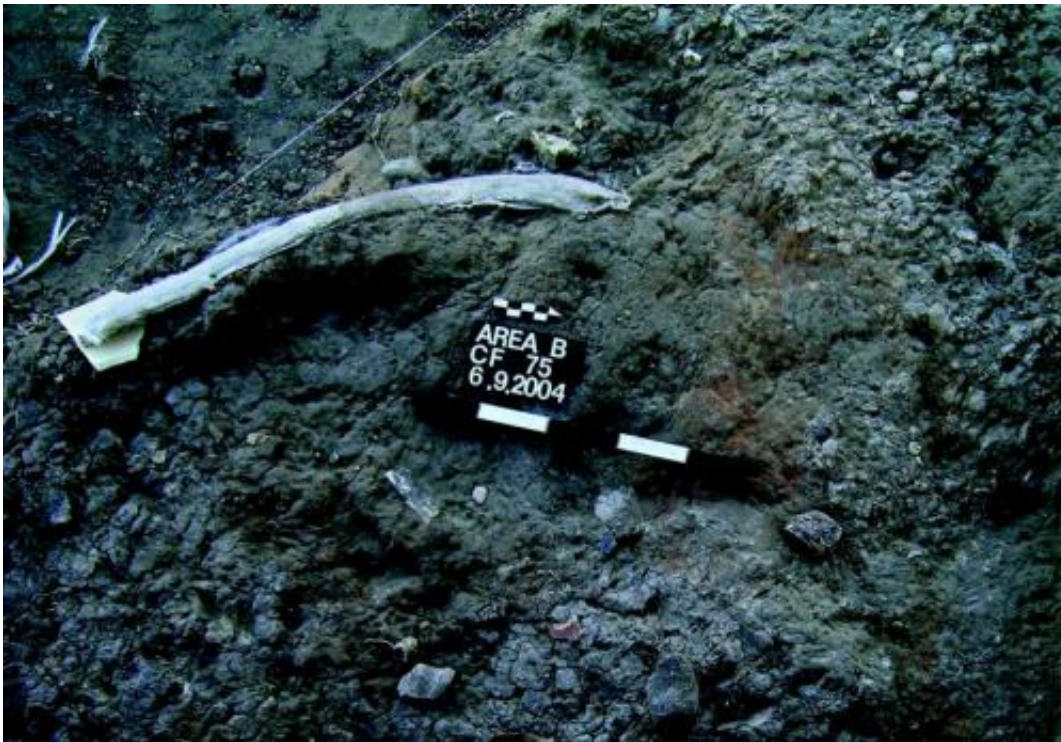


Prehistoric stone tools bear 500,000-year-old animal residue

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Elephant rib bearing cutmarks associated with flint tools at the Revadim site.
Credit: American Friends of Tel Aviv University (AFTAU)

Some 2.5 million years ago, early humans survived on a paltry diet of plants. As the human brain expanded, however, it required more substantial nourishment - namely fat and meat - to sustain it. This drove prehistoric man, who lacked the requisite claws and sharp teeth of carnivores, to develop the skills and tools necessary to hunt animals and

butcher fat and meat from large carcasses.

Among elephant remains some 500,000 years old at a Lower Paleolithic site in Revadim, Israel, Prof. Ran Barkai and his graduate students Natasha Solodenko and Andrea Zupanchich of Tel Aviv University's Department of Archaeology and Ancient Near Eastern Cultures recently analyzed "handaxes" and "scrapers," universally shaped and sized prehistoric [stone tools](#), replete with animal residue.

The research, published recently in *PLOS ONE*, represents the first scientifically verified direct evidence for the precise use of Paleolithic stone tools: to process animal carcasses and hides. The research was done in collaboration with Drs. Stella Ninziane Cesaro and Cristina Lemorini of La Sapienza, University of Rome, and Dr. Ofer Marder of Ben-Gurion University of the Negev.

Putting the puzzle together

"There are three parts to this puzzle: the expansion of the [human brain](#), the shift to meat consumption, and the ability to develop sophisticated technology to meet the new biological demands. The invention of stone technology was a major breakthrough in human evolution," Prof. Barkai said. "Fracturing rocks in order to butcher and cut animal meat represents a key biological and cultural milestone.

"At the Revadim quarry, a wonderfully preserved site a half-million years old, we found butchered animal remains, including an elephant rib bone which had been neatly cut by a stone tool, alongside flint handaxes and scrapers still retaining animal fat. It became clear from further analyses that butchering and carcass processing indeed took place at this site."

Through use-wear analysis—examining the surfaces and edges of the

tools to determine their function—and the Fourier Transform InfraRed (FTIR) residue analysis which harnesses infrared to identify signatures of prehistoric organic compounds, the researchers were able to demonstrate for the first time direct proof of animal exploitation by flint tools.

"Archaeologists have until now only been able to suggest scenarios about the use and function of such tools. We don't have a time machine," Prof. Barkai said. "It makes sense that these tools would be used to break down carcasses, but until evidence was uncovered to prove this, it remained just a theory."

A prehistoric Swiss army knife

While the question of their function and production remained unanswered until now, there was little doubt that the handaxe and scraper, found at prehistoric sites all around the world, were distinct, used for specific purposes. By replicating the [flint tools](#) for a modern butchering experiment, and then comparing the replicas with their prehistoric counterparts, the researchers determined that the handaxe was [prehistoric man](#)'s sturdy "Swiss army knife," capable of cutting and breaking down bone, tough sinew, and hide. The slimmer, more delicate scraper was used to separate fur and animal fat from muscle tissue.

"Prehistoric peoples made use of all parts of the animal," said Prof. Barkai. "In the case of the massive elephant, for example, they would have needed to use both tools to manage such a challenging task. The knowledge of how to make these tools was precious, and must have been passed along from generation to generation, because these tools were reproduced the same way across great territorial expanses and over hundreds of thousands of years.

"In this thousand-piece puzzle called archaeology, sometimes we find

pieces that connect other pieces together. This is what we have found with the stone tools and animal bones."

Provided by Tel Aviv University

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