PRESS RELEASE

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Early hominins from Thomas Quarry I (Morocco) reveal an African lineage near the root of *Homo sapiens*

Study pinpoints 773,000-year-old fossils with high-resolution magnetostratigraphic dating, illuminating the shared ancestry of *Homo sapiens*, Neandertals, and Denisovans

To the point

- **Precisely dated fossils:** A high-resolution magnetostratigraphic record at Thomas Quarry I captures the Matuyama–Brunhes reversal at around 773,000 years ago, providing one of the most accurate ages for an African Pleistocene hominin assemblage.
- **Near the root of our lineage:** Mandibles and other remains show a mosaic of archaic and derived traits consistent with an African sister population to *Homo antecessor*, near the divergence of Middle Pleistocene Eurasian and African hominin lineages.
- **Northwestern Africa's key role:** Decades of Moroccan-French research in the Casablanca coastal formations reveal a uniquely preserved cave sequence and carnivore-den context, highlighting the region's importance in early *Homo* evolution.

An international research team led by Jean-Jacques Hublin (Collège de France & Max Planck Institute for Evolutionary Anthropology), David Lefèvre (Université de Montpellier Paul Valéry), Giovanni Muttoni (Università degli Studi di Milano) and Abderrahim Mohib (Moroccan *Institut National des Sciences de l'Archéologie et du Patrimoine* (INSAP)) reports the analysis of new hominin fossils from the site of Thomas Quarry I (Casablanca, Morocco). The fossils are very securely dated to 773,000 plus/minus 4,000years ago, thanks to a high-resolution magnetostratigraphic record capturing in detail the Brunhes/Matuyama boundary, the last main geomagnetic polarity reversal and precise temporal markers of the Quaternary. Published in Nature, this work highlights African populations near the base of the lineage that eventually gave rise to *Homo sapiens*, providing new insights into the shared ancestry of *H. sapiens*, Neandertals, and Denisovans.

Decades of Moroccan-French fieldwork lead to major new discoveries

The results presented here stem from over three decades of continuous archaeological and geological research conducted in the framework of the Moroccan-French Program "*Préhistoire de Casablanca*". This program conducts extensive excavations, systematic stratigraphic studies, and large-scale geoarchaeological analyses in the southwest part of the city of Casablanca.

This patient and rigorous fieldwork progressively revealed the exceptional stratigraphic, palaeoenvironmental and archaeological setting of Thomas Quarry I, ultimately leading to the discovery of the hominin remains and geological sequences that underpin the present study.

As Abderrahim Mohib explains: "The success of this long-term research reflects a strong institutional collaboration involving the INSAP (*Ministère de la Jeunesse, de la Culture et de la Communication Département de la Culture* of the Kingdom of Morocco), the *Ministère de l'Europe et des Affaires Étrangères* of France (through the French Archaeological Mission *Casablanca)"*. The present study was also supported by the Università degli Studi di Milano (Italy), the Max-Planck Institute for Evolutionary Anthropology (Germany), the *LabEx Archimède* – University of Montpellier Paul Valéry, the University of Bordeaux and the *Muséum National d'Histoire Naturelle* (France).

A unique geological setting: the Moroccan Atlantic coast as a Pleistocene treasure house

Jean-Paul Raynal, co-director of the program throughout the excavation that led to the discovery of fossil remains, emphasizes that "Thomas Quarry I lies within the raised coastal formations of the Rabat–Casablanca littoral, a region internationally renowned for its exceptional succession of Plio-Pleistocene palaeoshorelines, coastal dunes and cave systems. These geological formations, resulting from repeated sea-level oscillations, aeolian phases, and rapid early cementation of coastal sands, offer ideal conditions for fossil and archaeological preservation". As a result, the Casablanca region has become one of Africa's richest repositories of Pleistocene palaeontology and archaeology, documenting the early Acheulean and its developments, diverse faunas reflecting environmental change, and several phases of hominin occupation.

Thomas Quarry I, excavated into the Oulad Hamida Formation, is particularly well known for containing the oldest Acheulean industries of north-western Africa dated to around 1.3 million years ago and lies close to other celebrated sites such as Sidi Abderrahmane, a classic reference for Middle Pleistocene prehistory in the Northwest Africa. Within this wider complex, the "Grotte à Hominidés" constitutes "a unique cave system carved by a marine highstand into earlier coastal formations and later filled with sediments that preserved hominin fossils in a secure, undisturbed and undisputable stratigraphic context" explains David Lefèvre.

A uniquely well-dated hominin assemblage in Africa

Dating Early and Middle Pleistocene fossils is notoriously difficult, due to discontinuous stratigraphies or methods affected by considerable uncertainty. The *Grotte à Hominidés* is exceptional because rapid sedimentation and continuous deposition allowed to capture a high-resolution magnetic signal recorded within sediments with remarkable detail.

Earth's magnetic field reverses polarity episodically over geological time. These paleomagnetic reversals occur worldwide and almost instantaneously on geological timescales, leaving in sediments a sharp, globally synchronous signal. The Matuyama–Brunhes transition (MBT), which occurred around 773,000 years ago, is the most recent of these major reversals and constitutes one of the most precise markers available to geologists and archaeologists.

As Serena Perini explains:
“Seeing the Matuyama–Brunhes transition recorded with such resolution in the ThI-GH deposits allows us to anchor the presence of these hominins within an exceptionally precise chronological framework for the African Pleistocene.”

The *Grotte à Hominidés* sequence spans the end of the Matuyama Chron (reverse polarity), the MBT itself, and the onset of the Brunhes Chron (normal polarity). Using 180 magnetostratigraphic samples—an unprecedented resolution for a Pleistocene hominin site—the team established the exact position of the reverse-to-normal switch, currently dated at 773 ka, and even captured the short duration of the transition (8,000 to 11,000 years). It is chronologically valuable that the sediments containing the hominin fossils were deposited precisely during this transition. Additional faunal evidence independently supports this age, affirming the primacy of magnetostratigraphy over other methods for establishing the chronology of this site.

Hominins close to the root of the *Homo sapiens* lineage

The hominin remains come from what appears to have been a carnivore den, as suggested by a hominin femur showing clear traces of gnawing and consumption. The assemblage includes a nearly complete adult mandible, a second adult half mandible, a child mandible, several vertebrae, and isolated teeth.

High-resolution micro-CT imaging, geometric morphometrics, and comparative anatomical analysis reveal a mosaic of archaic and derived traits. Several characteristics recall hominins from Gran Dolina, Atapuerca, of comparable age – the so-called *Homo antecessor* - suggesting that very ancient population contacts between north-west Africa and southern Europe may once have existed. However, by the time of the Matuyama–Brunhes transition, these populations appear to have been already clearly separated, implying that any such exchanges must have occurred earlier.

Matthew Skinner notes: "Using microCT imaging we were able to study a hidden internal structure of the teeth, referred to as the enamel-dentine junction, which is known to be taxonomically informative and which is preserved in teeth where the enamel surface is worn away. Analysis of this structure consistently shows the *Grotte à Hominidés* hominins to be distinct from both *Homo erectus* and *Homo antecessor*, identifying them as representative of populations that could be basal to *Homo sapiens* and archaic Eurasian lineages."

Shara Bailey confirms the generalized shape and traits of the *Grotte à Hominidés* teeth, noting that "In their shapes and non-metric traits, the teeth from *Grotte à Hominidés* retain many primitive features and lack the traits that are characteristic of Neandertals. In this sense, they differ from *Homo antecessor*, which - in some features - are beginning to resemble Neandertals. The dental morphological analyses indicate that regional differences in human populations may have been already present by the end of the Early Pleistocene".

A new window on the last common ancestor of humans and Neandertals

This discovery highlights that Northwest Africa played a major role in the early evolutionary history of the genus *Homo*, at a time when climatic oscillations periodically opened ecological corridors across what is now the Sahara.

As Denis Geraads notes: “The idea that the Sahara was a permanent biogeographic barrier does not hold for this period. The palaeontological evidence shows repeated connections between Northwest Africa and the savannas of the East and South.”

The hominins from the *Grotte à Hominidés* are almost contemporaneous with the hominins from Gran Dolina, older than Middle Pleistocene fossils ancestral to Neanderthals and Denisovans, and roughly 500,000 years earlier than the earliest *Homo sapiens* remains from Jebel Irhoud. In their combination of archaic African traits with traits that approach later Eurasian and African Middle Pleistocene morphologies, the hominins from the *Grotte à Hominidés* provide essential clues about the last common ancestor of *Homo sapiens*, Neandertals, and Denisovans—estimated from genetic evidence to have lived between 765,000 and 550,000 years ago. Paleontological evidence from the *Grotte à Hominidés* aligns most closely with the older part of this interval.

Jean-Jacques Hublin concludes that “the fossils from the *Grotte à Hominidés* may be the best candidates we currently have for African populations lying near the root of this shared ancestry, thus reinforcing the view of a deep African origin for our species”.

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