



Press Release

Earliest evidence of a complex adhesive in Europe

University of Tübingen researchers attribute items from French site of Le Moustier to Neanderthals – evidence of higher mental abilities and cultural development

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Tübingen, 21.02.2024

More than 40,000 years ago, early people in what is now France used a multi-component adhesive to make handles for stone tools. They produced a sophisticated mixture of ochre and bitumen, two raw materials that had to be procured from the wider region. This is the earliest discovery of a multi-component adhesive in Europe to date.

Under the direction of Dr. Patrick Schmidt from the University of Tübingen's Early Prehistory and Quaternary Ecology section and Dr. Ewa Dutkiewicz from the Museum of Prehistory and Early History at the National Museums in Berlin, researchers re-examined finds from the Neanderthal site of Le Moustier in the Dordogne for evidence of prehistoric glues. The development of adhesives and their use in the manufacture of tools is considered to be some of the best material evidence of the cultural evolution and cognitive abilities of early humans. The study has been published in the latest edition of *Science Advances*.

Rediscovered in the museum holdings

The stone tools from Le Moustier are kept in the collection of the Museum of Prehistory and Early History and had not previously been examined in detail. The Swiss archaeologist Otto Hauser recovered them in 1907 from the upper rock shelter at Le Moustier, which was used by Neanderthals during the Middle Palaeolithic period of the Moustérien between 120,000 and 40,000 years ago. They were rediscovered during an internal review of the collection and their scientific value was recognized. "The items had been individually wrapped and untouched since the 1960s. As a result, the adhering remains of organic substances were very well preserved," says Ewa Dutkiewicz.

Remains of ochre and bitumen on stone tools

The researchers discovered traces of a mixture of ochre and bitumen on several stone tools, such as scrapers, flakes and blades. Ochre is a naturally occurring earth pigment. Bitumen is a component of asphalt and can be produced from crude oil, but also occurs naturally in the soil. “We were surprised that the ochre content was more than 50 percent. This is because air-dried bitumen can be used unaltered as an adhesive, but loses its adhesive properties when such large proportions of ochre are added,” says Schmidt. He and his team tested this in tensile tests and with experimentally produced reference material.

“It was different when we used liquid bitumen, which is not really suitable for gluing. If 55 percent ochre is added, a malleable mass is formed,” he says. It is only just sticky enough for a stone tool to remain stuck in it, but the hands stay clean – so it is a good material for a handle. “A microscopic examination of the use-wear traces on these stone tools, carried out in collaboration with New York University, revealed that the adhesives on the tools from Le Moustier were used in this way,” according to the researchers.

Targeted approach

The use of adhesives with several components, including various sticky substances such as tree resins and ochre, was previously known from early modern humans, *Homo sapiens*, in Africa but not from European Neanderthals. “Compound adhesives are considered to be among the first expressions of the modern cognitive processes that are still active today,” says Schmidt.

In the Le Moustier region, ochre and bitumen had to be collected from distant locations, which meant a great deal of effort, planning and a targeted approach. “Taking into account the overall context of the finds, we assume that this adhesive material was made by Neanderthals,” says Dutkiewicz. “What our study shows is that early *Homo sapiens* in Africa and Neanderthals in Europe had similar thought patterns,” says Schmidt. “Their adhesive technologies have the same significance for our understanding of human evolution.”

Publication:

Patrick Schmidt, Radu Iovita, Armelle Charrié-Duhaut, Gunther Möller, Abay Namen, Ewa Dutkiewicz: Ochre-based compound adhesives at the Mousterian type-site document complex cognition and high investment. *Science Advances*, <https://doi.org/10.1126/sciadv.adl0822>

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Experiment reproducing a bitumen-based compounds adhesive: on the left, liquid bitumen and the earth pigment ochre prior to mixing. The stone tool on the right was glued into a handle made of liquid bitumen with the addition of 55 percent ochre. It is no longer sticky and can be handled easily. Photos: P. Schmidt