**PRESS RELEASE**

# Tracing Early Human Culture Evolution. The Persistent and Constantly evolving use of Ochre 40,000 years ago in Ethiopia

**A team of researchers from Spain and France have analysed the largest known collection of red and yellow mineral pigment fragments, commonly called ochre, dated to the Middle Stone Age (300-40 000 years ago) and found at Porc-Epic Cave, Ethiopia. Their study, published in *Scientific Reports*, reveals that the human groups visiting this site gradually changed the techniques used to produce ochre powder to adapt to environmental changes.**

The earliest known mineral pigments shed light on how early human cultures emerged and evolved. However, ancient sites that yielded archaeological collections large enough to precisely trace how these minerals were acquired, processed, and used are rare.

The cave site of Porc-Epic Cave, Dire Dawa, Ethiopia, dated around 40,000 years ago, represents one of the few Palaeolithic sites that have yielded a continuous and extensive record of ochre use, spanning a period of at least 4,500 years. More than 40 kg of ochre (4213 pieces), 21 ochre processing tools, and two ochre-stained artefacts were found during the site excavation.

The in-depth analysis of this unique collection has just been published by an international team of researchers led by Daniela Rosso, University of Valencia, Spain, in collaboration with colleagues from the university of Côte d'Azur, Bordeaux, and Bergen.

By analysing the chemical composition of ochre pieces found at the site and natural ochre from the cave's surroundings, and studying the techniques used to process these rocks, the authors unveil how Middle Stone Age inhabitants of the cave exploited mineral resources. Results show that they were able to predict the properties of different ochre types accessible in their environment, and gradually adapt their technology to cope with changes in raw material availability produced by environmental changes.

The analysis of Porc-Epic ochre shows that a wide variety of ochre types were collected and brought to the site to produce ochre powder of different textures and shades, probably adapted to different symbolic or functional activities. However, the ubiquitous presence of red ochre, rich in hematite, throughout the occupations of the site, indicates that Porc-Epic inhabitants were specifically interested in this particular colour when collecting ochre pieces in the environment or exchanging them with neighbouring populations.

Fine-grained ochre pieces, rich in iron oxides, rare in the surroundings of the cave, were often abraded on grindstones to produce good quality ochre powder, characterised by a fine texture and an intense red colour. Lower quality ochre pieces, rich in quartz grains, available in the vicinity of the cave, were more often crushed to produce coarser powder. The good quality ochre was more intensively sought at the beginning of the site occupation, while the use of the lower quality ochre types gradually increased through time. These changes in the use of ochre depict a culture in slow transition, progressively replacing exotic high-quality rocks with poor quality locally available ones.

The study of this exceptional ochre collection shows how a cultural feature was continuously transmitted through generations by Middle Stone Age populations, and how they were able to gradually adapt processing techniques according to changes in raw material availability. In sum, the Porc-Epic ochre record reflects a deeply-rooted yet constantly evolving cultural feature, during a period essential to our understanding of the emergence and evolution of complex cultures.

## Figure


Top left: location of the site; top right: view of Porc-Epic Cave (photo: A. Herrero); bottom: ochre pieces from Porc-Epic Cave (photo: D. Rosso).

## Note

This study was conducted by researchers from the University of Valencia, Spain (Departament de Prehistòria, Arqueologia i Història Antiga, PREMEDOC research group), the CEPAM laboratory (Université Côte d'Azur) and PACEA laboratory (CNRS/Université de Bordeaux), France. Research was supported by the Generalitat Valenciana, Spain; the Ministerio de Ciencia e Innovación, Spain; the Fyssen Foundation, France; the SFF Centre for Early Sapiens Behaviour (SapienCE), Norway; the LaScArBx (Univ. Bordeaux) research programme; the Talents Programme, France; the Grand Programme de Recherche 'Human Past' of the Initiative d'Excellence (IdEx) of the University of Bordeaux and the ERC Synergy Grant QUANTA (No. 951388).

## Reference

Rosso DE, Regert M, d'Errico F. 2023. First identification of an evolving Middle Stone Age ochre culture at Porc-Epic Cave, Ethiopia. *Scientific reports.*

## Contacts

**Postdoctoral researcher** l Daniela Rosso l daniela.rosso@uv.es

Tél. 0034 659644948

**CNRS researcher** l Francesco d'Errico l francesco.derrico@u-bordeaux.fr

Tél. 0033 (0)540002628 ; 0033 (0)625616854