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Press Release

Innovation in stone tool manufacture occurred independently in Europe and the Near East, says study

Researchers from Universities of Tübingen and Arizona challenge hypothesis that migration from the Near East brought a distinctive stone tool culture to Europe around 42,000 years ago

Tübingen, 15.10.2025

An analysis of stone tools found in Italy and Lebanon indicates that around 42,000 years ago, modern humans in Europe and the Near East took different approaches to toolmaking. In their comparative analysis, Dr. Armando Falcucci from the Early Prehistory and Quaternary Ecology working group at the University of Tübingen's Geoscience Department and Professor Steven Kuhn from the School of Anthropology at the University of Arizona came to the conclusion that stone tool making technology developed independently in the two regions, and could not be explained by knowledge imported to Europe by migration from the Near East. Their study has been published in the latest edition of the *Journal of Human Evolution.*

The Near East served as a crucial biogeographic corridor for the dispersal of our *Homo sapiens* ancestors out of Africa. For decades, researchers assumed that many technological innovations in Europe were introduced by early modern humans migrating from the Near East. Against this backdrop, the Protoaurignacian culture, which emerged across southern Europe around 42,000 years ago, has been widely considered a western extension of the Ahmarian culture of *Homo sapiens* groups located in the Levant.

First quantitative analysis

Although many scholars have noted cultural similarities between the Ahmarian and Protoaurignacian, no systematic comparison of their archaeological record had been conducted until Falcucci and Kuhn's quantitative analysis. To represent the Ahmarian culture, the researchers studied thousands of stone tools from the archaeological site of Ksar Akil, near Beirut, Lebanon, one of the Ahmarian localities closest to Europe. Protoaurignacian artifacts came from three key sites in Italy: Grotta di Fumane near Verona in the northeast, Riparo Bombrini near Ventimiglia in the

northwest, and Grotta di Castelcivita near Salerno in the south. “Superficially, the stone tools from these different areas may look similar. But we wanted to look deeper, examining in detail how they were produced,” says Steven Kuhn. Armando Falcucci adds that “when comparing the sites, we focused mainly on the production of stone insets for composite tools, carefully reconstructing how chert nodules were shaped to strike off regular blades with sharp edges.”

The analysis revealed striking differences in how Ahmarian and Protoaurignacian toolmakers produced their artifacts. In both regions, stone tools became progressively smaller over time, reflecting the development of complex composite implements. However, although toolmakers in both regions systematically produced small blades, they did so in very different ways. “Overall, the techniques of the Ahmarian and post-Ahmarian cultures in the Near East do not match those of the Protoaurignacian culture in Italy. The differences in flaking methods suggest that European hunter-gatherers developed their projectile technologies independently,” says Falcucci.

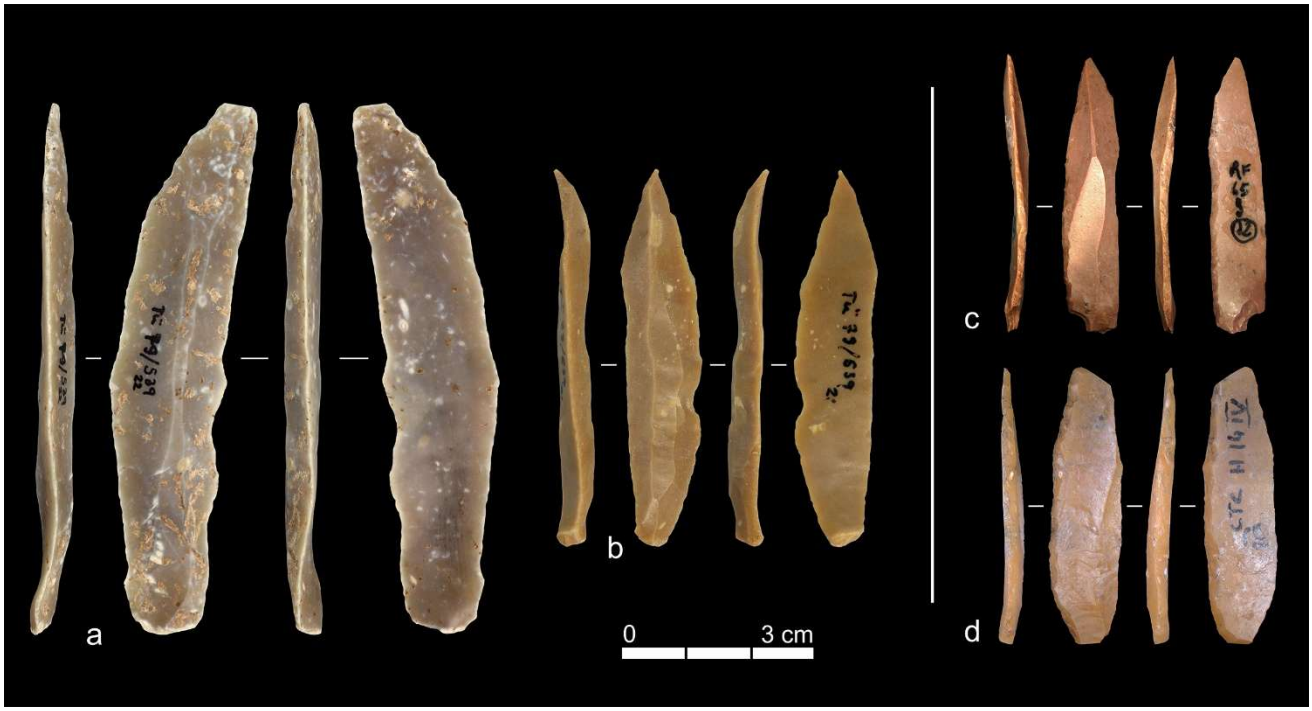
Reconstructing our earliest history

“The common assumption that all Paleolithic technological innovations in Europe were introduced through successive waves of migration from the Near East needs to be re-evaluated,” Kuhn says. “Increasing biomolecular and fossil evidence indicates that *Homo sapiens* began spreading across Eurasia at least 60,000 years ago, coexisting and interbreeding with local Neanderthal and Denisovan populations,” adds Falcucci. “Our study adds to a growing body of research portraying modern human expansion into Eurasia as a complex, non-linear process. It underscores the importance of recognizing the often-underestimated scope of cultural interactions with our extinct relatives when reconstructing our species’ deep past. The archaeological record provides invaluable evidence for this endeavor,” he concludes.

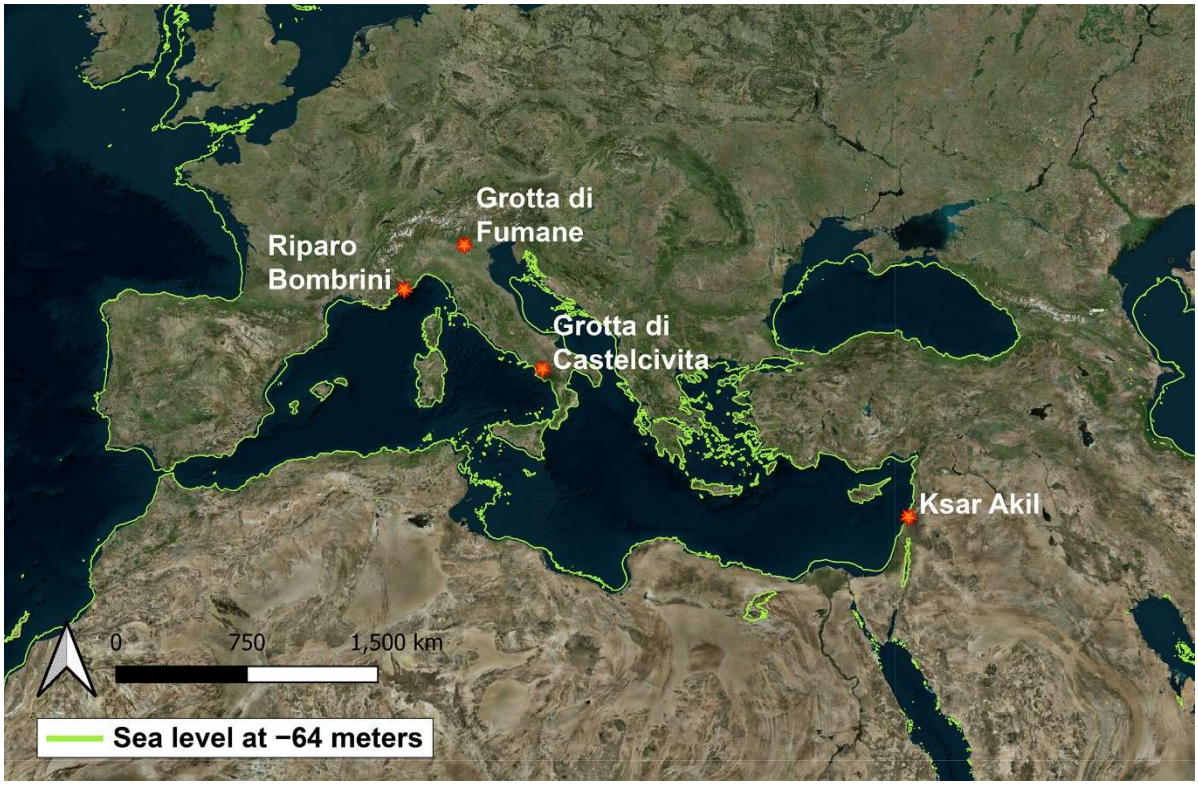
“Piece by piece, researchers are forming a clearer picture of the history of our ancestors and their cultural development, adding details or reporting surprising twists and turns. I am delighted that the University of Tübingen is also able to contribute to this process with new findings,” says University of Tübingen President, Professor Karla Pollmann.

Information:
The study of the large collection of stone tools from Ksar Akil (Lebanon), currently stored at Harvard University, was made possible by research grants from the Reinhard Frank Foundation and the German Research Foundation.

Publication:
Armando Falcucci, Steven L. Kuhn: *Ex Oriente Lux?* A quantitative comparison between northern Ahmarian and Protoaurignacian. *Journal of Human Evolution*, 208. https://doi.org/10.1016/j.jhevol.2025.103744



Examples of stone tools from the Ahmarian at Ksar Akil (a & b) and the Protoaurignacian at Grotta di Fumane (c) and Grotta di Castelcivita (d). Falcucci and Kuhn found that, despite similarities in the final forms, the technological processes used to produce these tools were strikingly different. Panels a and b are from the University of Tübingen's stone tool collections; panel c is adapted from Falcucci et al. (2022) and panel d from Falcucci et al. (2024). Credit: Armando Falcucci



Map of the Mediterranean showing the geographic locations of the analyzed sites and the reconstructed sea level approximately 42,000 years ago. Credit: Armando Falcucci

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