



THE MUSEO ARCHEOLOGICO ERNICO OF ANAGNI (FROSINONE, ITALY): A NEW PALEONTOLOGICAL AND PALEOANTHROPOLOGICAL EXHIBITION IN THE “CITY OF THE POPES”

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ABSTRACT: Opened in May 2023, the Museo Archeologico Ernico (MAE) in Anagni, Italy, is a newly established institution dedicated to preserving and showcasing the archeological and paleontological heritage of the Anagni Basin (southern Latium). This paper presents an overview of the museum’s scientific and exhibition design, developed through a collaborative partnership between the Ministry of Culture, the Superintendency for the provinces of Frosinone and Latina, and the Municipality of Anagni, under the scientific coordination of Sapienza University. The MAE highlights significant discoveries from key Pleistocene sites in the Sacco Valley, including the Early Pleistocene fauna of Coste San Giacomo and the Middle Pleistocene hominin and faunal remains from Fontana Ranuccio. The exhibition, organized in eight thematic rooms, focuses on human evolution, geological and climatic dynamics, paleontological and archaeological research methods. Beyond its role as an exhibition space, the MAE aims to serve as a pivotal cultural and scientific institution, fostering local collaboration and implementing strategic initiatives to boost visitor engagement and promote the valorization of the rich archaeological and paleontological heritage of the Sacco Valley. With its modern infrastructure, the museum promotes accessibility, integration, and the use of innovative technologies, making it a significant resource for both academic research and public education.

Keywords: Pleistocene, Paleontological and archaeological heritage, Science Museum, Anagni Basin, Human evolution.

1. INTRODUCTION

The Museo Archeologico Ernico (MAE) of Anagni (Frosinone) is a new and significant cultural institution dedicated to the preservation and promotion of the rich archaeological and paleontological heritage of the surrounding territory. The scientific and exhibition design project for the MAE’s ground and first floors begun in March 2022 and culminated in its inauguration on May 10, 2023. This goal was achieved through close collaboration between the Ministry of Culture, the Superintendency of Archaeology, Fine Arts and Landscape (SABAP, Soprintendenza Archeologia, Belle arti e Paesaggio) for the provinces of Frosinone and Latina and the Municipality of Anagni, through a scientific partnership with Sapienza University of Rome. The collaboration was coordinated by researchers, and professionals in relevant fields from the Department of Earth Sciences of Sapienza University (Fig. 1).

The exhibition was organized in eight thematic rooms maintaining the pre-existing layout of the first two floors of the museum building.

The thematic journey of the MAE focuses on the

geological history of the Anagni Basin including paleontological and archaeological findings, which represent the evolution of the territory through the Quaternary.

The museum aspires to become a key cultural reference for the region, rooted in a town already renowned for its historical importance. Anagni, a major center for medieval studies (e.g., the 1303 “Schiaffo di Anagni” [literally, “the slap of Anagni”], when King Philip IV of France clashed with Pope Boniface VIII, leading to the Pope’s brief imprisonment by Sciarra Colonna, also offers a remarkable window into the history of Earth and human evolution. Its surrounding territory holds exceptional paleontological findings and evidence of early human presence, spanning the last two million years.

The primary objective of the MAE is twofold: to consolidate its status as a cultural pole and resource for the municipality of Anagni, and to integrate its famous medieval heritage with that of its deeper past. A significant proportion of the findings exhibited at the MAE comes from numerous excavations in the area surrounding Anagni. These excavations have yielded a substantial number of finds attributable to fossil *Homo* populations, all located within the Sacco Valley, which contains



Fig. 1 - External view of the MAE (Museo Archeologico Ernico), Anagni, Latium.

Fontana Ranuccio and Coste San Giacomo two of Italy's most important localities for the study of the Quaternary (Cassoli & Segre Naldini, 1984; Segre & Ascenzi, 1984; Segre Naldini et al., 2009; Bellucci et al., 2012, 2014; Angelucci et al., 2023).

2. THE GEOLOGICAL AND PALEOANTHROPOLOGICAL CONTEXT OF THE SACCO VALLEY

The Valle Latina (Latin Valley) is a tectonic depression located in southern Latium, extending from Rome to Cassino along the course of the Sacco river. It is bounded to the east by the Lepini and Volsci Mountains, composed primarily of Mesozoic carbonate successions, and to the west by the Ernici Mountains (Cretaceous-Miocene). During the Apennine Orogeny, these formations were subjected to compressive stress and thrusting, with significant phases of tectonic compression during the Miocene and Pliocene (Carrara et al., 1995; Sani et al., 2004; Pereira et al., 2018) (Fig. 2).

During the Pleistocene, the region experienced an extensional phase that led to the formation of several intramontane basins. The infilling of these depressions generated the Quaternary continental successions of the area, predominantly composed of fluviolacustrine deposits such as gravels, sands, clays, and silts, as well

as pyroclastic layers sourced from volcanic centers active in the central Latin Valley between approximately 700,000 and 250,000 years ago. The most prominent of these intramontane basins is the Anagni Basin, covering an area of roughly 20 km² (Pereira et al., 2018).

What grants this basin its scientific relevance is the paleontological record preserved within its continental stratigraphy a record that reconstructs the Quaternary history of central Italy through multiple phases. Renowned sites of this territory are Coste San Giacomo, Fontana Ranuccio, Colle Marino and Ceprano.

2.1. The site of Coste San Giacomo (CSG)

Discovered in 1978 and dated approximately to 2.2 million years ago, the site of Coste San Giacomo is one of the most important Italian and European localities containing vertebrate faunas from the middle Villafranchian of the Early Pleistocene (Palombo et al., 2003). The site's stratigraphy reveals an initial fluvial-torrential phase, followed by lacustrine deposits and finally fluvial and continental layers. These sedimentary conditions enabled the preservation of fossil remains, especially within sandy and clayey layers (Bellucci et al., 2012, 2014; Florindo et al., 2021).

The site of Coste San Giacomo yielded a diverse vertebrate fauna, including especially large but also

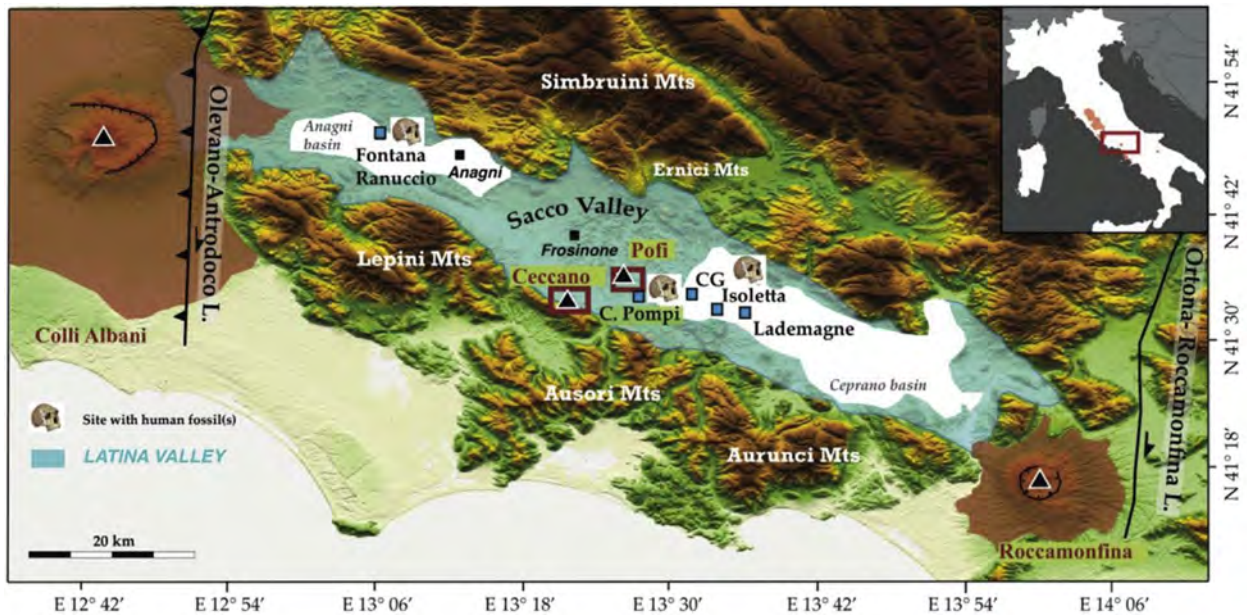


Fig. 2 - Reference map of the Latina Valley showing the locations of archaeological sites Fontana Ranuccio, Cava Pompei (C. Pompei), Cam-pogrande (CG), Isoletta, and Lademagne. Black triangles indicate the main volcanic centres. From Pereira et al., 2018.

small mammals, and amphibians (Bellucci et al., 2012, 2014, 2024; Bona et al., 2015; Strani et al., 2015; Palombo et al., 2017; Villa et al., 2021). For instance, several carnivorans are present at Coste San Giacomo, namely *Canis etruscus*, *Pliocrocuta perrieri*, *Martellictis ardea*, *Ursus* sp. and *Vulpes alopecoides*. The site documents one of the earliest European occurrences of the hippo *Hippopotamus* sp., the coexistence of the mastodon *Anancus arvernensis* and the mammoth *Mammuthus meridionalis*, and the largest European sample of the vole *Mimomys pliocaenicus* (Bona et al., 2015; Bellucci et al., 2024; Iannucci et al., 2023). For its importance, Coste San Giacomo has been taken as representative of a Faunal Unit, the last of the middle Villafranchian recognized in the Italian Peninsula, playing a key role in the correlation of the Gelasian continental paleontological sites of Europe (Gliozzi et al., 1997; Bellucci et al., 2014; Iannucci et al., 2023).

2.2. The site of Fontana Ranuccio

Fontana Ranuccio represents a markedly different phase of the Pleistocene. The site was discovered in 1976 during quarrying activities. Excavations, primarily led by the Istituto Italiano di Paleontologia Umana (IsIPU), uncovered a Pleistocene fauna and human remains initially dated to c. 450 ka, based on the $^{40}\text{K}/^{39}\text{Ar}$ dating performed by Biddittu et al. (1979) and subsequently redated at c. 400 ka with the $^{40}\text{Ar}/^{39}\text{Ar}$ technique (Pereira et al., 2018).

The sedimentary context is primarily volcanic, with stratigraphy composed of lapilli and scoria within a matrix of pedogenised colluvial sands. The fossiliferous layers also exhibit iron-rich diagenetic crusts indicative of post-depositional processes. Notable faunal remains include carnivorans such as *Panthera* sp. *Crocuta crocuta*, *Canis mosbachensis*, the presence of *Macaca sylvanus* and the archaic form of cave bear *Ursus deningeri*. The presence of *Stephanorhinus* sp. and *Equus* cf. *E. mosbachensis*, suggesting a range of habitats that

spanned from forests to open grasslands (Cassoli & Segre Naldini, 1993; Strani et al., 2018; Bona & Strani, 2021; Conti et al., 2021; Alberdi et al., 2024). Human remains attributable to *Homo heidelbergensis*, the presumed common ancestor of *Homo sapiens* and *Homo neanderthalensis* - have also been recovered, alongside numerous flint tools, indicating prehistoric human activity at the site and four teeth (Segre & Ascenzi, 1984; Rubini et al., 2014; Zanolli et al., 2018; Grimaldi et al., 2020; Angelucci et al., 2023). Fontana Ranuccio is another reference locality for a European Land Mammal biochronological scheme, giving the name to one of the Galerian Faunal Units around 400,000 years ago; (see Iannucci & Sardella, 2023, for discussion).

2.3. The Ceprano Cranium

Another site worth mentioning located near the Anagni Basin is Ceprano, where a Middle Pleistocene human fossil was found by Mr. Italo Biddittu in 1994, during road construction work. The specimen consists of fragments found in a layer of clay, hence the name "Argil" (clay in Italian) which constitutes a cranial vault (*calvarium*) representing an archaic human form characterized by a low, thick cranial dome and a strongly developed supraorbital torus (Ascenzi et al., 1996, 2000; Manzi et al., 2001; Di Vincenzo et al., 2017; Buzi et al., 2021).

Overall, the fossil displays a mosaic of morphological features that appear transitional between *Homo erectus* and *Homo heidelbergensis*, suggesting it may represent an archaic form of the latter species. Dated between 430,000 and 385,000 years ago, the Ceprano Cranium is one of the oldest hominin remains (even if partial) discovered in Italy. Its significance lies in the insights it provides into early human evolution on the continent, particularly regarding dispersal dynamics and diversification of prehistoric populations in Italy and across Europe (Manzi, 2016; Buzi et al., 2021).

3. THE MUSEO ARCHEOLOGICO ERNICO (MAE): A HUB FOR RESEARCH AND OUT-REACH, BETWEEN PAST AND PRESENT

The exhibition is located on the ground and first floor of the museum building located in Piazza Guglielmo Marconi, in the historic center of Anagni. On the first floor, the exhibition route encompasses geo-paleontological, paleoanthropological, and archaeological thematic sections. For each of these sections the exhibited specimens were selected to explore the main themes of the exhibitions with a particular focus on the geologic evolution of the region and its ecosystems changes over the last 2 million years.

To fully leverage the potential of the museum's spaces, the museological team conducted a comprehensive analysis of the existing structure. This involved not only an inventory of the available areas but also a detailed assessment of potential exhibition flow and critical emergency egress routes (Fig. 3). Concurrently with the museological planning, a virtual tour of the designated zones was developed. This digital model facilitated real-time visualization of the museological team's design choices, enabling more effective coordination with the museography team responsible for the physical implementation of the exhibition.

The central idea of the exhibition is to place the Anagni basin in a broader temporal context. This broadens the field of observation, going beyond the narrow focus on individual paleo-archaeological sites to embrace the overall evolution of the territory up to the present day.

The understanding of the archaeological and paleontological discoveries in this area is enhanced by the recognition of the work of past scholars over the last century and the ongoing research of current specialists. To emphasize this, a dedicated room in the museum illustrates the evolution and modern methods used in paleontological and archaeological research (Room 8).

This approach not only honors the long-standing research efforts in the region but also imbues the finds with educational and engaging significance that extends beyond their purely scientific importance.

3.1. The Museum structure

Considering the museum's structural organization across two levels, the visitor experience on the first floor unfolds through a series of thematically distinct rooms, each showcasing significant finds that highlight the archaeological, paleontological and geological richness of the region (Fig. 4).

The first room "The Museum, Anagni and its history", serves as an introduction to the museum and the Anagni city. A central display shows a partial cranium of *Bos primigenius* with its impressive horn cores. This space acts as a crucial orientation point, clearly signposting the subsequent anthropological and geological-paleontological sections.

The journey into human origins starts in the sec-

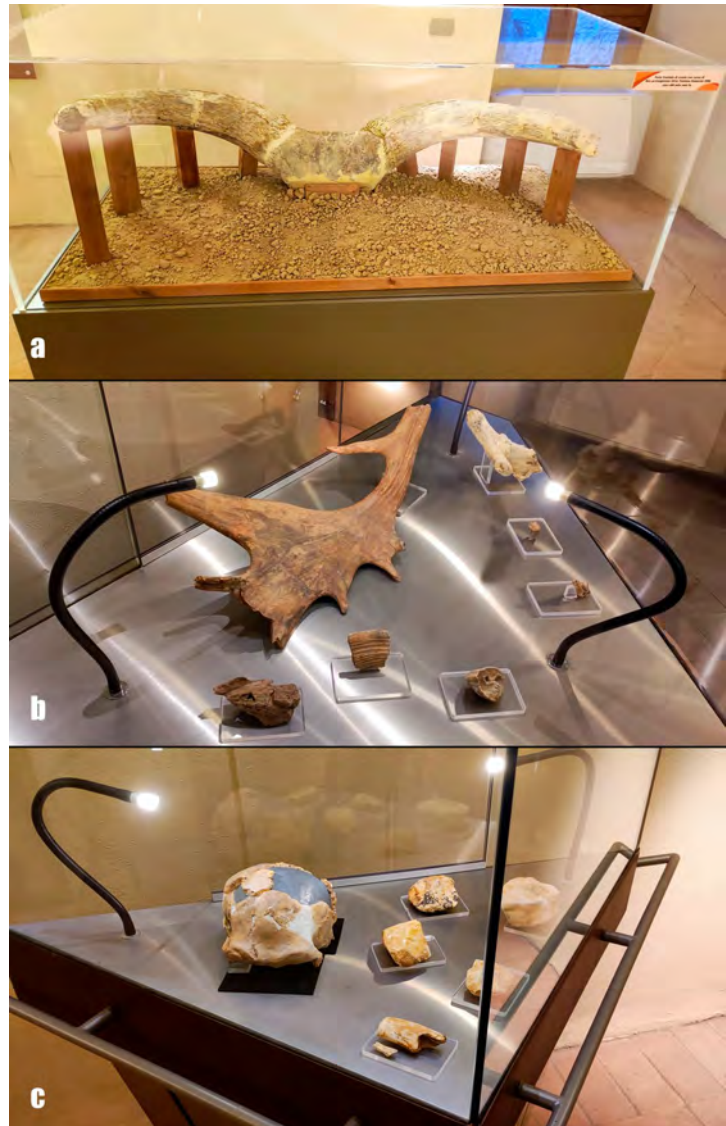


Fig. 3 - Exhibit examples at MAE. (a) Skull of *Bos primigenius* placed in the showcase donated by BancaAnagni. (b,c) Examples of triangular showcases displaying exhibits in the various rooms.

ond room "Introduction to Human Evolution", where key regional discoveries are presented in triangular showcases: a cast of the Ceprano cranium, a fossilized hyena humerus and some lithic tools from Colle Marino, evidence of a human presence in the area around 650,000 years ago (Angelucci et al., 2023). Adjacent to this showcase, a cast of the so called "chimera", a virtual reconstruction of a hypothetical *Homo heidelbergensis*, created by multiple specimens and digital modelling (Profico et al., 2019) offers a tangible view into this ancient ancestor's morphology. Explanatory panels contextualize these finds within the broader narrative of human evolution and the scientific methodologies employed in their study (Fig. 5).

Room 3, "Human Evolution", adopts a visually engaging approach, presenting human ancestry as a complex genealogical tree. At its center, a semi-circular ped-

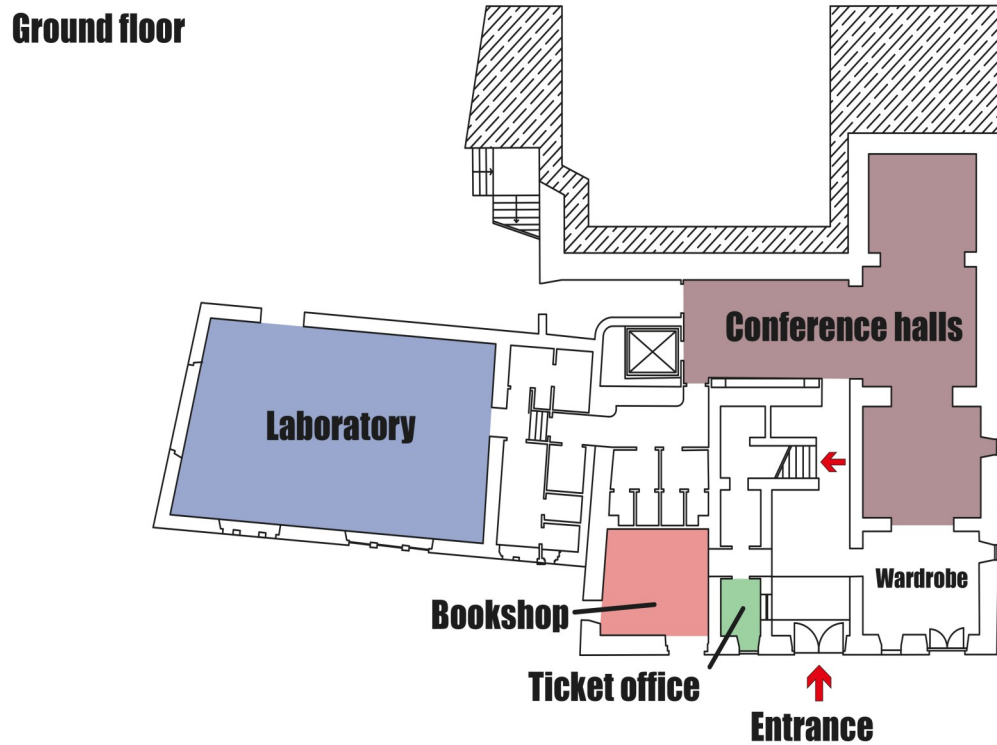
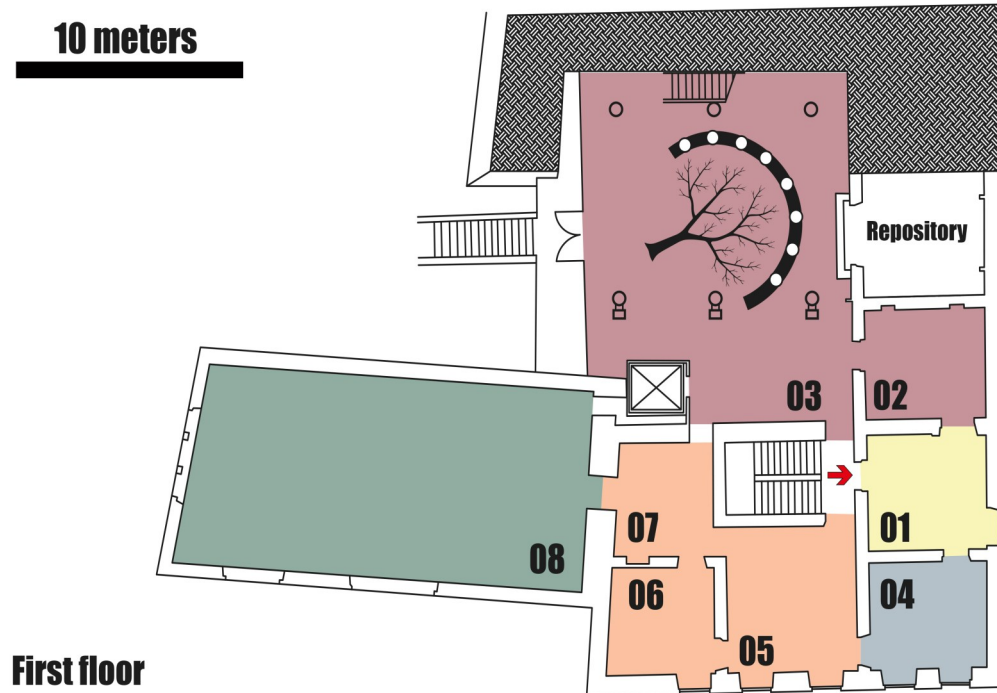


Fig. 4 - Museum's ground and first floors ayout, detailing exhibition and service areas: (01) The Museum, Anagni and its history; (02) Introduction to Human Evolution; (03) Human Evolution; (04) Geology and Climate; (05) The Coste San Giacomo Site; (06) The Fontana Ranuccio Site - Part 1: Environment and Fauna; (07) The Fontana Ranuccio Site - Part 2: Humans and Tools; (08) The Middle Pleistocene Environment.



Fig. 5 - A close-up view of the 'chimera', a virtual reconstruction of *Homo heidelbergensis*, as exhibited in Room 2. The background features explanatory panels and an artistic rendering of a possible female individual of this hominin specie.

estal displays a carefully curated selection of eight cranial casts representing the most known hominin species, illustrating the morphological changes over millions of years. A global map highlights key hominin discoveries worldwide, while a floor-level depiction of the evolutionary tree (Fig. 6) spatially connects these ancestral forms.

The deepness of the temporal context is established in Room 4, "Geology and Climate". Here, two triangular showcases present stratigraphic and mineralogical samples that shed light on the geological forces that shaped the southern Latium area and the principles of fossil dating. Explanatory panels detail the region's dynamic geology, the science of stratigraphy, and the significant climatic fluctuations of the Quaternary period, providing the essential backdrop for understanding the fossil records.

The paleontological site of Coste San Giacomo (CSG) is discussed in Room 5, "The Coste San Giacomo Site". Showcases present key fossils from this 2.2 million year old Early Pleistocene site, including a tooth of *Homotherium*, the saber tooth cat, along with a 3D print cast of the *Homotherium latidens* cranium further enhances visitor inclusive experience. Panels detail the site's discovery and multidisciplinary research, revealing a unique faunal assemblage including early occurrences



Fig. 6 - View of Room 3 showcasing eight cranial casts representing key hominin species, arranged in front of a world map detailing significant global finds categorized by species. The foreground displays a stylized representation of the human evolutionary tree, illustrating the history of our ancestors.

of the genus *Hippopotamus* and *Canis etruscus*, alongside the coexistence of *Anancus arvernensis* and *Mammuthus meridionalis* emphasized by an animated video created by one of the authors (M.Y.M.), which vividly reconstructs the CSG environment and its fauna (Fig. 7).

Room 6, "The Fontana Ranuccio Site - Part 1: Environment and Fauna", introduces another crucial site of the Valle del Sacco Basin, dating approximately 400,000 years ago. Showcases display the diverse large mammal fauna species identified at the site, offering a glimpse into the Middle Pleistocene biodiversity. 3D prints of cave lion (*Panthera spelaea*), hyena cranial casts and several 1:1 images of the animals "in vita" illustrated by one of the authors (F.S.), (Fig. 8) provides detailed morphological insights of the species found. Panels narrate the site's discovery, the research done during those years and the results obtained, such as the paleoenvironmental reconstruction, based on pollen and fossil analyses, which reveals a landscape of grasslands and woodlands inhabited by species such as *Palaeoloxodon antiquus*, *Stephanorhinus hemitoechus*, *Hippopotamus amphibius*, and the early aurochs (*Bos primigenius*), alongside predators like the cave lion and Deninger's bear (*Ursus deningeri*).

The human presence at Fontana Ranuccio is the focus of Room 7, "The Fontana Ranuccio Site - Part 2: Humans and Tools". Four significant human teeth discovered at the site digitalized by optical scanner and print in resin are shown in the room (Fig. 9). Another showcase presents a remarkable biface, made with elephant, alongside numerous retouched stone flakes, illustrating the sophisticated Mode 2 Acheulean technology employed. A pedestal highlights "small tools", refined flakes likely used for precision tasks. Panels discuss the importance of human dental remains

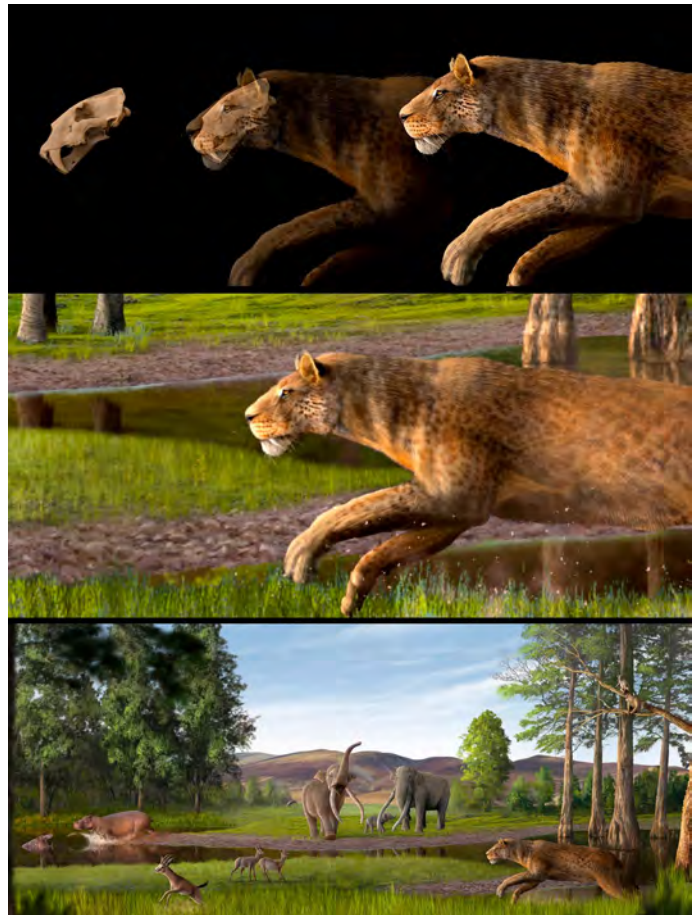


Fig. 7 - Three frames of the videomapping showing the paleoenvironmental reconstruction of Costa San Giacomo and the detail of *Homotherium*.



Fig. 8 - Reproduction of the extinct species represented in the museum. From left to right: Clacton fallow deer, Middle Pleistocene red deer, *Praemegaceros*, aurochs, Middle Pleistocene horse, *Stephanorhinus*. Shoulder height of red deer: around 1.20 m.

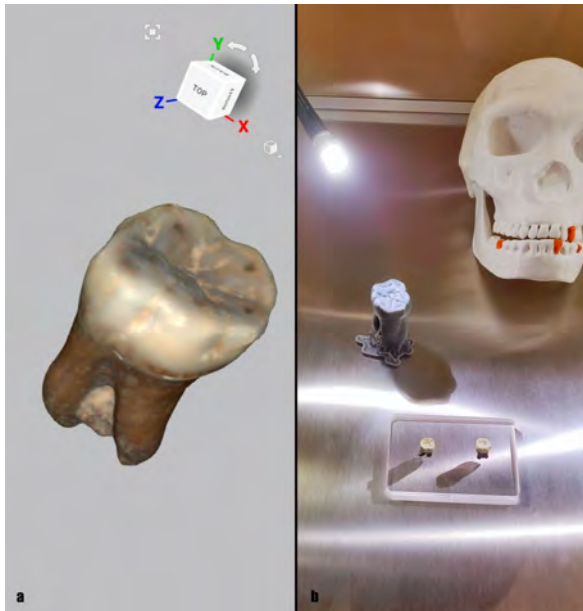


Fig. 9 - Digitization of human dental remains from the Fontana Ranuccio site, held at the Anthropological Service of the S.B.A.L. (Italian Ministry of Culture), and subsequent resin printing for public display. (a) virtual model acquired by optical scanner. (b) Resin print of a Fontana Ranuccio tooth. On the left a resin model magnified in dimensions enlarged to enhance its morphological characteristics, on bottom two of the four printed and painted human teeth, on the right, a PLA-printed human cranium is displayed, featuring highlighted teeth that represent the actual dental finds from the Fontana Ranuccio site. This presentation aims to improve comprehension of the specific teeth unearthed: an incisor, a canine, and two molars.

within the European Middle Pleistocene record and discuss the raw materials and production techniques of the lithic industry.

Finally, Room 8, "The Middle Pleistocene Environment", offers an immersive experience. A dedicated space introduces virtual paleontology, showcasing its applications through videos and 3D-printed animal crania and many large panels depict the megafauna of the preceding rooms (Iurino et al., 2013, 2022; Cherin et al., 2018). Using existing trapdoors with walkable glass, some simulated fossil finds, excavation tools, and lithic casts are displayed from a unique "bottom-up" perspective. At the end of the exhibition path, a reconstructed excavation surface provides a tangible representation of archaeological practice, further detailed in an adjacent panel. A life-size, double-sided cutout of *Palaeoloxodon antiquus* offers a striking encounter with an iconic species of this period (Fig. 10).

3.2. The informative panels: objectives and contents

In designing the museum's informational panels, the curatorial team worked from the outset with the objective of promoting the museum as a cultural and scientific reference point for the territory it represents. The content of the panels has been developed to offer visitors not only a general introduction to the geopaleontological and archaeological characteristics of the area, but also to illuminate the broader scientific significance of the southern Lazio region, whose contributions to the history of paleontology are of worldwide signifi-

cance. Crafting this regional overview required a considerable amount of synthesis, as the team was tasked with selecting the essential information necessary to convey the area's central role in the development of paleoanthropological research. The challenge lay in condensing a complex scientific narrative into an intelligible and compelling format, without losing the richness and depth of the content.

To achieve this, the panels integrate both thematic breadth and disciplinary depth. They provide foundational educational content on a range of topics, including paleoanthropology, stratigraphy, human evolution, virtual paleontology, the role of climate change as a key driver of evolutionary processes and the methods used in archaeological and paleontological excavation, offering visitors an understanding of the scientific processes behind the findings exhibited. This multifaceted approach was designed to engage a diverse audience - one that includes general visitors who may not have a specialized academic background - by equipping them with the conceptual tools necessary to appreciate the exhibits in their broader scientific context.

Alongside the selection of relevant content, an equally significant phase of the project was the editorial process. In close collaboration with the authors of the texts, the editorial team worked to streamline the language, eliminating redundant or overly technical passages that could hinder comprehension.

A deliberately simple and linear syntax was adopted to enhance the readability of the texts and to ensure that even complex scientific ideas could be easily grasped. This careful editing phase was not merely a refinement of style, but a deliberate effort to align with the museum's commitment to cultural accessibility and cultural democracy. The texts were thus restructured and revised to ensure that scientific knowledge could be transmitted clearly, accurately, and inclusively - qualities essential to fostering informed public engagement. It was through continuous dialogue and mutual respect for both scientific rigor and communicative clarity that the final product emerged: a set of interpretive panels that are dense with information yet accessible to all (Fig. 11).

4. MAE: OPENING, DEVELOPMENTS, AND FUTURE PROSPECTIVES

Since its inauguration on 10 May 2023, the MAE initially opened on weekends with free admission for several months, or upon specific requests from school groups or volunteers from the Anagni Proloco.

In December 2023, the Anagni Municipal Administration established crucial guidelines for the museum's initial phase, focusing exclusively on the first floor dedicated to the Archeo-paleontological (Resolution No. 39 of December 21, 2023). The administration gave key directives for an initial phase concentrated on developing the Archeo-paleontological section, highlighting the importance of an intensive promotional strategy and cautious management of museum services. The introduction of essential services, such as web marketing strategies, data collection, guided tour management, and educational support, has optimized the museum's attractiveness and daily operation.

February 2024 marked a turning point with the signing of a contract (lasting 10 months) with the company Archeoares snc for the direct assignment of services specified in a previous resolution. Despite the lack



Fig. 10 - The Middle Pleistocene environment exhibit: (a) Floor display showing evidence of hominin marrow consumption. (b,c) Final layout of the exhibition space.



Fig. 11 - Exhibit corner of the section concerning virtual paleontology (room 8). a) set up with digitized skulls in hands-on mode, video playback, and forex display panel summarizing some of the techniques used in modern paleontology and archaeology. b) example of display panel with qr-code for English version of the text.

of a full-time scientific director, the museum temporarily hired an activities coordinator, an employee of the Company, with a part-time contract lasting ten months.

The commitment to staff training and the museum's integration into the local cultural network, through agreements with cultural institutions and memoranda of understanding, has further strengthened its capacity to serve the community and visitors effectively.

The MAE management has adopted a proactive strategy to strengthen local cultural cooperation, promoting the signing of agreements and memoranda of understanding with other cultural bodies.

In particular, the municipal administration has initiated a collaboration with O.P.E.S. to implement five universal civil service projects, an indispensable and useful resource for the museum's ticket office and reception activities.

In March 2024, the "Anagni Pass" was conceived, established, and promoted, a single ticket providing access to both the MAE and the nearby Palazzo Bonifacio VIII.

The introduction of this pass represents a strategic step towards integrating the MAE into Anagni's cultural and tourism fabric, fostering a synergy between local cultural institutions. The Anagni Pass not only facilitates

access to multiple sites with a single purchase but also serves as a tool for enhancing the historical center of Anagni, an area spanning approximately one kilometer that can be explored in about 20 minutes on foot.

The creation of the "Anagni Pass" and ticketing strategies are steps towards the goal of a future concession of museum services to third parties, with the aim of creating a strong cultural network in the historical center of Anagni, incentivizing tourism and the valorization of local heritage.

Two years after its opening, and following the decisions made by the Municipality of Anagni (determination no. 34 of January 10, 2025), ARTISLENDORE ITALIA SRL has been tasked with managing its cultural services for seven months. This temporary choice serves to keep the Museum open and functioning while the approval of internal regulations, the definition of services offered, the appointment of the scientific director, and the preparation for a long-term assignment are being completed. ARTISLENDORE ITALIA SRL's responsibilities include online and onsite ticket sales, the organization of at least ten guided tours, activities for schools, and the coordination of all of this.

5. CONCLUSIONS

The MAE has significant potential as an important scientific and cultural resource. Its modern and well-equipped facilities, which include areas for visitor reception, education and research, combined with the effective cooperation between the city management, cultural organization and universities, place it at the forefront among institutions dedicated to the cultural growth of the local area.

This collaborative framework enables the museum to function as a nucleus of cultural, educational, and research activities, establishing it as a key reference point for culture and tourism in the region.

The prospect of transforming the MAE into a center of cultural and scientific excellence is a concrete and achievable ambition. The success of this transformation will depend on the implementation of modern management strategies that promote sustainability and the museum's integration into the broader cultural circuit. This, combined with the uniqueness of the exhibited finds, the focus on accessibility, and the use of innovative display and conservation technologies, will be crucial for its future impact.

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