

KEYNOTE PAPER

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TOUCHING LANGUAGE ORIGINS AGAIN: HOW WORKED BONE SHAPED OUR UNDERSTANDING

Abstract

In 1986 Bill Noble and I began to talk to each other about the origins of language. We articulated the importance of bone tools as the best marker of the imposition of form on artefacts. Some people have said that such an indication of mental representation of form can only follow from the emergence of language. I will review the arguments we produced then and show some of the evidence that strengthened our belief that they were important. I will then put them in the context of the vastly expanded knowledge of the archaeology of modern human behaviour over the last 30 years. Some of the arguments have been ignored, others have been overtaken by new finds, but the theoretical position also raised questions that have not been adequately answered. I will conclude by emphasising the importance of bone tools for understanding that theory and discussing some of the ways in which the theoretical position has moved on. Insights from studying bone tools opened up understanding of modern human cognition but we need more complex models of cognitive evolution.

Initial arguments

When Bill Noble and I began to look at areas of overlap between his interests as a psychologist of perception, particularly hearing, and my interests in the archaeology of fisher-gatherer-hunter peoples in Europe and Australia, we found that there was a fruitful intellectual area to explore in the question of language origins. Prior to our collaboration there had been much work concentrating on syntax as the important defining element of language, given the salience of Chomsky's linguistics in the 1960s (Holloway, 1969), on the anatomical conditions for speech production in humans and Neanderthals (Lieberman, 1984), on the features of the brain that might identify the language capabilities of early hominins (Falk, 1980; Holloway, 1983) and

on the possible archaeological signatures (Isaac, 1976; Marshack, 1976; White, 1985). There was also an active engagement with primate communication in the laboratory (Terrace, 1979; Premack and Premack, 1983; Gardner and Gardner, 1985; Savage-Rumbaugh et al., 1986), but less-so in the wild (Marler and Mitani, 1988), and arguments by comparison with stages of human infant language acquisition (Parker and Gibson, 1979; Wynn, 1979).

Our project was to identify the impact of language on the human mind – what I would now call cognition – which was Noble's primary contribution, and how language could be identified through the products of the archaeological record, which was

my job. We argued that the distinctive feature of humans, when compared with other animals, was in our reflective awareness that gave our ancestors a capacity to talk about what they perceived. Vervet monkeys, and many other animals, such as chickens (Evans et al., 1993), call attention to a predator in the air above them (Seyfarth et al., 1980), but no one has claimed that they can talk about the eagle they saw yesterday or the vulture they might see tomorrow. That reflective capacity, we argued, could have emerged through the practice of depiction (Davidson and Noble, 1989), and we acknowledged important work in the origins of depiction (Davis, 1986). The key to the identification of the evolutionary emergence of language, then, would be to find symbols in the archaeological record. Our identification of this issue happened at about the same time as others were looking at the question (Chase and Dibble, 1987), but we thought that we brought deeper knowledge of the issue in the psychological literature (Gibson, 1979).

In a later paper we were careful to define language as “the symbolic use of communicative signs; the use of signs in communicative settings to engage in acts of reference” (Noble and Davidson, 1991:224). We had already noticed that very few people concerned with language origins had defined what they meant by language – and that continues to be the case. Our use of a remarkably uncontroversial definition attracted a lot of criticism, principally because we did not include syntax, despite the fact that most definitions are very similar even when emphasizing syntax (e.g., Crystal, 1987). The meaning of the word symbol also has its problems, particularly in religious communities where an earlier meaning has been corrupted to claim that symbols are defined by religious beliefs. For most languages, the meaning of the word “symbols” as “signs that are both arbitrary and conventional” is closer to Peirce’s semiotics, which spoke of signs that “represent their objects, independently alike of any resemblance or any real connection [i.e., arbitrary], because dispositions or factitious habits of their interpreters [i.e., conventions] insure their being so understood” (quoted in Nöth, 2010). Much

greater sophistication in the semiotic interpretation of the archaeological record has been developed since then (Preucel, 2006; Davidson, 2013a; Culley, 2016; Kissel and Fuentes, 2017).

In the original paper we were already concerned that it was through tools that symbolic construction might be most readily identified. To that end, we criticised a then short list of archaeological items said to have symbolic meanings (see also Davidson, 1989), and field inspections revealed that some of the others fell short, too (Davidson, 1990, 1991). Several objects said to have symbolic functions did so because no one could imagine a utilitarian reason for their shaping (Edwards, 1978). What emerged from these studies were two perceptions. The first perception was that there was a fundamental question of the extent of “deliberate” shaping of stone artefacts and whether that could be determined by the repeated patterning of the forms as found (Dibble, 1989). Without the repeated patterning, it would be very difficult to establish that there was a convention. The second perception was that intentional shaping of artefacts may be better revealed by looking at bone artefacts, because, for later periods, the shaping was relatively unconstrained by the nature of the mechanics needed to shape them or the outcomes of repeated use.

The main difficulty with stone artefacts arises because there are two possible constraints on the production of stone artefact form that could lead to repeated patterning, but which do not arise from a convention that carries meaning. The first constraint is the mechanical requirements of knapping. All knappers need to maintain platform angles, areas of high mass and the appropriate force, and the combination of these three requirements leads to similarities of the forms that will be produced. This has been demonstrated in ingenious experiments that did not preference the location of removals from cores and randomised the choice of platforms and areas of mass from which flakes could be removed (Moore and Perston, 2016). The other constraint arises because habits of knappers tend to approach the mechanical problems of flaking in ways they have learned. This would produce similarities that in

style studies are called "isochrestic" (Sackett, 1985; Wiessner, 1985).

One attempt to talk about this issue was the suggestion that modern humans with modern cognition made tools with "imposed form" (Mellars, 1989:347), saying: "The suggestion, in essence, is that the majority (though by no means all) Upper Palaeolithic tools appear to reflect a much more obvious attempt to modify the original shapes of the flake or blade blanks in order to achieve some specific, sharply defined form. In other words, shaping of the tools usually involves the removal of large areas of the original flake or blade blanks, so that the final form or the tool bears little if any direct relationship to the shape of the original blank chosen." This attempt at a definition was not easy to operationalise, though it did seem possible to point to forms – such as backed artefacts (see the arguments in Davidson and Noble, 1993) – where the modifications did not affect the working edge. In identifying the weaknesses of the standard story of stone artefact progression, we pointed to industries with: "distinctive artefacts, confined to relatively small regions and narrow time periods, shaped in ways that cannot be related either to the technology of their production (as handaxes can) or to the modification of the working edge as a result of the constraints imposed by the technology of use (as scrapers and denticulates can)" (Davidson and Noble, 1993:380).

In this case, there are many examples of early bone tools with modified working edges, such as the choppers from Bilzingsleben (illustrated in Noble and Davidson, 1996) and, indeed, many of the bone retouchers discussed at the Hannover conference (e.g., van Kolfschoten et al., 2015). But from the beginning of the Upper Palaeolithic there were ground and polished bone projectile tips where the makers controlled almost all aspects of the form of the artefact, including the initial idea, and these appear in Europe at the same time as bones, ivory and antlers modified for non-functional reasons, such as art (Conard, 2003). So there was the germ of an idea in the concept of "imposed form" that could be operationalised, but only with a clear vision of the role of mechanical constraints.

The concept of "imposed form" was still not problem-free, and still is not. It was used extensively in a more recent discussion of modern human behaviour (Henshilwood and Marean, 2003), but the authors did not respond to the challenge of whether the form of Acheulean handaxes was imposed (Davidson, 2003). If the form of handaxes was imposed, and the logic of the importance of imposed form is followed, modern human behaviour might be traced back to nearly 2 million years ago (Asfaw et al., 1992; Sánchez-Yustos et al., 2017). That question needs to be resolved, and I have attempted such a resolution (Davidson, 2002), admittedly without winning over all specialists on the Acheulean (but for a different approach that recognises the problem see Corbey et al., 2016).

This history demonstrates that the recognition of symbolic communication may involve understanding the symbolic mental representation of artefacts such that what is at issue is not just language origins, but cognitive evolution. In reaching that position, bone tools are revealed as of great importance for understanding when humans became capable of creating artefacts relatively free from the constraints of the mechanics of raw material.

I will turn to cognitive evolution in the final section of this paper, but the other fundamental observation is that symbolic mental representation could be found in other sorts of artefacts and the most remarkable of those are the watercraft (Davidson and Noble, 1992) necessary for people to cross from Sunda, the continental landmass that is the normal condition for what is Island Southeast Asia, to Sahul, the continental landmass that is the normal condition of the islands of Australia and New Guinea that are only separated during brief interglacial high sea-levels. One of the impacts of this observation was to force a shift of focus away from Europe and on to Sahul and the question of why Australia and the Americas seem to be so late in joining the archaeological record (Davidson, 2013b). We revisited that argument in 2010 (Davidson, 2010b), and it has been addressed by others (O'Connell et al., 2010; Kealy et al., 2015). Further important arguments about the complexity of conceptualisation

of artefacts and their construction have addressed heat-treatment of toolstone (Brown et al. 2009) and the production of compound adhesives using ochre (Wadley et al., 2004).

The lesson of this history is that by concentrating on communication using symbols, we isolated characteristics of the archaeological record that, while they had been understood for many years, had not entered into discussion of the sorts of cognitive abilities of hominins. In doing so we pointed to the sorts of mental representations that were needed for these achievements (Balme et al., 2009; Davidson, 2010a). But that was not enough.

Expansions of knowledge over last 30 years

It is important to remember that one of the reasons the empirical basis for our argument seems out of date is precisely because the discoveries of the last 30 years have had the effect of fundamentally altering the picture. These discoveries only highlight the importance of developing more appropriate theoretical models of the evolution of cognition.

What made the huge empirical difference was the succession of startling discoveries from Blombos in the Western Cape, South Africa, beginning with bone artefacts (Henshilwood and Sealy, 1997), which, to some extent, confirmed what was already known from Klasies River (Singer and Wymer, 1982). Importantly, the Blombos bone tool finds, from the very beginning, included artefacts that were intentionally, fully shaped independent of their immediate use, as well as others that were expedient tools with modified working ends, but otherwise relatively unshaped. And the Blombos bone points were fully 30,000 years older than anything known from Europe. Distinctions between accidentally pointed osseous fragments, expediently modified tools and intentionally shaped tools are fundamental to sorting through the issues about the role of bone tools in human evolution.

One great difference is the changed importance given to beads in the archaeological record. It is fair to say that 30 years ago there were relatively few

people studying beads (but for an honourable exception see White, 1989), and this is partly because they were widely seen as merely decorative and of no importance. But this changed with the recognition of early beads in Australia before 30,000 years ago (Morse, 1993), the discovery of early beads in Turkey and Lebanon before 40,000 years ago (Kuhn et al., 2001), the discovery of beads from Blombos in southern Africa well-dated to 75,600 thousand years ago (Henshilwood et al., 2004), the recognition that beads already known from Qafzeh Cave in Israel were 92,000 years old (Bar-Yosef Mayer, 2005), and subsequent reassessment of other previously excavated examples around the Mediterranean that may be more than 100,000 years old (Vanhaeren et al., 2006). In the explosion of interest in beads and pendants dated to the late Pleistocene, some of the studies have been methodological (White, 2007), some concerned with finds from individual sites (d'Errico et al., 2005), others with comparisons over a wide geographic area (Vanhaeren and d'Errico, 2006; Vanhaeren et al., 2006), or with theoretical arguments developed to fit scenarios relevant to these sorts of finds (Balme and Morse, 2006; Kuhn and Stiner, 2007, 2014). Interest in beads has depended on the historical contexts of the study as well as differences in approaches (Moro Abadía and Nowell, 2015). New finds continue to be added from Timor l'Este dating back to 37,000 years ago (Langley and O'Connor, 2016) and at 33,000 years ago in northern China (Wei et al., 2016). A comprehensive review of evidence for early beads and ornaments shows that they were widespread across the world with the earliest presence of modern humans (Wei et al., 2016). Some, however, resist the claim that these are beads and suggest instead that they were materials used for counting – something that could not be done without symbolic thinking (Coolidge and Overmann, 2012; Overmann, 2016). Either way, their abundance in sites around the world and their scarcity in early sites suggests that interpretations involving some sort of cognitive change are appropriate. Noble and I (Davidson and Noble, 1992) suggested that once language emerged, the use of beads as markers of members of an in-group would be selectively advan-



Figure 1 Simon Parfitt (right, front) showing the sabre-toothed cat (*Homotherium latidens*) humerus from Schöningen, which had been used as a retoucher. Also present are (from left to right) Jarod Hutson, Thomas Terberger, Marie-Anne Julien, Sandrine Costamagno and Petr Neruda. (Photo by Iain Davidson)

tageous given the potential for misunderstanding once meanings were conventionalised.

Bone tools had an important role in getting the argument to its present state. Almost all of the work referred to, including all my work with Noble, has sought explanations about cognition in a rather *ad hoc* manner. As data and argument expand, they demand the development of cognitive models that are adequate to account for cognitive evolution from an ape-like common ancestor to modern humans and that such models be testable using archaeological data. I have discussed recent attempts at theorising in several publications and the reader is referred there for further argument (Davidson 2010a, 2013a, 2014, 2016; Barnard et al. 2016). One of the points that emerges from theorising is that, rather than through the discussion of the se-

miotic status of finished or discarded objects, the evolutionary status of some cognitive processes are best understood through an analysis of the processes of manufacture or/and use of such artefacts. This is not the place to go into detail about such models, rather I want to end with some speculations that arose from discussions at the Hannover conference, speculations that might be related to one model of the sequence of cognitive evolution (Barnard et al., 2016).

Some final remarks

Much of the discussion at the conference was about those remarkable bone tools known as retouchers (**Figure 1**). These began to be important in Marine

Isotope Stage 9 (possibly earlier) at both ends of the Mediterranean, in Bolomor Cave in the west and in Qesem Cave in the east (Blasco et al., 2013), for instance. Others discussed the typology and context of the various finds, though they seem, generally, to share typological characteristics that are a product of use, rather than prior shaping. Nevertheless, Blasco and her colleagues point out that the Bolomor example was shaped “at the edge opposite the active area” consistent with the criterion Noble and I defined to identify imposed form (Davidson and Noble, 1993), but considerably earlier than the backed artefacts that prompted our definition.

Here, I want to elaborate on something that seemed to emerge in discussion before stalling on the minutiae of typological nomenclature. My intuitive understanding of the evidence as presented at the conference was that bone retouchers represented an important new technology for retouching stone tools. Blasco et al. (2013) suggest they may just have been an improvement on retouching materials used earlier, whether these were stone or wood. One possibility mentioned at the conference was that they appear with Quina scrapers – which we might call steep edged scrapers to avoid the parochialisms of typologists. At Qesem, several of these steep scrapers were used for hide preparation (Lemorini et al., 2016), and a linked series of arguments might run as follows: 1) use of bone retouchers permitted improved retouch of steep scrapers; 2) better production of steep scrapers permitted better preparation of hides; 3) more consistent production of well-scraped hides made the use of animal skins better for clothing; 4) better clothing allowed more certain adjustment and perhaps adaptation to cooler climates.

A sequence of this sort follows a pattern that is becoming familiar from other parts of the archaeological record: significant outcomes were a product of hominins recognising affordances that may have been there for a long time, and once that achievement was made, a new niche was constructed (Davidson, in press). We take all such niche constructions for granted; yet, they were achievements. This pattern for bone retouchers fits into a broader

set of affordance discoveries and niche constructions that could be something like this:

- Previous knapping events can be a source of more tools or of new cores (Davidson and McGrew, 2005)
- The bones in the carcass can be used as tools (as suggested by Jarod Hutson and others at the Hannover conference)
- The skin on the meat can be a tool for carrying
- The skin that is used for carrying can keep you warm
- The stone to cut the wood can be resharpened with a bone
- The resharpened flake can be fashioned into a scraper that can clean the skin (as suggested by Avi Gopher)
- A flake can be combined with a bone (and perhaps a strip of skin) to make a more efficient knife (Barnard et al., 2016)

The point here is that we can associate some of these elements with particular elements of the Barnard model of cognitive evolution. We have already outlined the need to recognise the concept of a “part” before parts obtained from different sources can be combined (Barnard et al., 2016; Davidson, in press). The challenge is to fit all of these elements into a scheme of evolution of hominin cognition. But that is another story.

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