

Restricting your answer to stone tools, discuss how effective palaeoanthropologists are at interpreting the social lives and/or behaviour from the fossil and/or archaeological records

Stone tools dominate the archaeological record, being one of the most significant evidence of past human activity. Stones tend to be fairly indestructible, therefore stone artefacts have a higher chance of surviving (Schick & Toth, 1993: 18). Because of its abundance in the archaeological record, they are heavily relied on by archaeologists to interpret past human behaviour (Hardy & Raff, 1997: 601) and lifestyles that have long disappeared. (Davidson & Nowell, 2010: 1). During the 19th century when the study of human origins was being revolutionised with new theories and discoveries, palaeoanthropology emerged as a new science (Goodrum, 2014: 706). French anthropologist Paul Topinard initially defined palaeoanthropology as the discipline devoted to the study of prehistoric human races and human paleontology. He suggested that whilst prehistoric archaeology was responsible for excavating and interpreting the artefacts, palaeoanthropology should focus on studying the fossil bones. Moreover, he argued that in order to successfully examine the fossil bones, special skills must be needed, suggesting they should be trained in zoology or anatomy (Goodrum, 2014: 712). Later on in the 20th century, palaeoanthropology became defined as the study of human evolution and of extinct hominid species (Goodrum, 2014: 732). This essay will focus on examining the ways in which palaeoanthropologists have interpreted the social lives and behaviours from stone tools by exploring various case studies and the methodologies used.

Human evolution concerns not only just physical change, but also behavioural transformations, suggest Schick & Toth (1993: 17). They discuss that whilst changes in biology are easier to see, the changes in behaviour (sexuality, diet, ecology, social organisation, reliance upon culture) are less visible, but equally important nonetheless. Moreover, they

state that ‘we have been shaped through natural selection into tool makers and tool users’, and this shift to using stone tool technology to adapt to our environment was a major behavioural change (1993: 17). The focus on behaviour-oriented approach to the study of the archaeological record was established with the study by the Leakeys’ (Louis & Mary) in East Africa. Their work at the Olduvai Gorge revealed a progression of changes in hominid evolution and stone tool technology (Schick & Toth, 1993: 73). This new approach paved the way for prehistorians and other disciplines to move away from the traditional cultural-historical approach and raise questions in a new light; such as the behaviours of early hominids and how they lived. Potts (1991: 155) agree by stating that to investigate the behaviours of Oldowan toolmakers, the contextual aspects must go beyond the stones, such as analysing the activities of the hominid tool-makers.

The Leakeys and their team found bones from a species that they named *Homo habilis* - ‘the handy man’, (first member of the genus *Homo*) which led to the prevailing view that human stone tool use began with this species (Callaway, 2015). In the 1960s, they uncovered 1.8 million year old stone tools at Olduvai Gorge in Tanzania and these were also associated with *Homo habilis* (Davidson & Nowell, 2010: 1). Wood (2014) suggests that this was a turning point for palaeoanthropology as it shifted the search for the first humans from Asia (*Homo erectus*) to Africa, sparking a debate that continues to this day. Discussing another significant discovery - the hominid tracks in Laetoli - in relation to the earliest stone tools, Leakey (1981: 95) presents the idea that this bridges a gap of 1.6 million years between the Laetoli tracks and the date of the earliest stone tools at Olduvai Gorge. From their research, Leakey & Hay (1979: 323) concluded from these trails that the Pliocene hominids had achieved a fully upright bipedalism, moreover describing it as a ‘major event in the evolution of man which freed the hands for tool making and eventually led to more sophisticated human activities’. Schick & Toth (1993: 46) support this argument by stating that the ‘origins of upright walking could have been partially related to an increased reliance on technology’. Furthermore, Mary Leakey characterised and defined the Oldowan

artefacts in detail, providing ‘a systematic terminology and quantitative basis for discussion’ (Potts, 1991: 154-55). The Leakeys’ work established a great antiquity for the prehistory of stone tool making (Schick & Toth, 1993: 74), however, their uses in prehistory are still poorly understood despite them comprising the vast majority of the cultural artefacts in the archaeological record (Hardy & Raff, 1997: 601). As Wood (2014) stated, ‘the Leakeys’ iconic discoveries at Olduvai Gorge should remind us of how much we don’t know, rather than how much we do’. Without a doubt, the study of stone tools flourished amongst archaeologists and palaeoanthropologists with this enormous breakthrough and new methods and approaches put forward by the Leakeys, thus the research studies in the disciplines improved significantly.

The oldest stone tool industry known as the Oldowan industry dates back to 2.6 million to 1.4 million years ago. The industry exhibits sharp stone tool flakes struck from cores by direct percussion from a hammer-stone (Stout, 2011: 1051). Despite demonstrating the simplest methods of stone tool flaking, the Oldowan stone tools show evidence of behavioural sophistication beyond simple percussion such as repeated flaking and transportation of tools (Potts, 1991: 153). Braun et al (2008: 2153) suggest that it is necessary to understand how stone tools are produced in order to understand the behaviours associated with the Oldowan stone tool production. Different behavioural patterns and technological differences between the Oldowan sites could be interpreted by observing the sequence of removals and the morphology of the flakes and cores in the assemblage. For instance, after analysing several assemblages from Olduvai Gorge, Braun et al noticed a decrease in percentages of flakes from Oldowan through to the Late Acheulean, which they concluded was a direct result of increased levels of tool transportation in the later industries (2008: 2153). Potts (1991: 163) however, shares the viewpoint that transportation happened in the Oldowan as well; by comparing the composition of flaked and detached pieces that were deposited, he suggests that there was a dynamic system of transport of materials by the toolmakers where they made multiple trips to these sites bringing raw materials from different

locations, indicating raw material selectivity. Stout (2011: 1052) agrees, observing that some early Oldowan assemblages did exhibit systematically biased patterns of flake detachment. By analysing these activities, palaeoanthropologists have concluded that there was a behavioural sophistication apparent amongst the toolmakers.

A problem of the classical archaeological approaches to the study of stone tools was identified by Stout (2011: 1050) as he states that they tended to focus more on the form of artefacts rather than the processes that produced them. 'It is biological capacities and cultural recipes that evolve, not artefact morphologies' (Stout, 2011: 1050). After identifying the problem, he also contributed solutions and ideas on how to describe the processes of tool production. With the Stone Toolmaking Action Hierarchies: he suggested gaining insights from experimental replication of the tools and reading the production scars left on tools by analysing the different periods (Oldowan: 2.6 - 1.4 mya, Early Acheulean: 1.6 - 0.9 mya, Late Acheulean: 0.7 - 0.25 mya) (2011: 1051). He stated that the sequential approach was useful in reconstructing details of past technologies successfully. Moreover, through this approach, the gradual change in behavioural capabilities are evident from the stone tool technologies as they become more elaborate and sophisticated. Stout (2011: 1051) notes that stone tools in the Oldowan showed signs of 'actual flaking', demonstrating the accurate percussion through the strong grip and support of the hammering stone. Moreover, the most earliest stone tool technology in the Oldowan industry, already demonstrate the planning depth, manual dexterity and spatial coordination, observes Haslam et al (2009: 339). These stone tools required bodily skills that can only be achieved through deliberate practice and experimentation rather than through observation (Stout, 2011: 1057). Schick & Toth (1993: 38) supports this argument by stating that from a behavioural perspective, the presence of flaked stone tools represented a technological pattern possessed only by human line, as it is not found in the wild among modern primates. Tool use amongst chimpanzees and other non-human primates have been observed by palaeoanthropologists - where they use stone to

crack nuts - however, their tools lacked the craftsmanship of the Oldowan toolmakers (Callaway, 2015). After studying the behavioural patterns of the different stages of stone tool production through a comparative analysis, Stout concludes that they demonstrate the presence of cumulative cultural evolution in the Lower Palaeolithic (2011: 1057). He suggests that the technologies clearly do increase in hierarchical complexity over time, which he believes was influenced by the biological evolution of hominin brains. Social interaction for motivation and support for the acquisition of these skills were evident, which was uniquely developed in humans, and this could explain why the tools of non-human primates lacked the skills and techniques.

Considering the behavioural sophistication evident in the Oldowan industry such as the transportation of tools, raw material selectivity and the flaked stone tools (Harmand et al 2015, Potts 1991, Stout, 2011), it could be argued that tool manufacture occurred earlier than the Oldowan (Haslam et al, 2009: 339). For instance, the presence of stone tool modified bones at Dikika, Ethiopia dated to 3.39 myr offers insight into an early phase of stone tool use in hominin evolution (McPherron et al, 2010: 858). In order to study these bones, the surfaces were examined under X8-80 magnifications, then an ESEM (Environmental Scanning Electron Microscope) was used to further identify and document the marks. These identifications were then blind tested between zooarchaeologists and taphonomists who then concluded from the results that most marks were indeed stone inflicted. Harmand et al (2015: 310) suggested that these cut marked bones also demonstrates percussive activities other than knapping, such as pounding or battering, which offers insight into earlier stages of hominin tool use. This can be considered a significant advancement in palaeoanthropology as this discovery predates the known evidence of stone tool use for meat and marrow consumption in the hominin lineage by 800 kyr (McPherron et al, 2010). Zooarchaeologists Dominguez and Pickering (2003: 281) also observed archaeological sites which demonstrated butchering of animals, coming to the conclusion that hominids in East Africa gained regular access to carcasses and were exploiting these fully for

meat. They furthermore analysed the behavioural patterns of these hominids under the Home Base - 'Food Sharing' model. It indicated the transportation of the carcasses - probably for processing, consumption and sharing - demonstrating the 'hominid proficiency in hunting and/or confrontational scavenging' (2003: 276).

The 3.3 million year old stone tools from Lomekwi 3 in Kenya also illustrate the use of stone tools before the Oldowan industry. After 28 lithic artefacts were discovered on the surface of the Lomekwi archaeological site, an excavation was carried out which revealed an additional 18 tools. The technological analysis and replication experiments revealed the technological features of these tools. The LOM3 knappers used techniques such as passive hammer to detach the flakes. From the repeated fail blow marks indicated on the tools, it is evident that the precision of the percussive motion was poorly controlled (Harmand et al (2015: 313). In addition to them lacking craftsmanship, these were much larger than those from the Oldowan stone tool industries. However, it was distinctively different from the non-human primate tools - usually unipurpose tools - as the use of individual objects for various tasks were identified, furthermore reflecting a technological diversity than previously thought (2015: 312). Although, it was previously thought that development of technology was linked to climate change and the spread of savannah grasslands, the LOM3 artefacts were made in forest environments and represented a distinct culture (Callaway, 2005). The 'information obtained from excavations would also include the spatial relationships between the stone artefacts and faunal remains and sedimentary clues regarding palaeoenvironments and the conditions of deposition' (Potts, 1991: 155), which suggest that palaeoanthropology has broader means of analysis than just the stone tools themselves. Stone tool industries may have existed before the start of major climate changes, however, it could be argued that they became more sophisticated and advanced in relation to climate change. As Schick & Toth (1993: 51-52) suggest, it is our technological adaptation and the ability to adapt to the environment that has played a crucial part in shaping our evolutionary trajectory. Davidson & McGrew

(2005: 813) state that, ‘the act of knapping created a new niche for hominins’ which differentiated their behaviour from ancestral chimpanzees and gorillas. It was our lineage- the hominin lineage - alone that took the cognitive leap of developing and using sophisticated stone tools, and Harmand et al believe that this was ‘the foundation of our evolutionary success’ (2015: 310). They then proposed that the LOM3 artefacts could bridge the technological stage between a hypothetical pounding-oriented stone tool use by earlier hominins and the flaking-oriented knapping behaviour of later Oldowan tool makers (2015: 310). The characteristics of the LOM3 stone tool artefacts and their uses when compared with the Oldowan stone tools indeed demonstrate significant technological and morphological differences which help understand important behavioural and cognitive changes.

In conclusion, it is evident that the technological strategies used for stone tool production is more complex than previously acknowledged (Braun et al, 2008: 2153). After the Leakeys’ revolutionised palaeoanthropology as a discipline, suggesting new approaches of study such as the behaviour-oriented approach, more studies about stone tools in behavioural aspects thrived. The concentration was no longer just on the stone tool artefacts as palaeoanthropologists took other factors such as the environment, landscape and its faunal remains into consideration. It provided a framework under which the palaeoanthropologists could imagine a setting where the toolmakers lived and worked which would help understand the social lives and behaviour more. Moreover, to appreciate the social lives and behaviour further, palaeoanthropologists undertook methods such as the recreation of stone tools to understand the processes which made them. As Braun et al (2008) stated, the analysis of the production of the stone tools would help us understand the behaviours that are associated with these stone tools. The techniques used by the early toolmakers were unraveled with these replication experiments. Moreover, Stout’s (2011) sequential analyses provided information that depicted the changes in technology over time. Although subtle, they demonstrated gradual advancements of the stone tools as they become more

sophisticated overtime. He stated that it was ‘the biological capacities that evolved, not artefact morphology’ (Stout, 2011: 1050), however this was proven untrue by Harmand et al (2015) who discuss the stone tool artefacts found in Lomekwi, Kenya. These stone tools appeared to be much larger and heavier in size compared to the Oldowan stone tools, thus illustrating morphological changes between the stone tools. The advancements in stone tool technology was essential for palaeoanthropologists to understand the behavioural sophistications that took place, such as the transportation of tools, changes in raw material selectivity, hunting and scavenging and why it happened. These technological adaptations show our ability to adapt to the environment and changes and this has been shaping our evolutionary trajectory for millions of years (Schick & Toth, 1993: 52). The various methodologies used by the palaeoanthropologists to understand behavioural patterns and social lives supports the notion that palaeoanthropology is a multi-disciplinary science, that interlinks with disciplines such as archaeology, zooarchaeology, paleontology, anatomy and ecology. For instance, primate archaeology helps palaeoanthropologists understand the differences and similarities between non-human primates and humans, and how we split to our own hominin lineage, which further help appreciate the behavioural advancements of humans. Although there is still a lot to be researched, what has already been discovered have been interpreted quite effectively by palaeoanthropologists. With the discipline flourishing, palaeoanthropologists have slowly started bridging gaps in the stages of human evolution. Our success as scientists of this prehistoric past depends upon our skill in discoveries, identifying and explaining the nature of ancestral creatures, lifeways, environments and technologies that existed long ago (Schick & Toth, 1993: 19). Overall, it can be concluded that the interpretation of behaviour and social lives in relation to stone tools were interpreted by palaeoanthropologists quite proficiently. The various methodologies and approaches used by the palaeoanthropologists in recent years to study the behaviour associated with stone tools have proven to be successful.

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