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The symmetry of Acheulean handaxes and cognitive evolution

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ABSTRACT

The significance of symmetry to understanding the cognitive profile of the hominins responsible for making Acheulean handaxes has been contentious. Recent finds and analytical techniques have allowed a reassessment of the relevance of symmetry to evaluating the cognition of archaic humans by highlighting differences in the shape of Early to Late Acheulean bifaces. In this paper, I critically examine issues regarding the symmetry of handaxes as well as models of cognitive evolution that refer to the structure of Acheulean bifaces.

1. Introduction

The extent to which the symmetry of Acheulean bifaces can clarify issues pertaining to cognitive evolution has been controversial. One side of the debate claims that symmetry can be explained by functional constraints or contends that no discernible trend towards symmetrical tools or refinement of shape is evident (see, for example, McPherron, 2009; McNabb, 2013). The other side of the argument maintains that not only is symmetry important to understanding human behaviour, but this becomes increasingly prominent during later periods with the advent of increasing symmetry and thinner, more extensively, worked handaxes (Goren-Inbar and Sharon, 1999, 2006; Klein, 2000; Wynn, 2002; Stout, 2011; Shipton, 2013). Both sides of the debate present evidence for their respective positions, although a growing number of studies support a trend towards symmetry, as the present paper will demonstrate. Evidence will therefore be presented demonstrating that symmetry is not only an important feature of Acheulean handaxes but can provide crucial information as to the timeline of cognitive evolution.

One approach to this issue concerns what is referred to as the "display hypothesis" whereby material culture is regarded as foremost in the lifeways of late Middle Pleistocene hominins due to the possibility that language was not yet fully dominant (McNabb, 2012; Cole, 2012)—though some claim language may have been relatively advanced in *Homo heidelbergensis* (Shipton, 2013). Thus, Acheulean tools became a *potential* focus for socio-cultural concern in the sense a person's group status might be enhanced by producing a well-shaped handaxe. However, according to McNabb et al. (2004), Acheulean handaxes did not serve as a proxy for socio-cultural engagement, rather they helped "objectify the surrounding world and the others of your kind within it". Paradoxically, this contradicts the display hypothesis as the shape of Acheulean handaxes, including the contested symmetry, did not therefore constitute evidence of social signalling. This conclusion is partly premised on the assumption that there was no increase in symmetry over time and only a few isolated handaxes show a concern for such a feature, which is better explained by coincidental effects (McNabb, 2013). In sum, the symmetry of Acheulean tools is deemed to be rare or incidental with the majority of tools showing little to no such preference leading to the conclusion that hominins only had a general idea of a tool i.e., a handaxe or cleaver, with little concern for shape as such.

By way of contrast, a number of studies found a preference for symmetry did, in fact, occur in specific Acheulean lineages (Saragusti et al., 2005; Grosman et al., 2008). In addition, more recent studies suggest that symmetry continues to be important to understanding Acheulean handaxes (Couzens, 2012; Beyene et al., 2013; Beyene, 2013). Moreover, a number of earlier studies suggest that a concern for symmetry did exist during the later Acheulean (Lycett, 2008; Machin et al., 2007; Wynn, 2002). Consequently, previous analytical approaches, such as the by-eye judgements of McNabb et al. (2004), which measured absolute symmetry, may have actually underestimated the frequency and extent of symmetry (Underhill, 2007; Couzens, 2012).

2. Symmetrical handaxes: tendencies and trends

Contrary to McNabb et al.'s (2004) findings, digitally based scanning of Acheulean bifaces by Couzens (2012) found the incidence of symmetry to be greater in handaxes from Cave of Hearths compared to the

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much earlier Rietputs bifaces; though Couzens regards the observed symmetry as deriving from functional constraints despite finding that the bifaces became thinner over time. Nevertheless, the increase in symmetry corresponds with the trend towards more refined standardised tools from the Early to Late Acheulean (Klein, 2000; Goren-Inbar and Sharon, 1999; Goren-Inbar and Sharon, 2006).

A separate investigation at the Late Acheulean site of Patpara, Son Valley, India, by Shipton et al. (2013) using 3D scanning techniques, also found distinct differences in the refinement, standardisation and symmetry of handaxes compared to concurrent and earlier sites. The authors interpreted this trend as arising from increased cognitive sophistication. This study concluded that the skills employed to make Acheulean handaxes overlapped with those for making Levallois tools thereby creating a seamless transition from one tradition to the other. Similar studies of Acheulean sites in the Levant employing 3D scanning techniques also reveal a tendency towards increased refinement and symmetry from an earlier to a later phase (Saragusti, 2002; Saragusti et al., 2005; Grosman et al., 2011). Indeed, Grosman et al. (2011) showed that the technique could even counteract post-depositional factors thereby allowing symmetry to be more successfully tracked through time.

A further study, although not based on 3D scanning, bears out these finding (Beyene et al., 2013; Beyene, 2013), which looked at the increase in symmetry and workmanship of handaxes from the Konso formation in Ethiopia dating ~1.75 mya to ~0.85 mya (see Fig. 1). As the authors state: "Between ~1.6 and ~1.2 Ma, an increase of workmanship is seen in handaxe form, resulting in better tip shape and plan form symmetry", and further on: "In contradistinction to the >1.2-Ma assemblages, the younger ~0.85-Ma Konso Acheulean is characterised by considerably refined handaxes. Some of these handaxes are refined to the extent that they would qualify as approaching 'three-dimensional symmetry' (i.e., symmetric not only in plan view but also in cross-section form)." Interestingly, although picks achieved a shape plateau early on, bifaces continued to become more refined and standardised.

These finding are supported by a review of various Acheulean sites in Africa, which found a trend towards refined, thinner and more symmetrical bifaces that roughly corresponds to Early, Middle and Late Acheulean phases (Sahnouni et al., 2013). Correspondingly, research on temporal trends found that the symmetry and standardisation of handaxes cannot be fully accounted for by drift or neutral effects (Lycett, 2008). In addition, Machin et al. (2007) concluded that the refined symmetry of handaxes is unable to be explained by function alone and implicate an "aesthetic" factor related to craftsmanship (Machin, 2009). Similarly, Wenban-Smith (2006) has noted the overly large ficrons, dated to ~232.64 kya (Wenban-Smith et al., 2007) from Cuxton, display exquisite, almost flamboyant, workmanship with virtually perfect symmetry.

The large bifaces, which are too large and heavy for practical use (Kohn, 1999, p. 54), are particularly interesting as they conform to the golden triangle. The golden triangle is derived from the golden section that is determined by the three angles concerned which, in turn, is derived from a regular pentagon by extending the sides so they intersect—each point of the resulting pentagram thereby produces an isosceles golden triangle. Handaxes too large and unwieldy to have a practical function thus present a unique opportunity to test the golden triangle. In this respect, Hodgson (2008) demonstrated that overly large, heavy symmetrical handaxes from a number of sites, such as the Furze Platt (weighing 2.8 kg and 30.6 cm long), conform to the dimensions of the golden triangle. Some Acheulean handaxes from Isimila Iringa, Tanganyika also weigh over 4 kg, are up to 40 cm long (Poznasky, 1959) and show a similar concern. Correspondingly, a symmetrical handaxe (weight 0.685 kg, length 15.5 cm) was recovered from the 600 kya site of Sima de los Huesos that was placed among the remains of hominins, possibly as a grave offering (Carbonell et al., 2003; Bischoff et al., 2007). As archaeologists have noted (Gamble et al., 2011), the colours of this biface are particularly striking which, together with symmetry, may have marked it out as a special object. In recent reviews of the Palaeolithic/Stone Age, it was concluded that a concern for symmetry was indeed prominent from around 500 kya (Gamble et al., 2011; Sahnouni et al., 2013; Shipton, 2013), a property which is associated with thinner, more refined bifaces characterised by an increase in the numbers of flake scars.

In sum, the above studies indicate that temporal trends towards greater standardisation and symmetry continue to be important to understanding the significance of handaxes (Sahnouni et al., 2013) especially in relation to cognitive evolution (Shipton et al., 2013).

3. Implications for cognitive evolution

A number of theoretical models have been proposed to explain the cognitive profile of hominins that employ different frameworks which, nevertheless, evince a considerable degree of overlap. These frameworks provide a valuable means of assessing levels of cognition and are referred here to assess the relationship between the symmetry of

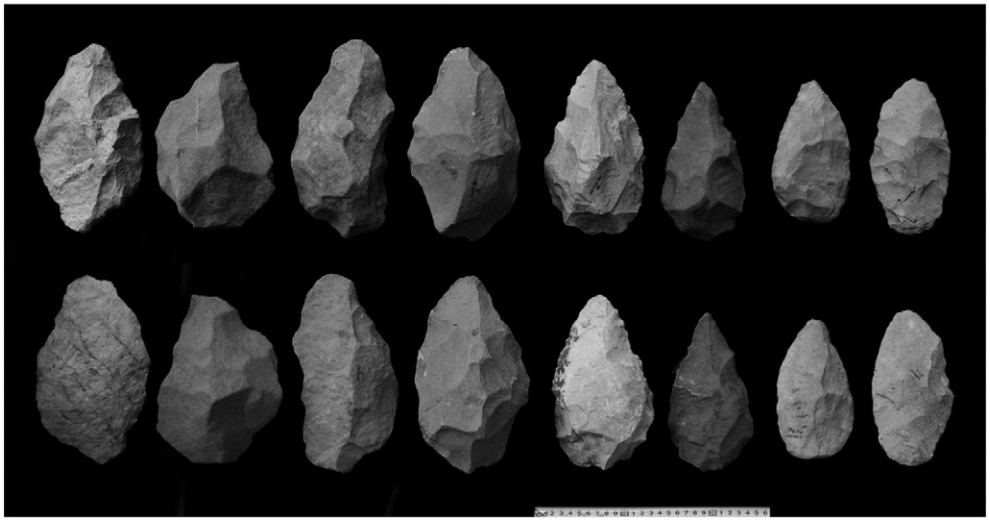

Fig. 1. "Handaxe refinement through time. Upper, dorsal; Lower, ventral. From left to right, two each are shown from KGA6-A1 (~1.75 Ma), KGA4-A2 (~1.6 Ma), KGA12-A1 (~1.25 Ma), and KGA20 (~0.85 Ma). In each pair of handaxes from the respective sites, near-unifacial (left) and more extensively bifacial (right) examples are shown (except with the KGA20 handaxes, which are both well worked bifacially)".
Figure and caption reproduced from Figure 4 by Beyene et al. (2013) PNAS 110 (5): 1584–1591.