography but with a substantially higher frequency of anthropomorphs.

This paper suggests that if an appreciation of this activity is ever widely acknowledged by archaeolo-

gists, then evidence of this practice will be uncovered at many more sites, confirming the occurrence of such behaviour across a vast geographic region and over hundreds of thousands of years. However, this will only occur when archaeologists stop following bear tracks.

Appendix

Photographs were taken using reflectance transformation imaging (with subsequent adjustment in order to increase the coefficient or provide multiple light sources) or simply utilised natural lighting. Post-processing (removal of the background) was completed at 400% magnification in Adobe Photoshop.

PB# - From the collection of Piet Bakker
TB# - From the collection of Tony Berlant
PH# - From the collection of Pieter Huisman
MH# - From the collection of the Museon Den Haag
TT# - From the collection of Tedde Toet
FS# - From the collection of Richard Wilson

Acknowledgments

This paper is dedicated to the memory of Tedde Toet who was instrumental in uncovering the nature of the Fontmaure site and also to the memory of Tony Baker whose teaching and guidance concerning fracture mechanics has proven invaluable. The author would like to acknowledge the hospitality of Marie-France Durand, Paul Durand, Christian Souriau and Samuel Souriau. Comments and suggestions from the six *RAR* referees were welcomed and appreciated. The author would also like to recognise the contributions of assistance and input from Tony Berlant, Alan Day, Roger Gracie, Dr James Harrod, Pieter Huisman, Niek van Rijswijk and Matthijs Vos. Special thanks are extended to Piet Bakker for sharing his insight and knowledge, and to Judith and Raymond Wilson for their enduring support.

Richard Wilson
2, Bury Green Cottages
Wheathampstead
Hertfordshire
England, UK
richardwilson.palaeoart@gmail.com

RAR 35-1263

COMMENTS

Figure-stones at Fontmaure, a welcome paradigm shift

By JAMES HARROD

Wilson has made a major advance in the ongoing paradigm shifts on the question of figure-stones in Palaeolithic art, 'art' during the Middle Palaeolithic and Neanderthal palaeoart capabilities, and factors in the evolution of art. He has given an excellent summary of the 19th century debate on figure-stones and the political academic decision to dogmatically discount research and reject discussion of archaeological evidence on the topic. The dogma is perhaps in no country more entrenched than the U.K. Wilson boldly takes on the deniers.

Drawing on vision science as well as lithics, Wilson develops a set of criteria for a method to identify zoomorphic figuration in flint artefacts. He sets aside potential anthropomorphous figuration because of the high risk of face pareidolia. He emphasises that the criteria are purposefully limited to portable lithic artefacts and their outline shape. He eschews claims for figurations on surfaces inside the overall stone shape and the multiple taphonomic, superimposition and other challenges that occur in the study of parietal rock art and incising of bone or ivory.

In my read Wilson's criteria are (1) the object was found in an archaeological site with secure provenience and adequate dating; (2) it is a lithic artefact; (3) it shows intentional modification, especially edge-modification, using reductive techniques typical of tool-making and/or atypical techniques; (4) the result of modification is neither a typical tool nor functional as a tool; (5) the result of modification may be identified as a zoomorph, and sometimes refined to species, based on the overall outline shape of the artefact and evidence of working to achieve that shape; (6) the overall shape of the artefact corresponds to key salient characteristics of a species, especially with respect to the cervico-dorsal contour and shape of the head, which are characteristic for that species, differentiating it from other species; (7) there is repetition of similar figurations on other lithic artefacts from the same or other, related archaeological sites; and (8) there is repetition of similar figurations in other media, such as other kinds of stone, portable engravings or parietal rock art from the same or related sites.

For almost three decades I have been researching the question of figure-stones, and working on a science-compatible methodology (Harrod 1992, 2010, 2013, 2014). Wilson has given us the most comprehensive and precise set of methodological criteria I have seen; this is a major contribution to advancing the scientific study of figure-stones in palaeoart.

Wilson examines over 500 lithic artefacts from the Middle Palaeolithic levels at the site of Fontmaure, France, and finds 467 with iconography, including 397 'bears'. I could quibble about several of these species-level interpretations; Wilson makes clear that for the purpose of this study it is sufficient to demonstrate zoomorphic figuration; species identification is secondary. While no hominin fossils have been found at Fontmaure the tool industry is accepted to be that of Neanderthals. If so, Wilson's conclusion for figure-stones at Fontmaure implies Neanderthals had far more artistic capacity than the prevailing paradigm credits them. Wilson provides several references to other Middle Palaeolithic sites with figurative art

attributable to Neanderthals, including nearby La Roche-Cotard II with its 'proto-figurine' displaying a human-like 'mask' on one side and 'feline-like face' on obverse (Marquet and Lorblanchet 2000). New radiocarbon dates indicate the mask's stratum is older than 40 000 BP and La Roche-Cotard I, which has a similar stratum, now has an OSL date of ~75 000 BP (Marquet 2013). Wilson's discovery provides evidence that Neanderthals made figurative (iconic) art long before *Homo sapiens sapiens* arrived on the scene. This significantly counters an emerging view based on U-Th dating of rock art — and I suggest apparent selective sampling bias — that Neanderthals were only capable of making simple non-iconic 'art', such as handprints, lines, dots or pigment blotches on cave walls (Hoffmann et al. 2018).

In developing his method Wilson has drawn on the latest rock art, neuroscience and vision research on the role of visual ambiguity and pareidolia in hominin palaeoart (proto-art) and its evolutionary trajectory. Considering the Makapansgat all-natural exotic figurine manuport, he suggests that the hominin capacity for pareidolia is a trigger-feature at the earliest stage of the evolution of art. I agree, with one caveat. 'Looking-at-figures-in-clouds' may be a ubiquitous contemporary human activity, but neither visual ambiguity and pareidolia, nor hyperactive response to ambiguous stimuli of predator threat as such can explain the drive to make art. Such explanations seem refuted by the fact that contemporary humans rarely if ever respond to visual ambiguity, pareidolia and ambiguous predator threat by making art.

The key concept to grasp is that artists work in 'art space' in or with an 'art medium' and their drive is to express their subject, which is their response to self and life through choreographic gesture-movements in an art space using the media of that space. In the case of cave art the artist is responding to walls and other features (protuberances, crevices, shapes, patterns etc.), not as walls and other features as such but as art space and media which support art making. After a lecture by a nationally known painter and art historian, I asked how do you begin a work, what is your process. His response was I see a pattern and then I let the medium tell me what to do next (David Driskell, pers. comm., April 2018). It is the creation of the art space and art media and the urge to make, display and curate art that needs explanation in any hypothesis about the evolutionary origin of art.

Wilson aptly references Hadjikhani et al. (2009) on early activation of the face-specific cortex during visual processing as supporting the view that detection of face-like objects is deeply rooted in hominin brain evolution and propensity to see faces in visual ambiguity. I would add that Hadjikhani et al. further find that a circuit including fusiform face area and a multimodal posterior superior temporal sulcus area, also sensitive to biological motion (Duchaine and Yovel 2015), quickly — one might say automatically — distinguishes real faces from face-like objects (pareidolia) by around 170 ms. Any hypothesis using face-pareidolia to explain the emergence of hominin artistic or spiritual behaviours seems refuted by this neuroscience finding. Although visual ambiguity and pareidolia do not explain the impulse to art making or the origin of art, as Hadjikhani et al. imply, they have been used as a feature in particular artworks, expressing playfulness, surprise or conceptual meaningfulness. On this latter point see Voss et al. (2012). Setting aside my caveats, Wilson's method and findings are a welcome advance in the study of iconic figuration in rock art and human evolution.

Dr James B. Harrod
Portland, ME 04102
U.S.A.
academia.edu; *researchgate.net*
james@originsnet.org
RAR 35-1264

The affordances of stones

By DEREK HODGSON

Wilson begins with a broadside criticising conventional typologies that classify Oldowan and Acheulian tools. This criticism may be somewhat misplaced as things have moved on from purely functional typologies, with many archaeologists and anthropologists having come round to the idea that, because stone tools were increasingly modified by hominins, they became a socially-mediated commodity (Gamble et al. 2011; Gowlett et al. 2012). Precisely because they underwent modification through material engagement, stone tools became a vehicle for social display (McNabb 2012). It is perhaps within this context that we might be able to consider early stone tools as having significance for understanding hominin cognition. Thus, I do not believe we should completely overturn the traditional typologies; rather we need to view them in a new light by considering the social context more fully. This conforms to scientific methodology whereby a paradigm is either updated, or in rare cases completely overturned, whenever new compelling evidence demands. Wilson suggests a paradigm shift is called for in order to accommodate his thesis. This is unnecessary. The preferred way forward, if his preliminary findings were to be accepted, would be to update the current consensus by regarding the 'figure-stones' and stone tools as evidence that such objects have a stronger social dimension than previously supposed. It is notable that the assumed figure-stones either portray animals or human faces, two of the most salient criteria fundamental to the survival of hominins during the Pleistocene and which

have dedicated domains even in the modern brain — an observation that may help support Wilson's hypothesis.

I have previously referred to the Berekhat Ram and Tan-Tan objects as 'passively conceived' in the sense that most of the natural form of the stone is left intact (Hodgson 2010). In other words, the conception depends mainly on the projective capacity of the perceptual system (the observer's share) for completing the figure as such. The fact that these objects date to around 300 000 year ago or more suggests the ability to engage in projective imagery was within the cognitive capacity of early hominins. In fact, many animals, including primates, have the ability to see objects in pictures, though they generally have more difficulty with line drawings (Hodgson 2010 and references therein). Yet they invariably mistake such representations for the real thing. Moreover, they tend to only identify things that are particularly relevant to their own evolutionary niche, such as animals from their own clade. This can be viewed as a purely 'passively' reactive process as animals do not produce representational images, yet such passivity provides a platform for the later proactive modification of a natural object whereby iconic affordances are acted upon, if only minimally. Correspondingly, in early artefacts, we seem to see a gradual development from a purely 'passive' response, towards a slight enhancement of distinctive features, which eventually culminates in fully modulated iconic figurines. This scenario is reflected in the archaeological record with the Makapansgat cobble which, as a found object, displays no artificial modification and can be said to be purely passive (except that it was picked up and carried some distance, suggesting its inherent iconicity was valued). With the Berekhat Ram and Tan-Tan objects, we see only minimal artificial intervention, with fully sculpted objects only appearing during the very late Pleistocene. The figure-stones to which Wilson refers seem to fall within the category of a minimally altered natural object. The problem is that the examples put forward are not as clearly modified as the Berekhat Ram and Tan-Tan objects in a way that emphasises the iconicity, and therein lies the problem.

Having said this, the evolution of the visual brain suggests that the intentional modification of suggestive stones should exist during the Acheulean, especially when this is seen against the increasing fine motor control and enhanced visual acuity linked to a proliferation in cross-modal neural tracts leading to an enhanced association cortex in humans (Rilling 2014). I would posit that this enhancement gained traction around 700 000 to 500 000 years ago that led to cognitive by-products appearing. Such by-products are found in the non-functional items as exemplified, for example, in the refined symmetrical handaxes that suggest a proto-aesthetic leaning. Elephant bones were also shaped into symmetrical handaxes suggestive of ritual tendencies (Zutovski and Barkai 2016). In addition, the visual brain benefits from a prolific ability to see forms in ambiguous arrays that may derive from detecting and hunting animals in ambivalent environments (Vyshedskiy 2014), which was probably quite advanced during the late middle Acheulian.

Some of the above comments provide support for the existence of figure-stones but with reservations especially as regards verification. Nevertheless, I commend Wilson on a valiant attempt to advance his case. Perhaps this might set in train a series of empirical investigations employing rigorous double-blind experimental protocols that could provide more concrete and compelling evidence to further his ambitious claim.

Derek Hodgson
University of York
Kings Manor
Exhibition Square
York YO1 7EP
U.K.
derekhodgson@hotmail.com
RAR 35-1265

No bearing on conventional lithic analysis

By BEN WATSON

The notion that some of the lithics from Fontmaure feature evidence for iconicity is interesting to consider, but I am not convinced by Wilson's paper. The study is unfortunately highly subjective and inherently unscientific. Certain aspects of the artefacts have been selected to support the preferred interpretation, while evidence that contradicts it is largely ignored. For example, conventional approaches to stone artefacts — typological, functional and technological analyses — which are fundamental to a basic understanding of lithic morphology and answering basic research questions, are rejected. At the same time, constancy of form is one of the primary features of the assemblage used to support the main hypothesis. Something Wilson does not appear to realise is that the detection of consistent traits is in fact itself a form of typological classification.

The morphological similarity of some of the artefacts does not, however, necessarily indicate that they have a significance beyond mechanical functionality. Rather, it suggests intentionality in the production of flakes best suited to their functional requirements. Other Mousterian assemblages display similar levels of morphological similarity despite typological attribution. For example, lithics from Sesselfelsgrotte, Germany, are comparable to those from Fontmaure and could similarly be interpreted as exhibiting

animal-like features, but any apparent likeness is totally fortuitous; analyses clearly demonstrate their characteristic shapes are a result of their intended use as tools, and the intent of hafting them (Rots 2009). Typologically, the artefacts include flakes, scrapers, points, bifaces and other forms, and the amount of secondary modification amongst them differs significantly; some do not exhibit any retouch at all, suggesting production of preconceived forms during initial flake production.

Examples from Fontmaure, such as those shown in Figures 11 and 12, may indeed have been similarly retouched with the intent of hafting them. The fact that some do not display evidence for use-wear or hafting does not mean they were not intended as tools — the majority of lithics produced throughout human evolutionary history are in fact unmodified. If the examples in question were intended to be hafted, then the worked edges would also not typically exhibit evidence for use-wear, as they would not have been intended for cutting. Wilson further argues that some of the flakes are unlikely to be tools because of their large size and because they are characterised by thick blocks with wide cross-sections. But characteristics of this type should be expected of artefacts from a site like Fontmaure, which occurs directly on the exposure of jasper from which they are made. Early stages in the reduction sequence typically take place close to the source of a raw material, with artefacts found further away subject to greater degrees of retouch and reduction (e.g. Newman 1994).

Despite stressing the importance of technological analyses, I disagree there is an underlying assumption that all lithics from the Palaeolithic are the products of tool-making. Production of iconicity has not necessarily been rejected by archaeologists. Rather, there are simply very few convincing examples. To my eyes, most of those presented by Wilson do not resemble 'bears' or other iconic forms at all; conversely, they appear typical in shape and form of flaked artefacts from assemblages across time and space (e.g. those in Figs 7, 8, 16 and 17, especially when oriented longitudinally). A more useful study might be a statistical comparison between the detection of iconicity in the Fontmaure assemblage and a sample of naturally fractured rocks, or another assemblage, such as that from Sesselfelsgrotte. Wilson states he has attempted comparisons with naturally fractured rocks, but unfortunately does not present the results other than stating that convincing iconography occurs at lower frequencies in the natural samples. However, the fact remains that what is convincing to Wilson may not be to someone else. The interpretation or perceptibility remains entirely subjective. Wilson himself states that his identifications cannot be tested. His study therefore does not appear to tell us anything more than the fact that some of the artefacts from Fontmaure look like 'bears' to him. It reveals an attempt to detect meaning in a perceived pattern through arbitrary diagnostic features or traits, a problem often encountered in attempts to recognise subjects in rock art motifs.

Conventional lithic analysis, on the other hand, allows for technological processes to be measured empirically, and objective and statistically verifiable observations to be made and compared. It remains the most appropriate and logical referential framework through which to understand the possible causal factors contributing to the formation of the Fontmaure archaeological record. The application of such approaches should not be so readily dismissed, but fully explored from the outset, especially when able to provide more convincing explanations for why the artefacts take the particular forms that they do.

Dr Benjamin Watson
Melbourne
Australia
watson.benjamin@hotmail.com
RAR 35-1266

Beyond reasonable doubt? On the evidence required to identify figurative art in lithic assemblages

By MATTHIJS VOS

Richard Wilson's study aims to identify Palaeolithic figure-stones, i.e. figurative art produced by Pleistocene hominins, in a lithic assemblage from Fontmaure, France. The studied surface-found material is certainly of interest, the bulk of it originally deriving from two Mousterian layers (Pradel 1967). A methodologically sound identification of sculptures or other portable rock art among these lithics would be interesting and important.

In this comment I single out those aspects of Wilson's analysis that contribute to methodological best practices for the evaluation of perceived portable rock art in lithic assemblages. I feel these are valuable, irrespective of major concerns I have with other aspects of the analysis. Let me, however, start with the latter. Quite a few pitfalls exist and some missteps are easily made in the identification of figure-stones as man-made sculptures. Wilson has avoided some of these by working with a large lithic assemblage from a well-established archaeological site. Fontmaure was carefully excavated by Pradel, who provided detailed descriptions of lithics found in-situ in different, well-separated layers (1967). The more recently surface-collected material studied by Wilson mostly consists of stones that are clearly humanly worked. This sets his work apart from that of many figure-stone enthusiasts that make claims of incorporated iconography for assemblages sheerly consisting of geofacts. Much of the diligent rejection by archaeologists of such geofact

assemblages was in my opinion justified and in fact required to keep the profession sane.

Their 'standard rejection' should not apply to Wilson's Fontmaure assemblage, as we are dealing with artefacts. The stones thus deserve a fresh evaluation, starting from first principles. I carefully evaluated Wilson's analysis of the assemblage as a whole, and started to experience a concern similar to the one I have with geofact-based claims. My worry is that the study's central conclusion does not match the presented results, in view of the author's own criteria for man-produced iconography. As I fundamentally agree with the author's criteria and raw data, I would myself have reached the opposite conclusion: the research outcomes shown in his Table 1 require one to conclude that the iconography perceived in this stone assemblage was *not* produced by Palaeolithic hominins. Here I first explain the observed contradiction and then focus on the commendable aspects of Wilson's study (especially his well-illustrated evaluations of particular pieces and his use of the concepts of *arrangement* and *internal congruence* in the identification of figurative art).

We need to start with the 'required evidence'. What criteria did Wilson propose to judge whether the depicted stones are *either* sculpted figure-stones, i.e. figurative 'art' showing man-produced iconography, *or* need to be rejected as such? What evidence he deemed 'required' is stated in the following citation:

> The results from observations by the author of over 500 examples are shown in Table 1. They are both reproducible and open to refutation; finding a similarly high frequency (over 90%) of iconographic items in a sample of rocks fractured only by natural forces would indicate that the results are not statistically significant.

Now, careful examination of Table 1 shows that the author detected iconography in 17 out of 18 *unmodified* stones. That means the author finds 94.4% of iconographic items in a sample of rocks fractured only by natural forces. This implies a sound rejection of the author's claim of intentionally produced iconography in this lithic assemblage: case closed by the author's own criteria.

In other words, if the author identifies 94.4% of *unmodified* stones as iconographic, no archaeologist needs to feel compelled to accept the claim that 93.2% of flakes and cores truly incorporate iconography (note that the author ticked Yes for detection of iconography for 450 out of 483 modified stones in his Table 1). As the percentages (roughly 94 and 93%) do not seem to be very different (the difference is actually non-significant using a Chi^2 contingency table), one could safely conclude that the author simply has a high propensity to see either a bear or another zoo- or anthropo-morph in any stone that comes from Fontmaure. The 483 flakes and cores could then simply be just that: flakes and cores.

Upon reaching this unsettling conclusion I contacted the author, noting that either his conclusion as drawn on basis of Table 1 must be wrong, or the sampling must not have been as representative as it was stated to be. The author replied that indeed a mistake had been made in his construction of Table 1. He stated that the unworked stones with natural iconography had been purposely collected in the field and were thus strongly selected for. Unworked stones without natural iconography were in fact abundant but had not been purposely (or representatively) collected. The high percentage (94.4%) of natural iconography observed thus simply resulted from a strong selection bias by the collector. If we can trust that the sampled lithics (with 93% iconography) were *not* selectively collected to obtain figure-stones, these would still be a representative sample, making them fundamentally incomparable to the unworked stones.

As the author's ability to detect man-made iconography breaks down given the above methodological issue, I sat back and asked myself whether it would be possible that one or a few intentionally sculpted figure-stones are nonetheless present within this lithic assemblage.

To answer this question we need to be clearer about how we define a figure-stone (no definition is provided in the paper). In my mind (and in most of the classical *pierre-figure* / figure-stone papers cited by Wilson), a figure-stone is a stone modified by a human (of whatever lineage or period) in such a way that a zoomorphic or anthropomorphous appearance is created, enhanced or marked. This implies that an unmodified stone should not be called a figure-stone. Unmodified stones that 'naturally resemble something else' are mimetoliths and can be culturally significant, e.g. as manuports, but they are not figure-stones sensu strictu (incorporating hominin-produced iconography). Similarly, lithics that 'naturally resemble something else' are not figure-stones. Also within a lithic assemblage, a stone can only be seen as a figure-stone if it can be shown, *beyond reasonable doubt*, that the modification was intentionally produced to create or enhance a zoomorphic or anthropomorphous appearance.

Wilson does provide a step-wise line of reasoning to support such a claim for item FS#040 (see his Figs 11 & 12). In section 3.4 he provides us with a good example of how to do this by first describing the perceived working traces on item FS#040. This is followed by five points stating why (1) the stone is perceived to be humanly modified, (2) the work is deliberate and (3) intentional and (4) arranged in such a way that physical features are well-connected and arranged, and (5) the arrangement resembles known and accepted other ancient 'art'.

His key contribution is that all that he perceives is made explicit and thus opened up for discussion. One can then agree or criticise. I would for instance agree that deliberate retouch is present on item FS#040, although I do not agree that this piece could not have been intended as a tool. The small 'tuft' on the bottom jaw line perceived by Wilson in Fig. 12 is an element that

Figure 1.

Figure 3

frequently occurs on the working edge of Fontmaure tools. The notch on this piece was apparently not used, but it is not uncommon to find un-used tools or tools that have un-used sections. Furthermore, a crucial aspect in the arrangement of a zoomorphic head-shape, a natural or man-made *eye*, is lacking. So I am not convinced beyond reasonable doubt by the evidence provided for this particular piece. Ideally, a similar full description including drawings of working traces would be provided for all 450 modified pieces in the assemblage. Wilson effectively provides his *RAR* readership with a selective and thus limited survey of a very large number of stones. As the required full evidence and level of detail is not provided for most of the stones in the assemblage, none really manage to jump out as *convincing beyond reasonable doubt*. Application of pigment could be taken as evidence that a stone was seen and marked as iconographic. However,

Figure 2.

as big blocks of ochre (none of which are worked or facetted) do naturally occur in the soil of Fontmaure, contact traces on other stones are also to be expected in the absence of human pigment application. I feel a study that delves more deeply into the perceived 'painting' at Fontmaure is required before firm conclusions can be drawn.

Which returns us to the crucial question we need to address: how can one provide convincing evidence that intentional modification was applied to enhance or create a zoomorphic or anthropomorphous appearance? This certainly requires evidence beyond the presence of traits supporting the item's status as a good artefact. As argued by the author, citing Bednarik (2007), *arrangement* is certainly part of this. I agree, as nature or toolmaking are unlikely to make negatives in exactly the right places (and in only the right places) to produce a convincing zoomorph or anthropomorph.

In addition to this, *congruence* (see the author's section 3.5) can provide supportive evidence. Suppose that an item would have a zoomorphic natural surface feature and at the same time show all-around retouch that repeated this particular zoomorphic shape. This could be taken to provide evidence that the maker saw the natural feature and replicated the subject through retouch. Such powerful cases of congruence are likely to be rare. I would certainly not expect >90% of stones in a lithic assemblage to show such a high level of congruence. But perhaps more modest degrees of congruence could be identified in some cases. To honor the author's mission and because Fontmaure with its richly colourful jasper indeed seems to be one of the most promising places for items with special natural features to occur, I went through my own Fontmaure lithic material in search of stones that are (1) clear artefacts and (2) combine both *arrangement* and *congruence* of natural features and working traces. Among about 3000 pieces I found a single stone that would seem to be a candidate to fit these criteria. First, it is a jasper flake featuring a striking platform, a ventral bulb of percussion and scar (Figs 1 and 2). It is hence clearly a lithic artefact. Second, the dorsal side features

Figure 4.

Figure 5.

Figure 6.

Figure 7.

Figure 8.

Figure 9.

a natural colour blob that quite closely resembles a cave bear looking right, including a 'shoulder bump', a 'steep forehead', a 'muzzle' and a 'right foreleg' (Fig. 3, note the Chauvet cave bear inset as re-drawn by the author, horizontally mirrored, included here for comparison). Thirdly, the flake shape itself resembles the head of a juvenile bear looking right. At the location where one would expect an eye, a natural dark spot is present (Fig. 4). Three small negatives (that do not provide any tool-function) seem to mark or enhance the natural eye spot. One of these negatives invades deeper into the flake than any other negative along that edge, pointing right at the dark spot (Fig 5). Fourth, a single negative is present at the location at the back of the head where one would expect an ear (Fig. 6). Fifth, on the muzzle's 'nasal bridge', a bit of retouch seems to mark or slightly straighten out the muzzle (Fig. 7). Sixth, a 'mouth-like' area shows a few small negatives (Fig. 8, here shown in turned-over position). Seventh, some apparent use-wear that does not contribute to, but also does not disturb any part of the potential 'zoomorphic resemblance' suggests the piece may have been used as a cutting tool (Fig. 9).

Seen this way, the piece could be perceived as a potential figure-stone candidate, as it seems to combine (A) being an artefact with (B) some elements of potentially deliberate arrangement of working traces, and (C) some degree of internal congruence: a double 'bear facing right' theme. Now, this interpretation can easily be criticised just like I criticised FS#040. For example, one could judge the 'ear negative' as natural damage rather than as resulting from a deliberate blow.

My point here is not to convince anyone that this item is a figure-stone. The point is that Richard Wilson's contribution in *RAR* makes us think about what works and what does not work in figure-stone evaluations. His study brings together several interesting concepts that could be useful for the identification or rejection of potential man-made iconography in lithic assemblages. Full evaluation of his own and other Palaeolithic collections could possibly yield other good figure-stone candidates.

I expect convincing examples to be exceedingly rare, but would it not be interesting if they exist?

Prof. Dr Matthijs Vos
Ruhr-Universität Bochum
Universitätsstr. 150 / Gebäude NDEF 05
44780 Bochum
Germany
Matthijs.Vos@rub.de
RAR 35-1267

'Figure-stones', artefacts and probabilities

By ROBERT G. BEDNARIK

A central theme of Wilson's paper is that 'whilst the incorporation of rock edges and other natural features in rock art is now broadly accepted, the logical extension of this practice to lithics' remains generally rejected in archaeology. It is perhaps so because while there is evidence of aniconic rock art prior to the advent of Mode 4 industries, but not for iconic, and the claims involving lithics are pareidolia

based, i.e. they all involve iconicity. Another reason is the reluctance of many archaeologists to abandon the African Eve-derived mantra that all pre-*H. sapiens sapiens* hominins, including *H. sapiens neanderthalensis*, were too primitive to detect iconicity. The Fontmaure lithics are assumed to be of Mode 3 traditions, hence thought to have been made by Neanderthals, and there does not appear to be significant disagreement that they are artefactual. The question is simply: are they utilitarian or exogrammatic? In exploring this subject, Wilson's paper raises various conundrums.

The first is this: archaeologists are incapable of conclusively differentiating between stone implements and geofacts, and have been so since the times of Boucher de Perthes. Since no secure and agreed method exists to discriminate between these two classes (Lubinski et al. 2014), claims concerning the authenticity of stone tools are provisional because they are ultimately based on authority, being untestable. No doubt the overwhelming majority of such identifications are valid, but that is not the same as assuming that they are all true. Microwear can provide supportive evidence but is itself not conclusive. Certainly large assemblages provide better resolution than small, as does internally consistent typology. Wilson has attempted to apply the same logic to the Fontmaure 'figure-stones', by presenting a large number of similar objects.

An analogy to this challenge is provided by the many 'identifications' of rock art motifs: perhaps some are correct, but without secure diagnostic attribute lists and without the potential of falsification they are not scientifically credible. The same underlying problems apply to figure-stones: we lack an agreed system of testing such claims, just as we do for geofacts. Archaeologists are quick to discount them intuitively, and perhaps they are right, but since they themselves cannot securely discriminate between tools and geofacts, their criticisms of figure-stone collectors seem somewhat moot. All these issues present us with probabilities: the probability that lithics pronounced as such by archaeologists were indeed implements is perhaps very high; the probability that the identifications of rock art motifs or invented rock art styles are valid is significantly lower. Where, then, lies the probability that the hundreds of specimens Wilson lists from Fontmaure were deliberately shaped to represent objects such as animals?

Let us place the issue into context: it is an absurdity to claim that hominins of the Late Pleistocene or late Middle Pleistocene were incapable of detecting iconicity; those of much earlier periods managed this with mimetoliths, and other animal species have that ability today. Boucher de Perthes presented three key propositions: that humans, based on the stratigraphy of stone tools, coexisted with Diluvial fauna; that hand-axe makers used beads; and that they created figure-stones. All three propositions were universally rejected by archaeology (consider the unanimous declaration of the 1858 Paris archaeology congress). The first was later grudgingly accepted under the weight of massive cumulative evidence; the second remains widely rejected or ignored (most archaeologists seem unaware that people with Lower Palaeolithic tool traditions made and used beads); the third continues to be rejected universally and is not investigated in any helpful fashion. That does not encourage confidence in the practitioners of a field who have for decades supported the Piltdown hoax, rejected Glozel, or were fooled by the African Eve hoax or the Hobbit media circus, among so many other controversies.

Wilson's case is the most carefully assembled in favour of figure-stones that I am aware of; it is preliminary and needs to be followed up by more intensive review. Having myself examined literally thousands of 'figure-stones' (of which I accepted not a single specimen), plus thousands more on photographs (most also unconvincing) I need to regard myself as biased against this material. My intuitive reaction was that most of the pieces Wilson presents offer no persuasive features to accept them. However, the scientist in me warned me that until zero probability was proven, the issue had to remain unresolved. Moreover, a few of his specimens are most certainly interesting; for instance the probability that a fascinating object such as the fossilised coral in his Figure 29 occurs in an occupation deposit by sheer coincidence seems very low. I think it needs to be regarded as a probable mimetolith and manuport, although what it was *seen as* remains unknown. There are other specimens of interest and there remains also the nagging doubt that the perceived absence of Middle Palaeolithic iconicity could indeed be an archaeofact and thus unwarranted (see also the 'stickman' from the Oldisleben Micoquian).

Which brings us to the crux of the matter: how to recognise whether the shapes of stone flakes were created with the intent of producing images. Some years ago I offered a methodology for examining very early engravings, a subject suffering from similar obfuscation (Bednarik 2006). A comparable list of attributes needs to be designed for figure-stones to establish realistic probability ratings. This needs to include not only finest details of retouch but the introduction of methods not as yet available. For instance, I see tribology playing a role here, and good old-fashioned forensic science (Montelle 2009). Wilson has very competently opened a can of worms that most archaeologists would prefer did not exist; it does exist and it needs attention.

Robert G. Bednarik
Editor, *RAR*

RAR 35-1268

REPLY

Establishing a falsifiable framework for figure-stones

By RICHARD WILSON

I am thankful for the observations and constructive criticism provided by the commentators. My response concentrates on the main issues mentioned, for the most part in the order that they are raised, but for the sake of brevity combining some related points.

Harrod's work researching figure-stones has been inspirational to my studies since these began in 2006, and has played a key role in the development of the criteria utilised in this paper. Harrod makes an important point concerning the origin of 'art', a question not touched upon here but surely central to the study of palaeoart. His concise summary of the paper, its purpose and methodology aptly clarifies the aims of the author and is gratefully received. The 'emerging view' identified by Harrod that Neanderthals were supposedly incapable of making iconic 'art' is a troubling development, unsupported by the hard sciences, as alluded to by both Hodgson and Bednarik.

I agree with Hodgson's point that a full paradigm shift may be unnecessary but felt it was important to present an epistemologically sound rationale for the approach adopted. Likewise, I also agree in principle with the model that Hodgson sets out for a gradual development from 'passive' response, to enhancement of distinctive features, concluding in 'fully modulated iconic figurines'. On the other hand, I only partially concur when Hodgson opines that the Fontmaure examples provided are not as clearly modified as either the Berekhat Ram or Tan-Tan 'figurines'. Hodgson feels that the latter objects, although also only minimally modified, show working traces that more clearly emphasise iconicity than those of Fontmaure. While this would be true for items such as 7B, 7H and 17AG, incorporating natural features and only minimal modification, others, such as FS#040 (Figs 11 and 12), FS#006 (Fig. 13), 16AF and 16AG, are apparently created from scratch without reference to their original shape or indeed any natural features. I agree with Hodgson, Vos and Bednarik that rigorous verification requires follow-up work that more elaborately and systematically shows how both minimal modification and full creation of shape contribute to iconicity in the Fontmaure material.

Watson is of course correct to state that the study is subjective; this is overtly acknowledged throughout. However, far from entirely rejecting conventional approaches to stone artefacts the typological analysis applied does not rely upon the etic constructs of archaeologists. Instead it favours a neurologically supported premise. This provides as a basis that, as Hodgson notes, concerns 'salient criteria fundamental to the survival of hominins during the Pleistocene'. Neither does this study disregard technological analysis, albeit this is only demonstrated explicitly in a handful of examples. The gradual shift toward considering the social dimension of stone artefacts justly mentioned by Hodgson is recognition that the traditional perception of stone artefacts in terms of 'tools and tool making' is limited since it does not fully take into account socially-mediated material engagement.

Watson states that morphological similarity suggests intentionality suited to functional requirements. However, Rots (2009) notes that in the case of the Sesselfelsgrotte assemblage it is 'clear from this analysis that there is no strict link between typology and function'; a finding supported by other studies (e.g. Borel et al. 2017, including Odell 2001, cited by Rots). To be clear, the author is not suggesting that the lithics identified as exogrammatic (including the examples illustrated in Figs 12 and 13) cannot also be tools; these classifications are not always mutually exclusive. Rather the implication is that 'tool-use' alone is insufficient to account for the within-group similarity identified on the basis of their two-dimensional outlines. Also, as Harrod notes, where modification does not appear to be related to tool use, or hafting, but is critical to an iconographic interpretation, then this provides compelling evidence for iconography. The large size of some items, e.g. Figures 13 and 14, is incompatible with the suggestion by Watson (when refereeing) that they 'appear to have simply been notched or waisted for the purposes of hafting'. In the case of the sandstone specimen pictured in Figure 14 the author can think of no reason why doing so would be beneficial. Additionally, whilst we might expect to find a variety of flakes including those with wide cross-sections close to a raw material source, when they are retouched in limited areas which correspond to a pattern consistently observed across the assemblage (i.e. a delineation suggesting an animal head or cervico-dorsal contour), then it seems counter-intuitive to suggest that these examples are only representative of early reduction sequences.

The author agrees with Watson's suggestion that a useful study would compare the Fontmaure material with a sample of naturally fractured rocks but does not agree that it would be informative to make a direct comparison to another assemblage (since this may potentially also include deliberate iconography). The only valid statistical comparison for testing the identification of iconography in a lithic assemblage is against naturally fractured rocks. In one such test of 100 randomly selected specimens the author identified plausible (but not convincing) naturally occurring iconography in only 10 items. His two youngest children (aged 8 and 11) identified just 15

examples (only a handful of which corresponded to those identified by the author). Taking these results and generously doubling them suggests a background frequency of 'natural iconography', or interference, of between 20–30%. The incidence of iconography detected in the Fontmaure sample of modified artefacts (over 90%) is thus significantly higher, and generally of better quality. Moreover, the diagnostic criteria (e.g. cervico-dorsal contour, head and muzzle shape), far from being arbitrary, repeatedly concur with those dictated by the idiosyncratic anatomical and behavioural characteristics of bears and cannot simply be explained away as an attempt to detect meaning in a perceived pattern as Watson proposes. Although the etic interpretation of the author cannot be tested against the emic interpretation, etic interpretations are open to falsification. One way of refuting the author's observations would be to pick any animal (for example a fish or bird) and re-orientate the majority of the examples given to credibly support such a claim.

Watson proposes that conventional lithic analysis remains the most appropriate referential framework to understand the causal factors contributing to the formation of the Fontmaure material, but arguably these methods do not explicate the observed features that characterise the archaeological record in this case. 'Convincing explanations' may well be more readily accepted by the archaeological community when they fit with preconceived expectations; nevertheless, as Bednarik remarks, they are ultimately based on authority and untestable. For this reason, their perceived reasonableness could be misplaced and should be challenged.

As Vos notes, the author erred in combining unmodified stones (which were selected for their apparently iconographic properties) with modified stones (which were not subject to the same selection bias) in Table 1. Thus the high incidence of iconography in the unmodified sample is indeed not comparable to that of the modified set. But does this mean that the author's ability to detect man-made iconography breaks down as Vos proposes? A suitable comparison would require a randomly collected sample of unmodified stones from Fontmaure, which is presently not available, but the sample of 100 unmodified stones mentioned above provides a rough estimate that probably comes quite close (the chi-square statistic is 344.24, the p-value is < .00001).

With regard to FS#040, whilst no modification or natural feature exists on this piece that can be interpreted as an 'eye', the two-dimensional outline of the entire object does accord closely to the outline of the Chauvet 'cave bear' and exemplifies a pattern observed in other examples (including the example presented by Vos in his Fig. 3 and several of the artefacts in my Figs 15, 16 and 17) some of which do appear to present 'eyes' in anatomically correct positions (e.g. PB#251 in Fig. 15). The identification of 'cave bears' would imply that these items were created before the extinction of cave bears in Europe which is considered to be around 24 000 BP (Baca et al. 2016).

Although ochre naturally occurs in the soil of Fontmaure, it does so in only two colours; yellow and a pale red. The examples of ochre traces noted in Figures 26 and 27 include spots of vibrant red which, in the case of ochre deriving from Fontmaure, is a result of thermal alteration. Thermally altered ochre in combination with yellow ochre suggests that these two items were not fortuitously burnt, but deliberately painted. However, the author is in agreement with Vos that more research is required before any firm conclusions concerning the 'marking' of mimetoliths by Neanderthals can be reached.

Vos's excellent example of congruence, combining natural and modified features (his Fig. 3), is indeed a rarity. In contrast, the combination of intentional modifications resulting in a 'bear head' when viewed one way with a 'bear looking downwards' when rotated, is frequently observed in the material from Fontmaure. Such subject congruence (e.g. 'bear' and 'bear') was detected in 86 of the 483 modified pieces (18%) and is thus, in fact, quite common. The interesting implication of the internal congruence observed in the abovementioned Figure 3 is that a natural zoomorphic feature may actually have been observed and then partially replicated and accentuated through retouch, by a Palaeolithic knapper. Although appropriate arrangement of features should in principle suffice in the evaluation of figure-stones, congruence could provide the tipping-point evidence that is required to render a piece convincing.

Bednarik concisely summarises the key issues raised by the figure-stone debate. He also mentions the perceived absence of iconography during the Middle Palaeolithic and it is the author's hope that the 'nagging doubt' Bednarik identifies is probed further.

Finally, I hope that the step-wise approach and criteria applauded by Harrod and Vos can be developed further, as Bednarik suggests, to produce and employ a list of attributes designed to establish realistic probability ratings which can add value and insight to the study of palaeoart.

Richard Wilson

RAR 35-1269

REFERENCES

Andrefsky, W. 2005. *Lithics: macroscopic approaches to analysis*, 2nd edn. Cambridge University Press, Cambridge and New York.

Baca, M., D. Popović, K. Stefaniak, A. Marciszak, M. Urbanowski and A. Nadachowski 2016. Retreat and extinction of the Late Pleistocene cave bear (Ursus spelaeus sensu lato). *The Science of Nature* 103(92): 1–17. https://doi.org/10.1007/s00114-016-1414-8. [RW]

Bahn, P. G. 2016. *Images of the Ice Age*, 1st edn. Oxford University Press, Oxford.

Bahn, P. and M. Lorblanchet 2017. *The first artists*. Thames & Hudson, New York.

Bednarik, R. G. 1990a. On the cognitive development of hominids. *Man and Environment* 15(2): 1–7.

Bednarik, R. G. 1990b. More to Palaeolithic females than meets the eye. *Rock Art Research* 7(2): 133–137.

Bednarik, R. G. 1994a. A taphonomy of palaeoart. *Antiquity* 68(258): 68–74.

Bednarik, R. G. 1994b. Art origins. *Anthropos* 89: 169–180.

Bednarik, R. G. 1998. The 'australopithecine' cobble from Makapansgat, South Africa. *South African Archaeological Bulletin* 53: 4–8.

Bednarik, R. G. 2001. The eye is not as clever as it thinks it is. *Rock Art Research* 18(2): 82–83.

Bednarik, R. G. 2003a. A figurine from the African Acheulian. *Current Anthropology* 44(3): 405–413.

Bednarik, R. G. 2003b. The earliest evidence of palaeoart. *Rock Art Research* 20(2): 89–135.

Bednarik, R. G. 2006. The methodology of examining very early engravings. *Rock Art Research* 23(1): 125–128.

Bednarik, R. G. 2007. *Rock art science: the scientific study of palaeoart*. Aryan Books International, New Delhi.

Bednarik, R. G. 2010. 'Aurignacians' and the cave bear. In I. Fridrichová-Sýkorová (ed.), *Ecce Homo: in memoriam Jan Fridrich*, pp. 11–20. Knižnice České společnosti archeologické, o.p.s., Vydala Agentura Krigl, Prague.

Bednarik, R. G. 2011. *The human condition*. Springer, New York.

Bednarik, R. G. 2013a. *Creating the human past: an epistemology of Pleistocene archaeology*. Archaeopress, Oxford.

Bednarik, R. G. 2013b. Pleistocene Palaeoart of Africa. *Arts* 2(1): 6–34.

Bednarik, R. G. 2014. Exograms. *Rock Art Research* 31(1): 47–62.

Bednarik, R. G. 2015. Hominin mind and creativity. In B. Půtová and V. Soukup (eds), *The genesis of creativity and the origin of the human mind*, pp. 35–44. Department of Culturology, The Faculty of Arts, Charles University. Karolinum Press, Prague.

Bednarik, R. G. 2016a. Rock art and pareidolia. *Rock Art Research* 33(2): 167–181.

Bednarik, R. G. (ed.) 2016b. *Understanding human behavior: theories, patterns and developments*. Nova Biomedical, New York.

Bednarik, R. G. 2017a. *Myths about rock art*. Archaeopress Archaeology, Oxford.

Bednarik, R. G. 2017b. *Palaeoart of the Ice Age*. Cambridge Scholars Publishing, Newcastle upon Tyne.

Bednarik, R. G. and P. A. Helvenston 2012. The nexus between neurodegeneration and advanced cognitive abilities. *Anthropos* 107(2): 511–528.

Berlant, T. and T. Wynn 2018a. *First sculpture: handaxe to figure stone, January 27, 2018 – April 29, 2018; Exhibition – Nasher Sculpture Center*, viewed 23 Dec. 2017, *http://www.nashersculpturecenter.org/art/exhibitions/exhibition?id=535*.

Berlant, T. and T. Wynn 2018b. *First sculpture: handaxe to figure stone*, Nasher Sculpture Centre, Dallas, U.S.A.

Bona, S., A. Herbert, C. Toneatto, J. Silvanto and Z. Cattaneo 2014. The causal role of the lateral occipital complex in visual mirror symmetry detection and grouping: an fMRI-guided TMS study. *Cortex* 51: 46–55.

Bordes, F. and D. de Sonneville-Bordes 1954. Présence probable de jaspe de Fontmaure dans l'Aurignacien V de Laugerie-Haute. *Bulletin de la Société préhistorique française* 51(1): 67–68.

Borel, A., R. Cornette and M. Baylac 2017. Stone tool forms and functions: a morphometric analysis of modern humans' stone tools from Song Terus Cave (Java, Indonesia). *Archaeometry* 59: 455–471. doi: 10.1111/arcm.12264. [RW]

Boucher de Perthes, J. 1846. *Antiquités celtiques et antédiluviennes*. Treuttel et Würtz, Paris.

Brandl, E. 1972. Thylacine depictions in Arnhem Land rock paintings. *Archaeology and Physical Anthropology in Oceania* 7: 24–30.

Caramazza, A. and B. Z. Mahon 2003. The organization of conceptual knowledge: the evidence from category-specific semantic deficits. *Trends in Cognitive Sciences* 7(8): 354–361.

Consens, M. 2006. Between artefacts and egofacts: the power of assigning names. *Rock Art Research* 23(1): 79–83.

Dharvent, I. 1906. Note sur un silex taillé représentant un ours, *Bulletin de la Société préhistorique française* 3(1): 36–37.

Dobrez, L. 2013. Perception of depicted motion. *Arts* 2(4): 383–446; accessed 23 Dec. 2017.

Dobrez, L. and P. Dobrez 2013. Rock art animals in profile: visual recognition and the principles of canonical form. *Rock Art Research* 30(1): 75–90.

Duchaine, B, and G. Yovel 2015. A revised neural framework for face processing. *Annual Review of Vision Science* 1: 393–416. [JBH]

Feliks, J. 1998. The impact of fossils on the development of visual representation. *Rock Art Research* 15(2): 109–134.

Gamble, C. 2001. The peopling of Europe, 700 000–400 000 years before the present. In B. W. Cunliffe (ed.), *The Oxford illustrated history of prehistoric Europe*, pp. 5–41. Oxford University Press, Oxford.

Gamble, C. 2008. Breaking the time barrier, *Geoscientist* 18(8); *http://www.geolsoc.org.uk/gsl/cache/offonce/geoscientist/features/page4162.html*, accessed 2 Jan. 2010.

Gamble, C., J. Gowlett and R. Dunbar 2011. The social brain and the shape of the Palaeolithic. *Cambridge Archaeological Journal* 21(1): 115–135. [DH]

Gerlach, C., I. Law, A. Gade and O. B. Paulson 2000. Categorization and category effects in normal object recognition: a PET study. *Neuropsychologia* 38(13): 1693–1703.

Gowlett, J., C. Gamble and R. Dunbar 2012. Human evolution and the archaeology of the social brain. *Current Anthropology* 53(6): 693–722. [DH]

Groenen, M. 1994. *Pour une histoire de la préhistoire: le Paléolithique*. Editions J. Millon, Grenoble.

Hadjikhani, N., K. Kveraga, P. Naik and S. P. Ahlfors 2009. Early (M170) activation of face-specific cortex by face-like objects. *NeuroReport* 20(4): 403–407.

Harrod, J. B. 1992. Two million years ago: the origins of art and symbol. *Continuum* 2(1): 4–29. [JBH]

Harrod, J. B. 2010. Four memes in the two million year evolution of symbol, metaphor and myth. Radcliffe Exploratory Seminar on Comparative Mythology: Deep Reconstruction. Radcliffe Institute for Advanced Study, Harvard University in conjunction with 4th Annual Conference, International Association for Comparative Mythology, 6–7 October 2010. [JBH]

Harrod, J. B. 2013. Symbolic behavior (palaeoart) at two million years ago: the Olduvai Gorge FLK North pecked cobble — The earliest artwork in human evolution. Session 'Archaeology and the science of rock art', IFRAO International Rock Art Congress 2013 (May 26–May 31). Albuquerque, U.S.A. [JBH]

Harrod, J. 2014. Palaeoart at two million years ago? A review of the evidence. *Arts* 3(1): 135–155; doi:10.3390/arts3010135; accessed 23 Dec. 2017.

Hodgson, D. 2010. Ambiguity, perception, and the first representations. In K. Sachs-Hombach and J. R. J. Schirra (eds), *Origins of pictures*, pp. 401–423. Herbert Von Halem Verlag, Köln. [DH]

Hérisson, D., J. Airvaux, A. Lenoble, D. Richter, É. Claud and J. Primault 2012. The Acheulean site of 'La Grande Vallée' at Colombiers (Vienne, France): stratigraphy, formation processes, preliminary dating and lithic industries. *PALEO [Online]* 23: 1–20.

Higham, T., K. Douka, R. Wood, C. B. Ramsey, F. Brock and L. Basell 2014. The timing and spatiotemporal patterning of Neanderthal disappearance. *Nature* 512(7514): 306–309.

Hiscock, P. 2014. Learning in lithic landscapes: a reconsideration of the hominid 'toolmaking' niche. *Biological Theory* 9(1): 27–41.

Hodgson, D. 2003a. Seeing the 'unseen': fragmented cues and the implicit in Palaeolithic art. *Cambridge Archaeological Journal* 13(1): 97–106.

Hodgson, D. 2003b. The biological foundations of Upper Palaeolithic art: stimulus, percept and representational imperatives. *Rock Art Research* 20(1): 3–22.

Hodgson, D. 2006. Neurovisual theory, the visuo-motor system and Pleistocene palaeoart. In *UISPP XV International congress in Lisbon, Portugal*, pp. 49–55.

Hodgson, D. and P. A. Helvenston 2006. The emergence of the representation of animals in palaeoart: insights from evolution and the cognitive, limbic and visual systems of the human brain. *Rock Art Research* 23(1): 3–40.

Hodgson, D. and P. A. Helvenston 2010. The neuropsychological basis of rock art: hyperimagery and its significance for understanding the archaeological record. In K. Hardy (ed.), *Archaeological Invisibility and Forgotten Knowledge. Conference proceedings, University of Łódź, Poland, 5th–7th September 2007*. BAR International Series 2183, Archaeopress, Oxford.

Hoffmann, D. L., C. D. Standish, M. García-Diez, P. B. Pettitt, J. A. Milton, J. Zilhão, J. J. Alcolea-González, P. Cantalejo-Duarte, H. Collado, R. de Balbín, M. Lorblanchet, J. Ramos-Muñoz, G.-C. Weniger and A. W. G. Pike 2018. U-Th dating of carbonate crusts reveals Neandertal origin of Iberian cave art. *Science* 359(6378): 912–915. [JBH]

Inizan, M. L., M. Reduron-Ballinger, H. Roche, J. Tixier and J. Féblot-Augustins (eds) 1999. *Technology and terminology of knapped stone: followed by a multilingual vocabulary – Arabic, English, French, German, Greek, Italian, Portuguese, Spanish*. CREP, Nanterre.

Juritzky, A. 1953. *Prehistoric man as an artist*. Nederlandsch Museum Voor Anthropologie, Netherlands.

Katzman, J. L. 2010. A small handaxe from Fontmaure (Vienne). *Aggsbach's Paleolithic Blog, http://www.aggsbach.de/2010/07/a-small-handaxe-from-fontmaure-vienne/*, accessed 7 Nov. 2017.

Lewis, D. 2017. Megafauna identification for dummies: Arnhem Land and Kimberley 'megafauna' paintings. *Rock Art Research* 34(1): 82–99.

Lubinski, P. M., K. Terry and P. T. McCutcheon 2014. Comparative methods for distinguishing flakes from geofacts: a case study from the Wenas Creek mammoth site. *Journal of Archaeological Science* 52: 308–320. [RGB]

Made, H. van der 2002. A bead from the Mousterian site at Fontmaure, France. *Rock Art Research* 19(2): 135–136.

Marquet, J.-C. 2013. Les manifestations à caractère symbolique du site de La Roche-Cotard à Langeais Sont-Elles dues à l'homme de Néandertal? *Mémoires de l'Académie des Sciences, Arts et Belles-Lettres de Touraine* 26: 1–21. [JBH]

Marquet, J.-C. and M. Lorblanchet 2000. Le 'masque' moustérien de la Roche-Cotard, Langeais (Indre-et-Loire) / The Mousterian 'mask' of La Roche-Cotard site, Langeais (Indre-et-Loire). *Paléo* 12: 325–338. [JBH]

Matthes, W. 1969. *Eiszeitkunst im Nordseeraum*. Niederelbe-Verlag Otterndorfer Verlagsdruckerei H. Huster KG., Otterndorf NE.

McNabb, J. 2012. The importance of conveying visual information in Acheulean society. The background to the visual display hypothesis. *Human Origins (Archaeopress)* 1: 1–23.

Montelle, Y.-P. 2009. Application of forensic methods to rock art investigations — a proposal. *Rock Art Research* 26(1): 7–13. [RGB]

Montrot, E. 1937. Station paléolithique de Fontmore (Vienne). *Bulletin de la Société préhistorique française* 34(4): 193–213.

Newman, J. 1994. The effects of distance on lithic material reduction technology. *Journal of Field Archaeology* 21(4): 491. [BW]

Newton, W. M. 1912, *Light on Palaeolithic flint figures and Boucher de Perthes*, London.

Oakley, K. P. 1973. Fossils collected by the earlier Palaeolithic men. In *Mélanges de préhistoire, d'archéocivilization et d'ethnologie offerts à André Varagnac*, pp. 581–584. Serpen, Paris.

Odell, G. H. 2001. Stone tool research at the end of the millennium: classification, function, and behavior. *Journal of Archaeological Research* 9 (1): 45-100 [RW].

Okada, T., S. Tanaka, T. Nakai, S. Nishizawa, T. Inui and N. Sadato 2000. Naming of animals and tools: a functional magnetic resonance imaging study of categorical differences in the human brain areas commonly used for naming visually presented objects. *Neuroscience Letters* 296(1): 33–36.

Perani, D., S. F. Cappa, V. Bettinardi, S. Bressi, M. Gorno-Tempini and M. Matarrese 1995. Different neural systems for the recognition of animals and man-made tools. *NeuroReport* 6(12): 1637–1641.

Pradel, L. 1942. Bifaces de formes atypiques, en particulier 'bifaces à arête' provenant du gisement de Fontmaure (Vienne). *Bulletin de la Société préhistorique française* 39(5): 156–159.

Pradel, L. 1944. Micro-nucléi du gisement acheuléo-moustérien de Fontmaure (Vienne). *Bulletin de la Société préhistorique française* 41(1): 23–26.

Pradel, L. 1945. Le gisement de Moustérien typique final à influences paléolithiques supérieures de Fontmaure (Commune de Vellèches, Vienne). *Bulletin de la Société préhistorique française* 42(4): 84–93.

Pradel, L. 1947. Foyer du gisement moustérien typique à influences paléolithiques supérieures de Fontmaure (Vienne). *Bulletin de la Société préhistorique française* 44(1): 28–30.

Pradel, L. 1949. Stratigraphie des gisements moustériens de Fontmaure (Vienne). *Bulletin de la Société préhistorique française* 46(5): 219–221.

Pradel, L. 1957. Intention et fractures moustériennes. *Bulletin de la Société préhistorique française* 54(7): 382–386.

Pradel, L. 1962. Abbevillien en couche à Fontmaure (commune de Vellèches, Vienne). *Bulletin de la Société préhistorique française* 59(11): 803–809.

Pradel, L. 1963. La pointe moustérienne. *Bulletin de la Société préhistorique française* 60(9): 569–581.

Pradel, L. 1965a. Choix du matériau et destination de l'outil'. *Bulletin de la Société préhistorique française* 62(8): 275–276.

Pradel, L. 1965b. L'outillage au Paléolithique. *Bulletin de la*

Société préhistorique française 62(1): 3–21.

Pradel, L. 1966a. Classification des burins avec notation chiffrée. *Bulletin de la Société préhistorique française* 63(3): 485–500.

Pradel, L. 1966b. Pièces moustériennes à bord fracturé et aminci. *Bulletin de la Société préhistorique française* 63(3): 112–116.

Pradel, L. 1967. *Les gisements de Fontmaure. Paléolithique inférieur, Moustérien de tradition acheuléenne, Mousterien final à lames*. Institut d'Art Préhistorique de la Faculté des Lettres et Sciences Humaines de Toulouse, Toulouse. [MV]

Pradel, L. 1971. Une pierre-figure du Mousterien a bifaces de Fontmaure. *Bulletin Amis du Grand-Pressigny* 22: 16.

Pradel, L. 1973. Stigmates d'accommodation et d'usage sur les burins moustériens de Fontmaure. *Bulletin de la Société préhistorique française* 70(1): 26–32.

Pradel, L. and C. Tourenq 1967. Les matériaux de Fontmaure. Choix des paléolithiques et mesures des caractères physiques. *Bulletin de la Société préhistorique française* 64(3): 81–85.

Pradel, L. and C. Tourenq 1972. Choix des matériaux par les paléolithiques de Fontmaure et essais de fragmentation dynamique. *Bulletin de la Société préhistorique française* 69(1): 12.

Regnault, F. 1935. Essai sur les pierres figures. *Bulletin de la Société préhistorique française* 32(2): 142–145.

Rilling, J. K. 2014. Comparative primate neuroimaging: insights into human brain evolution. *Trends in Cognitive Sciences* 18(1): 46–55. [DH]

Rots, V. 2009. The functional analysis of the Mousterian and Micoquian assemblages of Sesselfelsgrotte, Germany: aspects of tool use and hafting in the European Late Middle Palaeolithic. *Quartär* 56: 37–66. [BW]

Searle, J. R. 1995. *The construction of social reality*. Allen Lane, London.

Shea, J. J. 2014. Sink the Mousterian? Named stone tool industries (NASTIES) as obstacles to investigating hominin evolutionary relationships in the Later Middle Paleolithic Levant. *Quaternary International* 350: 169–179.

Sinha, P., B. Balas, Y. Ostrovsky and R. Russell 2006. Face recognition by humans: nineteen results all computer vision researchers should know about. *Proceedings of the IEEE* 94(11): 1948–1962.

Stout, D., E. Hecht, N. Khreisheh, B. Bradley and T. Chaminade 2015. Cognitive demands of Lower Paleolithic toolmaking. *PLOS ONE* 10(4): 1–18.

Thieullen, A. 1901. Deuxieme etude sur les pierres-figures a retouches intentionnelles a l'epoque du creusement des vallees quaternaires. *Bulletins de la Société d'anthropologie de Paris* 2(1): 166–188.

Thieullen, A 1907. Le critérium. *Bulletin de la Société préhistorique française* 4(3): 173–179.

Thieullen, A., P. Raymond and M. Hervé 1909. Etudes prehistoriques le Diluvium. In *Conférence sur les pierres-figures*. Vigot Frères, Paris.

Voss, J. L., K. D. Federmeier and K. A. Paller 2011. The potato chip really does look like Elvis! Neural hallmarks of conceptual processing associated with finding novel shapes subjectively meaningful. *Cerebral Cortex 22*(10): 2354–2364. [JBH]

Vyshedskiy, A. 2014 (2nd edn). *On the origin of the human mind*. MobileReference, http://mobilereference.com/mind/online/index.htm. [DH]

Watson, B. 2011. The eyes have it: human perception and anthropomorphic faces in world rock art. *Antiquity* 85(327): 87–98.

Wilson, R. J. 2010, Cultural cobbles or a load of cobblers, *http://www.academia.edu/1915841/Cultural_Cobbles_or_a_load_of_old_*cobblers, accessed 23 Dec. 2017.

Zutovski, K. and R. Barkai 2016. The use of elephant bones for making Acheulian handaxes: a fresh look at old bones. *Quaternary International B* 406: 227–238. [DH]