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NOTA DE PRENSA

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Previously, the earliest confirmed evidence of fire use dated back only about one million years

Scientists Discover the Oldest Evidence of Opportunistic and Recurrent Fire Use by Our Ancestors

- A non-invasive, luminescence-based technique indicates that Homo erectus, although unable to produce fire, did manipulate it between 1.07 and 1.79 million years ago
- The finding is based on the analysis of micromammal bones from pellets found in Wonderwerk Cave (South Africa)

Madrid, 1st June 2026 *Homo erectus,* who inhabited Wonderwerk Cave (South Africa) nearly 1.8 million years ago, was already using fire on a regular basis. This is reported in the journal *PlosOne* by the international team, led by researchers from the National Museum of Natural Sciences (MNCN-CSIC) in collaboration with the University of Toronto, who analysed the micromammal remains from the site. The evidence, obtained through the development of a non-invasive technique based on luminescence that identifies the effects of fire on fossils, unequivocally confirms that in the Early Pleistocene, 1.07 and 1.79 million years ago, populations of *H. erectus* were already using fire opportunistically but regularly.

The new research

This study has demonstrated that fire collected from natural conflagrations was intentionally introduced inside the cave to locations about 30 meters in from the current entrance. This rules out the possibility that the charred remains inside the cave resulted from natural fires and confirm this as the oldest known record of intentional fire use associated with the genus *Homo*. “Fire was not a one-time occurrence because it appears in different stratigraphic layers, separated by tens of thousands of years, which reinforces the idea that they already knew how to transport and maintain fire in protected spaces,” explains MNCN researcher Yolanda Fernández-Jalvo.

According to taphonomic studies, birds of prey, notably owls, inhabited Wonderwerk Cave, almost continuously, for nearly 2 million years. In many layers, the abundance of micromammal bones indicates that the floor of the cave was covered with plentiful pellets regurgitated by these raptors, remains that were not hominin dietary elements. The researchers suggest that bone and hair remains embedded in the regurgitated pellets served as fuel that enabled *H. erectus* to keep the introduced fire burning. The fire did

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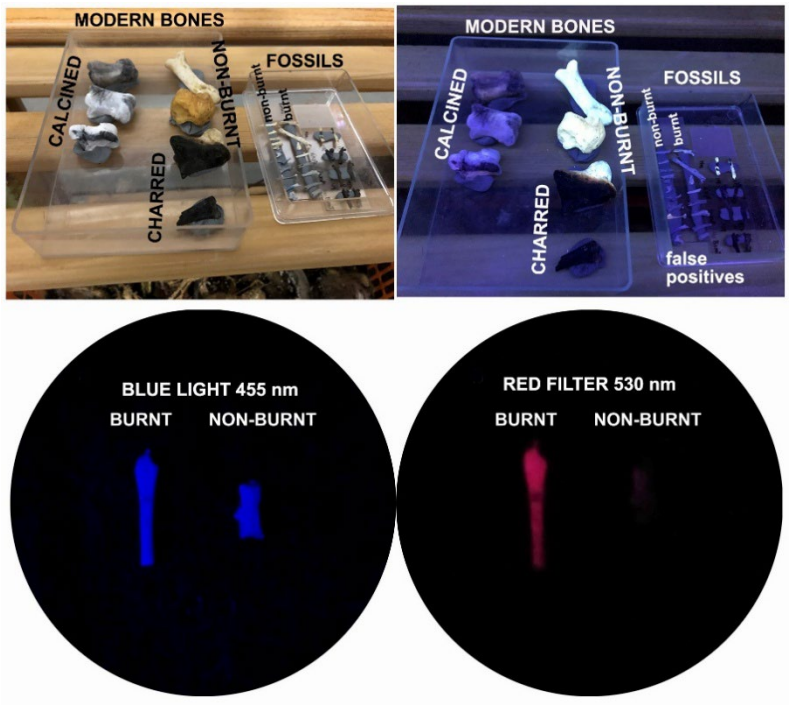
not spread but burnt only where it was placed amongst the pellets concentrations resulting in unevenly spaced spots of burnt micromammal bones. “This is a very subtle fire that we have identified in the bones of small mammals,” explains Fernández-Jalvo.

In the two levels of analysed micromammal bones deposited by birds of prey, the team identified clear evidence of combustion. Notable, was evidence for fire in Stratum 11, dating from between 1.07 and 1.79 Ma, where, discrete spots with all fossil bones exhibiting unmistakable signs of having been exposed to high temperatures. “This context, eliminates the ambiguity sometimes present in bone remains that have served as food, and points to an opportunistic use of fire, likely brought from outside and maintained inside the cave until it went out,” explains Michael Chazan, a researcher at the University of Toronto.

An innovative method for identifying past fire use

In addition to providing such as early date for fire use, the study introduces a new non-invasive protocol based on the luminescence properties of burnt bones, which has been validated by comparison with another technique widely used in archaeology called Fourier-transform infrared spectroscopy (FTIR), “The methodology we have developed allows us to distinguish burnt fossils from those that have undergone chemical alterations during fossilization, such as fluoridation or manganese deposition, which can visually mimic the effects of fire. We have improved the resolution with which we can identify burned fossils in very ancient contexts,” notes Fernández-Jalvo.

“This is a fast, non-destructive technique that can be easily applied to large collections of animal remains, making this portable, low-cost luminescence protocol a tool that can be used directly in field excavations, as well as offering the possibility of re-examining ancient sites,” says Marin-Monfort, the article’s lead author.



In modern bones, exposure to ultraviolet light or black light can distinguish between burnt and unburnt areas. In fossilized bones, black light can produce false positives, so it is necessary to follow the protocol we have published here, which is based on luminescence properties of burnt fossils.

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The use and subsequent control of fire is considered one of the most decisive innovations in human evolution, as it provides light, heat, and protection from predators, enabling new forms of social interaction and environmental transformation. No evidence has as yet been found at Wonderwerk Cave that hominins were cooking food, an innovation that is thought to have driven brain development in *Homo*. Understanding how and when the use of fire began is essential for comprehending the biological and cultural changes that characterize the genus *Homo*. "Our findings push back the chronology of fire associated with hominins and provides a solid methodological foundation for future research," concludes Liora K. Horwitz, co-director of the Wonderwerk project with M. Chazan.

One of the authors shows that the Wonderwerk Cave, is still inhabited by owls today. Clumps of their pellets (red arrows) can be seen, just as they must have appeared in the past, when *Homo erectus* entered the cave with burning branches from natural fires and laid them down on this "carpet," which helped the fire burn longer

Reference: M.D. Marin-Monfort, C.L. Shaw, Filipe Natalio, L. Grossman, P. Andrews, J. Campos, S. García-Morato, J.M. Pereira, A. Pons, M. Chazan, L. Kolska Horwitz, Y. Fernández-Jalvo. (2026) New Evidence for Early Pleistocene use of fire at Wonderwerk Cave (South Africa). *PlosOne* DOI: 10.1371/journal.pone.0347480

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