

Sample term paper on tool manufacture and the evolution of early humankind

[Technology](#), [Development](#)



The history of human evolution has always been a heated topic for debate; many theories abound as to what factors led to the evolution of apes into man, using the concepts of trait adaptation, among others, to help explain why we became what we became. There are those who believe that the major contributing factor was the development of language, or the forming of groups with hierarchical structures. Others believe that the development of monogamy as a social concept is the most important factor leading to the evolution of humanity. However, it is my concerted belief that the most important contributing factor is the development and manufacture of tools; our ability to use objects to benefit us and enhance our strength, reach, agility and capability was a vital component to our advancing as a species. Tools are the products of the human brain; therefore, I believe there is a connection between the development of complex tools by man and their increased brainpower and emphasis on intelligence as a selective trait. Research indicates that the evolution of mankind is heavily derived from the manufacturing of tools in early man, being the central conceit behind many of the social and cultural constructs that developed in early man and stemming from the need to make proper use of an existing physical property of hominids.

When discussing the issues regarding the age-old question of what factors precipitated the evolution of advanced cognitive abilities in humans, many theories have taken shape. One theory is that monogamy was a primary factor; as we became more social creatures, setting up constructs such as monogamy (i. e. having one sexual partner as opposed to mating however and with whomever we pleased) involved and was followed by increases in

cognitive reasoning (Ambrose, 2001). Our own minds and behaviors gravitated towards forming groups of individuals in order to survive, as well as making room for reasoning. Another reason includes monogamy being a way to limit the risk of infanticide – forming family units through pair living makes males more likely to have caring feelings for their offspring and being less likely to kill them (Opie et al., 2013). Yet another theory about human cognitive evolution revolves around the development of language – the increasing need to communicate to other early humans in greater complexity and nuance was facilitated by the development of increased cognitive ability (Stout et al., 2008). While these theories have their support, and are often linked to the development of tools, paleontologists have not discovered substantial evidence or support for them more so than in the theory of toolmaking.

The tool-making theory of human cognitive development is a derivation of the hunting hypothesis, which states that the primary influence for human evolution was the increasing prevalence of hunting as an activity to both defend themselves and other humans from animals of various sizes, and other hominids at the time (Ambrose, 2001). In essence, the use of tools to both hunt for meat and to more efficiently farm nutrient-rich plants allowed for humans to benefit from a healthier diet, which would create the evolutionary pressure to increase their intellect in order to make better tools and use them more effectively. These facts are relatively undisputed, given the advancement of human generations and evolution due to their survival through toolmaking. The discovery and control of fire permitted humans to stay warm during cold nights, to cook food to make it healthier to eat, and so

on (Ambrose, 2001).

It is difficult to determine the exact point at which humans started using tools, due to the primitive nature of said tools and the ambiguity in determining whether possible prehistoric tools were actually tools or simply natural objects. The oldest known tools are the Ethiopian stone tools of the Oldowan, which are dated at nearly 2.5 million years old; this ostensibly predates the commonly understood origins of a homo sapiens or homo erectus-like species (Ambrose, 2001). However, early 'homo' species are thought to be responsible for the Oldowan tools. From then, up until at least 700,000 years ago, paleontologists have uncovered hand axes that have been made of flint and quartzite, indicating that humans started to create tools to strike, slice, scrape and stab objects, whether for building, farming or hunting. Flint and tool-based bones are found around 50,000 years ago, as well as stone tools, which developed significantly with each subsequent evolution of early hominids from Homo habilis, homo ergaster, and so on. This significant exponential increase in tool development in early humans, theoretically coinciding with increases in social and cognitive complexity, strongly supports the idea that toolmaking was a significant factor in the evolution of mankind (Ambrose, 2001).

One of the biggest reasons that toolmaking has become one of the most important indicators for studying the evolution of humanity is its ability to be measured by the mankind of the present. Because well-made tools are durable, they are extremely convenient for investigation by paleontologists, as they are the best things to concretely measure about those early time periods (Byrne p. 1). Furthermore, they inform a great deal about the

cognitive ability of the creatures who use it – the “ everyday physics, means-end analysis, coordination of dexterous manipulations towards a predefined goal, recognizing and coping with local difficulties in a complex process,” and more are all factors that must cognitively go into the making and use of a tool (Byrne, pp. 1-2). There are many other cognitive components that go into creation of a tool, all found in early humans – tools are often created out of component parts, like a stone axe with a wooden or bone handle, etc. (Byrne, p. 2). Tools are often compound tools as well, like slings that use rocks as ammunition – in essence, tools that aid other tools. The variation of materials in toolmaking in early humans, from rock to wood to bone, and more, also indicates a great deal of cognitive activity required in the creation of tools (Byrne, p. 2).

Another factor that leads to its connection with the evolution of humans is not just cognitive, but physical. The use of increasingly complex tools comes not only with the increased ability to conceptualize and built it, but also to use it – the development of fine motor control is required to wield tools with these increasing levels of complexity (Eccles, 2005). According to Eccles, early primates did not have the fine motor skills that homo sapiens enjoyed, intertwining the physical development of opposable thumbs and the strength of their grip with the ability to build and wield tools. Furthermore, however, this sense of motor control comes along with expanded motor cortical representation with the thumb and fingers – in essence, the cognitive ability to use these limbs and digits appropriately are required for the physical abilities that accompany them. Previous generations of early hominids had this ability, but did not have the brain power yet; it was only through the

cognitive development that occurred that tools of increasing complexity could be made. These features of the brain evolved, in short, to allow for the creation and maintenance of tools (Eccles, 2005).

When considering the use of tools by cognitively-advanced early humans, one more thing that must be considered is the social need for the cognitive use of tools. Research indicates that hominids carried around tools related (not to current needs, but to contingencies that might arise, such as unexpected attacks or terrains unlike those encountered before" (Suddendorf & Corballis 1997, p. 159). The presence of tools to anticipate future needs also indicates further cognitive development in order to perform ' mental time travel,' which requires abstract thought and indicates a higher state of evolution than non-human animals (Suddendorf & Corballis, 1997). It can be argued that these are primarily social constructs, and so culture would need to develop in order to properly contextualize this tool use. However, as the utility of these cognitive abilities center around the use of these tools first and foremost (the formation of cognition being centered around tool-based conceits such as protection, climbing of terrain, etc.), it can be inferred that tools and toolmaking are the primary evolutionary pressure for this expansion of cognition.

In order for these varying degrees of tool use to become prevalent, the correct conditions need to be present to facilitate cognitive development (van Schaik, Deaner & Merrill, 1998). For example, in order to create the evolutionary conditions to manufacture tools needed to acquire food, certain social and cognitive factors need to be found in an early human society - these include the prevalence of extractive foraging as a useful skill in

acquiring food (van Schaik, Deaner & Merrill, 1998). Not only does the skill need to exist, but the cognitive pressure to acquire that skill through teaching and learning is necessary in order to get a whole society to pick up on the skill and use tools to facilitate it. A society needs to be socially tolerant, gregarious, and open to observational learning in order to discover and teach a skill related to toolmaking, which facilitates that sense of evolutionary pressure to develop the cognitive skills needed (van Schaik, Deaner & Merrill, 1998). The expanded increase in technology use in hominids has been theorized to directly correlate to the cognitive expansion of minds and development of society necessary to create manageable and manipulative skills regarding tools - this creates a whole lifestyle revolving around food sharing and processing in order to continue said society (van Schaik, Deaner & Merrill, 1998). In essence, the need to use tools to gather food (as befits the hunting hypothesis) is one of the major catalysts behind the increases in cognitive development required to successfully use said tools in a social setting.

There are some limitations to this hypothesis, most notably that the evidence that exists is limited, leaving vast room for speculation without confirmation. To be fair, tool use is not exclusive to humans, and does not necessitate the same kind of cognitive development to use tools entirely. Many different kinds of animals use tools other than apes, including woodpecker finches in the Galapagos, Egyptian vultures, Californian sea otters, and more (Byrne, p. 3). Even the theory that only humans make tools through their own tools has been disputed, with many apes having the ability to have a 'theory of mind' (Siddendorf & Corballis, 1997). However, in order

to explain the same kind of complexity and variety of tools used by humans, a certain level of cognitive development would have to be required. No matter what, it is a given that successful tool use is accompanied by advanced cognitive development; the major question revolves around toolmaking's role as an evolutionary pressure factor to bring about advanced cognitive development in humans.

Another thing to consider is that, like toolmaking, research suggests that language capacity evolved in concert with it to facilitate greater chances of survival and complex interactions between early humans and each other/their environment. As humans increasingly required complex, goal-based actions to complete tasks and increase the survival of themselves and their groups, the need was created for both language and toolmaking, which would be provided through the expansion of the cortex in human evolution (Stout et al., 2008). To that end, language and toolmaking could very well be simply side effects of the evolutionary need for comparatively weaker and more intelligent creatures like hominids to develop societies and cultures. By creating cultures, hominids are better able to increase their strength through numbers, communicate mass ideas through language and facilitate the creation and learning of tool skills as previously mentioned. At the same time, the aforementioned presence of a physical ability to use tools prior to cognitive increases, as well as their direct utility in bringing about greater results in survival and food-gathering, suggests that expanded cognition came about as a means to capitalize on that physical ability. Furthermore, much of the language use that would come about through increased cognition would center around the making and teaching of tools and their

uses, still relating the phenomenon of toolmaking toward being the central survival mechanism of early humans.

In conclusion, it can be reasonably inferred that human evolution came about largely due to the evolutionary pressures that existed for humans to create and use increasingly complex tools in order to survive. Toolmaking brings with it any number of significant social and survival-based benefits, including gathering and hunting food, defending against predators, building shelters and other tools, and more. In order to be given the chance to utilize the greater thumb-and-finger strength given to early hominids, expansion of cognition would need to occur. To that end, human cognition evolved and expanded in order to justify and expand our physical ability to use tools, including using them to make other tools, use increasingly complex and different materials to construct them, and carry them around in anticipation of unforeseen circumstances and needs. Even the development of monogamy, language, and cultures come about because of the more direct and immediate utility of tools as a means of survival; the expression of ideas and gathering of groups would likely center around tools and their creation and use. Because of these reasons and more, toolmaking must be recognized as a primary factor in the expansion of human cognition for evolution.

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