

World's oldest butchering tools gave evolutionary edge to human communication

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Acacia savanna south of Fada N'Gourma, Burkina Faso. Image: Wikipedia.

Two and a half million years ago, our hominin ancestors in the African savanna crafted rocks into shards that could slice apart a dead gazelle, zebra or other game animal. Over the next 700,000 years, this butchering technology spread throughout the continent and, it turns out, came to be a major evolutionary force, according to new research from the University of California, Berkeley, the University of Liverpool and the University of St. Andrews, both in the UK.

Combining the tools of psychology, evolutionary biology and archaeology, scientists have found compelling evidence for the co-evolution of early Stone Age slaughtering tools and our ability to communicate and teach, shedding new light on the power of human

culture to shape evolution.

To be reported Jan. 13 in the journal *Nature Communications*, the study is the largest to date to look at gene-culture co-evolution in the context of prehistoric Oldowan tools, the oldest-known cutting devices. It suggests [communication](#) among our earliest ancestors may be more complex than previously thought, with teaching and perhaps even a primitive proto-language occurring some 1.8 million years ago.

"Our findings suggest that stone tools weren't just a product of human evolution, but actually drove it as well, creating the evolutionary advantage necessary for the development of modern human communication and teaching," said Thomas Morgan, lead author of the study and a postdoctoral researcher in psychology at UC Berkeley.

"Our data show this process was ongoing two and a half million years ago, which allows us to consider a very drawn-out and gradual evolution of the modern human capacity for language and suggests simple 'proto-languages' might be older than we previously thought," Morgan added.

Morgan and University of Liverpool archaeologist Natalie Uomini arrived at their conclusions by conducting a series of experiments in teaching contemporary humans the art of "Oldowan stone-knapping," in which butchering "flakes" are created by hammering a hard rock against certain volcanic or glassy rocks, like basalt or flint.

Oldowan stone-knapping dates back to the Lower Paleolithic period in eastern Africa, and remained largely unchanged for 700,000 years until more sophisticated Acheulean hand-axes and cleavers, which marked the next generation of stone tool technology, came on the scene. It was practiced by some of our earliest ancestors, such as *Homo habilis* and the even older *Australopithecus garhi*, who walked on two legs, but whose facial features and brain size were closer to those of apes.

In testing five different ways to convey Oldowan stone-knapping skills to more than 180 college students, the researchers found that the demonstration that used spoken communication - versus imitation, non-verbal presentations or gestures - yielded the highest volume and quality of flakes in the least amount of time and with the least waste.

To measure the rate of transmission of the ancient butchery technology, and establish whether more complex communication such as language would get the best results, study volunteers were divided into five- or 10-member "learning chains." The head of the chain received a knapping demonstration, the raw materials and five minutes to try their hand at it. That person then showed it to the next person in the chain, who in turn showed the next person, and so on. Their competence picked up significantly with verbal instruction.

"If someone is trying to learn a skill that has lots of subtlety to it, it helps to engage with a teacher and have them correct you," Morgan said. "You learn so much faster when someone is telling you what to do."

As for what the results mean for the Oldowan hominins: "They were probably not talking," Morgan said. "These tools are the only tools they made for 700,000 years. So if people had language, they would have learned faster and developed newer technologies more rapidly."

Without language, one can assume that a hominin version of, say, Steve Jobs would have been hard-pressed to pass on visionary ideas. Still, the seeds of language, teaching and learning were planted due to the demand for Oldowan tools, the study suggests, and at some point hominins got better at communicating, hence the advent of Acheulean hand-axes and cleavers some 1.7 million years ago.

"To sustain Acheulean technology, there must have been some kind of teaching, and maybe even a kind of language, going on, even just a

simple proto-language using sounds or gestures for 'yes' or 'no,' or 'here' or 'there,'" Morgan said.

Indeed, the data suggest that when the Oldowan stone-tool industry started, it was most likely not being taught, but communication methods to teach it were developed later.

"At some point they reached a threshold level of communication that allowed Acheulean hand axes to start being taught and spread around successfully and that almost certainly involved some sort of teaching and proto-type language," Morgan said.

Provided by University of California - Berkeley

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