

Arene Candide: an ancient modified cranium and the shape of cognition

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Nestled along the rugged coastline of Finale Ligure, the Arene Candide Cave's wide limestone entrance belies its profound significance as one of Europe's richest prehistoric archives. For over 20,000 years, its sunlit, sheltered chambers served as both refuge and ritual space for diverse human communities. Spanning from the Upper Palaeolithic to historic periods, the cave preserves an extraordinary and continuous stratigraphic record in which the gestures of everyday life and the rituals of death are intertwined in a layered memory of human presence.

The first explorations, carried out by Arturo Issel in the late nineteenth century, inaugurated a long tradition of research that continued with the excavations of Luigi Bernabò Brea and Luigi Cardini in the 1940s and 1950s. It was during these campaigns that the famous Palaeolithic burials were unearthed, among them that of the so-called "Prince" — an adolescent who lived about 23,500 years ago, buried with a rich assemblage of perforated shells, deer teeth, and mammoth ivory pendants (see [Sparacello et al.](#), in this volume). The Prince's headdress, adorned with symbolic and precious materials, reveals a sophisticated language of the body and of social identity, anticipating that deep connection between aesthetics and identity that would persist throughout later prehistory.

In the cave's eastern sector, an Epigravettian necropolis emerged around 13,000 years ago, where at least 20 individuals are buried, often sprinkled with ochre and ornaments. The funerary behavior followed a complex program of primary deposition and later manipulation, in which earlier burials were rearranged around the new depositions ([Sparacello et al. 2018, 2021](#)).

The repeated and deliberate use of this funerary space suggests that Late Pleistocene communities had developed collective forms of memory and identity construction and transmission through time, centered on the funerary connection with the body of the ancestors.

It is within this context that the cranium known as AC12 was discovered in the 1940s (Fig.1). The cranium belongs to an adult male who lived between 12,600 and 12,200 years ago. Carefully placed above another burial and enclosed within stone slabs, AC12 stands out for its elongated cranial shape, with a receding and posteriorly extended forehead, unlike that of the other individuals from the necropolis. Since its discovery, the specimen has been at the center of contrasting interpretations: [Messeri \(1979\)](#) suggested that its peculiar form might result from deliberate modification, while others interpreted it more cautiously as the outcome of a developmental pathology. The implications of this debate for our understanding of social complexity in prehistoric Europe are substantial.

Early analyses of the restored cranium by [Formicola and Scarsini \(1987\)](#) attributed its unusual morphology to possible craniosynostosis—a premature fusion of the cranial sutures—or to unintentional deformation caused by mechanical pressure during infancy. In the absence of adequate morphometric tools and systematic comparisons, the hypothesis of a pathological origin prevailed, consistent with the methodological prudence appropriate to an isolated case in Upper Palaeolithic Europe.

This picture has changed dramatically with the recent study by [Mori and colleagues \(2025\)](#), which re-examined the specimen using advanced

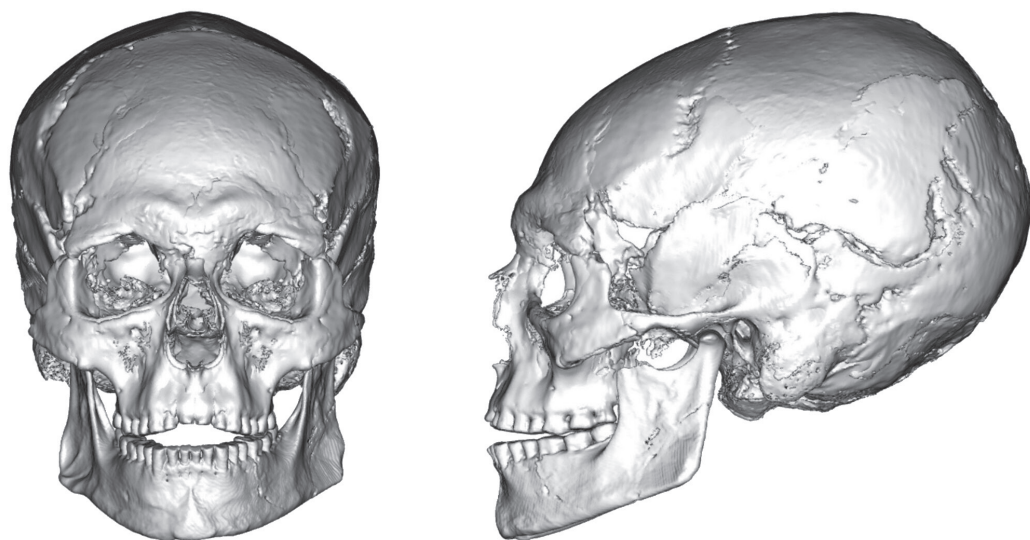


Fig.1 - The Ct-Scan based virtual reconstruction of the AC12 cranium preserved at the Natural History Museum of the University of Florence. From [Mori and colleagues \(2025\)](#).

3D virtual reconstruction and geometric morphometrics, comparing it to a large sample of both unmodified and intentionally modified human crania. Their results show that the morphology of AC12 cannot be explained by any pathological process. The absence of localized bone irregularities, the bilateral symmetry, and the regular curvature of the cranial vault are inconsistent with a pathological condition and instead match the patterns produced by intentional annular-oblique cranial modification, achieved by wrapping or binding the infant's head during early life.

The archaeological context supports this cultural interpretation: AC12 was carefully placed above another grave, within a niche bordered by stones — a deliberate and probably ritual act. What was once considered an individual pathology thus emerges as a conscious collective gesture, representing the earliest known evidence of intentional cranial modification in Europe.

Cranial shaping practices are known from numerous ancient cultures and represent one of the earliest forms of deliberate body modification for social or symbolic purposes. The main types

include annular deformation, obtained through continuous binding that elongates the cranium symmetrically; tabular deformation, produced by applying rigid boards to the forehead and occiput to create a flattened profile; and oblique variations, resulting from uneven pressure that causes asymmetrical tilting ([Dembo and Imbelloni 1938](#); [Antón and Weinstein 1999](#)). Such practices, widespread across time and geography, are documented among the Maya and Inca in the Americas, the Mongols, Huns, and various Caucasian groups in Eurasia, as well as in parts of Africa and Melanesia. In all these contexts, cranial modification carried strong socio-cultural value: it signaled rank, group affiliation, aesthetic preferences, or collective memory — a visible and irreversible language of the body ([Ortner 2003](#)).

The singularity of AC12 lies in the unexpected antiquity of this embodied language in Europe, among Late Pleistocene hunter-gatherers. Whether motivated by ritual, social status, or kinship, the act reveals that the body was already conceived as a medium of communication and identity. The shaped cranium of AC12 embodies

a collective decision inscribed in the biological material of a single person — a permanent message addressed to contemporaries and, through science, to us also. Like tattoos or scarifications of later times, this modification was not purely aesthetic: it spoke of identity, recognition, and memory, offering a rare insight into the social dynamics of ancient peoples.

Cranial modification is therefore not a private act but a cultural legacy. Imposed in infancy, when individual awareness and autonomy were absent, it translated community intention into bodily form. In this sense, artificial cranial modification was both a cognitive and social act — a way of thinking through the body, turning biological matter into a medium of collective meaning. The human body, viewed from this perspective, is not mere biological substance but a crossroads of perception, identity, and memory. Intentional alterations — cranial, cutaneous, or ornamental — constitute an embodied language that predates writing, making socio-cultural identity visible and inscribing culture into the very morphology of the person.

It is therefore not surprising that, with the onset of the Neolithic and the rise of agricultural societies, these same logics intensified and evolved, finding new forms of expression in collective funerary rituals, megalithic architecture, and the first stable social structures. Yet the roots of this symbolic language can already be traced to the Epigravettian communities of Arene Candide, where the body was thought, transformed, and signified as a vehicle of collective consciousness.

The Ligurian cave is thus not merely a deposit of human remains but a privileged observatory on the long *durée* of bodily language. From the Prince with his elaborate headdress to AC12 with his reshaped cranium, the sequence of burials reveals that human cognition has never been confined to the abstract mind: it has always found in the body its first and most enduring medium

of expression. In this sense, Arene Candide preserves not only the memory of the dead but also that of the embodied thoughts that have shaped our way of being human.

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