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# Beyond physical space. Virtual exhibition proposal for the site of Poggetti Vecchi (Grosseto, Italy)

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ABSTRACT - The middle Pleistocene site of Poggetti Vecchi (Grosseto, Italy) was excavated in 2012 when the construction of a thermal pool brought to light a stratigraphic succession with various levels of human frequentation. Data suggest that the presence of thermal water may have attracted animals and Neanderthals to Poggetti Vecchi at the beginning of the penultimate glaciation (MIS6), when the climate was getting colder.

The oldest archaeological unit (U2), dating around 170,000 years BP, consists of a paleosurface on which the remains of large fauna, stone and bone tools, and wooden artefacts were found. The remains of seven individuals of *Palaeloxodon antiquus* were found, probably belonging to a single family of elephants who died of natural causes. The most significant finds consist of fragments of digging sticks made of boxwood (*Buxus sempervirens*). Some of the sticks were partially blackened by fire, as a result of the working and finishing of the tools, providing the earliest evidence of the use of fire as an engineering tool.

The particularity of the Poggetti Vecchi environmental and archeological context is ideal for the dissemination of many aspects to a non-specialist public, including the reconstruction of the human-environment relationship in a period of climatic emergency. Despite this, the site of Poggetti Vecchi is still waiting to find a suitable temporary or permanent location for a museum exhibition.

Since physical space is increasingly difficult to find, while digital technologies are more accessible in everyone's daily life, the Istituto Italiano di Preistoria e Protostoria, as part of its research projects, wanted to promote the outreach of scientific culture through the virtual exhibition "170,000 years ago in Poggetti Vecchi. Neanderthals and Elephants in the Tuscan Maremma, the climate challenge".

Exploiting technology, this virtual exhibition made it possible to substitute the real space with a digital reality capable of expanding the visiting experience. One of the aims is to engage the public on the subject of the relationship between climate change and human communities since the origins of human history.

Keywords: Virtual exhibition; digital reality; Neanderthal; digging stick; *Palaeloxodon antiquus*; climate change.

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## 1. INTRODUCTION

The site of Poggetti Vecchi (Grosseto), represents an outstanding case study for the reconstruction of a specific 'thermal' ecosystem on the threshold of the penultimate glaciation. The site dated to 170,000 years ago, comprises remains of the *Palaeoloxodon antiquus* and artefacts that can be referred to early Neanderthals. The site was completely excavated during an operation of rescue archaeology in 2012. The materials found included elephants' bones, lithic tools, and the exceptional discovery of wooden tools. All these find are still waiting for a suitable temporary or permanent exhibitive location.

The variety of the materials and the peculiarity of the archeological and environmental context are particularly suitable for communicating various features to a non-specialist public. These features include the reconstruction of the relationship between man and the environment in a period of climatic crisis and the complexity of prehistoric research, as well as the restoration and conservation of specific artefacts.

Within the framework of its research projects, the Istituto Italiano di Preistoria e Protostoria decided to foster the spread of scientific culture through the virtual exhibition "170,000 years ago in Poggetti Vecchi. Neanderthals and Elephants in the Tuscan Maremma,

the climate challenge", which was launched in the Italian version on the 17th of December 2021 at TourismA (Florence) and in the English version at the Annual Meeting of the European Association of Archaeologists 2023, in the iNEAL session "Integrating Neanderthal Legacy: New Opportunities for Cooperation".

The exhibition aims to bring the public closer to the issue of the relationship between climate change and human communities from their origins, using cutting-edge scientific methods as the basis for developing models of sustainability.

### 1.1. THE ARCHEOLOGICAL SITE

Poggetti Vecchi is located near Grosseto (southern Tuscany, Italy) in a confined, depressed plain at the foot of an 11-m-high hill. Warm water springs occur locally, connected with the intense geothermal system present in many areas of southern Tuscany. The local gushing of thermal water is favoured by faults that reach the surface.

The Paleolithic site of Poggetti Vecchi was unexpectedly brought to light in 2012 at a depth of around 2.5 m while digging for a new thermal swimming pool. Stratigraphic excavations were carried out in an around 60 $m^2$ residual portion of the area divided into two sub-sectors, north and south of a narrow artificial ditch made to drain away hot spring water (Aranguren et al., 2012, 2013, 2019 a,b; Benvenuti et al., 2017).

The systematic excavation encountered an about 3-m-thick stratified succession of alternating lacustrine and colluvial deposits. Seven stratigraphic units have been recognised, named U1 - U7 from the bottom upward.

Unit 4 contains pisoliths and vertebrate bones suitable for radiometric dating. Pisoliths yield a U-series age of 171±3 ka and a left lower molar of *Bos primigenius* provided an ESR/U-series age of 170±13 ka (Benvenuti et al., 2017).

The paleosurface U2, formed with low sediment input, contains the oldest anthropic evidence of the site, represented by stone tools and wooden sticks, interspersed with bones of large vertebrates, especially *Palaeoloxodon antiquus* (Capalbo et al., 2018; Aranguren et al., 2019b).

The first focus of the multidisciplinary team involved in the research was to reconstruct the evolution of the landscape. The study is based on the characteristics of the deposit and of the paleobiological characteristics of vertebrates, mollusks, ostracods and pollens (Benvenuti et al., 2017).

At Poggetti Vecchi, pollen analysis highlighted the occurrence of grassland and wetlands in the plain, the latter particularly rich in species. Deciduous woods with the dominance of oaks covered the slopes of the surrounding hills.

Mollusks and ostracods indicate that the area was humid and scattered with temporary seasonal ponds. The climatic conditions were cooler than at present, with mean annual temperatures about 6 °C lower than at present, which seems in line with the temperatures at the onset of MIS 6.

Unit 2 was particularly rich in vertebrate remains. The large mammals are dominated by the straight tusked elephant (*Palaeloxodon antiquus*) followed, with progressively decreasing abundance, by the aurochs (*Bos primigenius*), the red deer (*Cervus elaphus*), and the roe deer (*Capreolus capreolus*).

250 lithic artefacts made from local raw materials were found in U2. The industry typologically refers to the Mediterranean lithic contexts between the end of the Lower Paleolithic and the beginning of the Middle Paleolithic. The lithic production was ultimately aimed at making thick, retouched flakes. Most have been retouched to obtain very regularly shaped blanks, intentionally designed for specific functional activities. Generally speaking, the majority of the tools display evidence of longitudinal actions on animal tissues.

Traces of knapping or of other anthropogenic modifications with functional implications were observed also on about 40 implements made from bones (Aranguren et al., 2019b).

The 34 wooden artefacts found on the paleosurface U2 were mostly concentrated in a relatively small area (around 17 $m^2$) at the western end of the excavation (Aranguren et al., 2018). They were all horizontally and randomly oriented, and in contact with the elephant remains. Some of them were found under the bones. The wooden artefacts are all made from *Buxus sempervirens* L. (boxwood). Boxwood is indeed probably the heaviest, hardest, and stiffest wood among European timbers.

The morphometric characteristics of the Poggetti Vecchi wooden sticks (dimensions, rounded handles, and blunt tips) recall those of the so-called "digging sticks". The sticks show traces of working: the surface is smooth, without bark and lateral branches, with the branch knots levelled to the surface of the stick. Both extremities are shaped. Digging sticks are multipurpose tools, which are a common part of the everyday equipment of foragers. They are used not only for gathering plants but also for hunting small game.

The surface of twelve sticks from Poggetti Vecchi is partially blackened. All these tests indicate that these wooden tools were superficially charred.

An experimental study was carried out to reconstruct the operational sequence and to verify that the use of fire was functional to the process of manufacture of the boxwood sticks (Revedin et al., 2020). The experimentation demonstrates that fire is useful for the removal of leaves, shoots, and bark and the shaping of the pointed tips. To achieve these results, a controlled management of 'fire' is necessary, as documented also in ethnographic contexts.

The Poggetti Vecchi sticks provide the first evidence of the use of fire for working wooden implements.

## 2. WHY A VIRTUAL EXHIBITION?

All the materials recovered in the Poggetti Vecchi excavation, still under study, are now stored in different

places - in Florence the wooden tools, in Grosseto the elephants' tusks and all the faunal remains, and in Trento the lithic tools.

In the ten years since the discovery, the interdisciplinary team has already published several scientific papers (Benvenuti et al., 2017; Aranguren et al., 2018; Capalbo, 2018; Aranguren et al., 2019 a,b; Capalbo et al., 2018; Revedin et al., 2020). In parallel with the scientific progress of the research, the scientific team also tried to disseminate the discoveries through different media, such as conferences for the general public, articles in archaeological magazines (Aranguren et al., 2019b), and documentaries on national TV (https://www.youtube.com/watch?v=i9LrYDfn-t0& ab_channel=Rai).

But what is still missing for Poggetti Vecchi is 1) a place to display and conserve all these findings, considering their huge dimensions and the extreme fragility of the ancient wooden tools; 2) the engagement of the greater public, especially the local community where the find come from.

We opted for a digital exhibition to showcase this unique site and its finds keeping in mind the Faro convention mission. The convention encourages improving access to heritage, in order to raise awareness about its value. It also fostered the use of digital technology to remove the barriers to information regarding cultural heritage and also for educational purposes (https://www.coe.int/en/web/culture-and-heritage/faro-action-plan#).

To pursue these goals we decided to realise a virtual exhibition, combining different digital supports (photo, video, 3D, illustrations) to design a journey back in time, starting from the excavation up to the overall interpretation of the site. We opted for a free, open-access platform, Artsteps (https://www.artsteps.com/), user-friendly and easy to access.

The virtual exhibition on Poggetti Vecchi is easily accessible from any browser just accessing to Artsteps and searching for "IIPP" or "Neanderthals". The exhibition is also accessible through smartphone, downloading the app Artsteps. The virtual space is simple and user-friendly, it is possible to move into the virtual space autonomously or start the virtual tour already prepared (Fig. 1).

To welcome the visitors, there is a Neanderthal woman holding a wooden stick, an illustration made by the great artist Tom Björklund who cooperates with us for the illustration of this exhibition (Fig. 2).

Approaching from the sea, we come to the small hill of Poggetti Vecchi where there is a thermal spring of hot water and we can appreciate this special environment, a temperate niche and a potential refuge for animals and men.

Moving on, we reach the excavation section, where videos and photos show all the phases of this rescue dig. The operation was very difficult because of the thermal water flowing constantly on the site.

The next step is a large exedra where the focus is on the *Palaeoloxon antiquus*, this gigantic extinct elephant who lived in this area until the penultimate glaciation (Fig. 3). On the paleosurface the remains of an elephant family were found, consisting of 7 individuals of different ages who died from natural causes. One of the main hypotheses is a change in the diet of those elephants. The deterioration of the climatic conditions restricted their feeding to only the grass available in the prairies surrounding the site. This factor may have contributed to the death of these animals (Capalbo, 2018; Aranguren et al., 2019b). We wanted to show also the conservation measures taken to preserve the tusks, from the removal from the ground to the laboratory restoration (Pozzi et al., 2014; Caloni et al., 2015).

The next section regards the paleoenvironment in Poggetti Vecchi 170,000 years ago (Fig. 4). Illustrated here is the study carried out by the interdisciplinary team to reconstruct the climate and the environment (Benvenuti

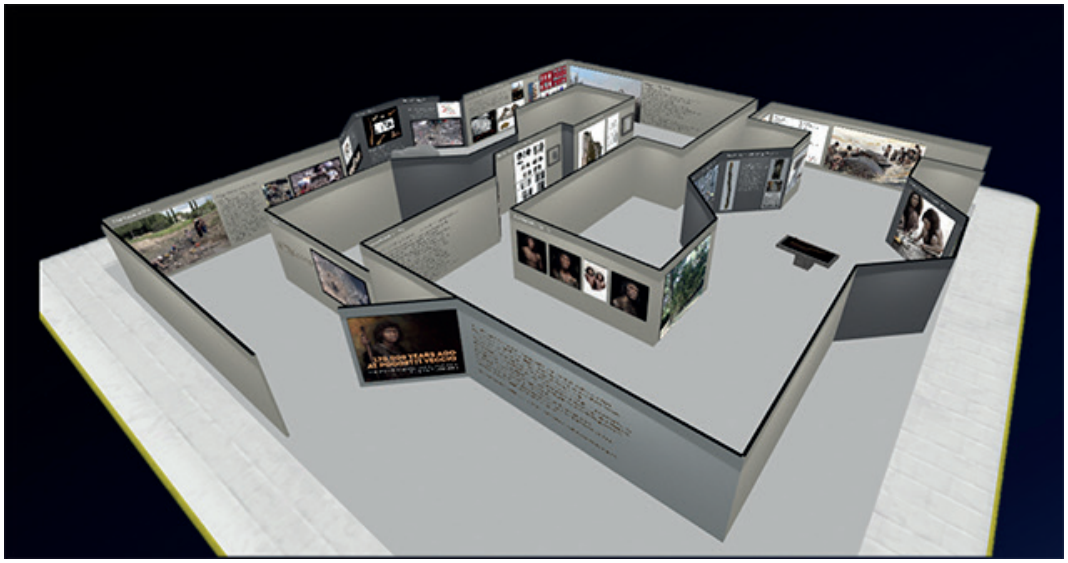

Fig. 1 - General view of the virtual space.


Fig. 2 - The entrance to the virtual tour. Illustration by Tom Björklund.

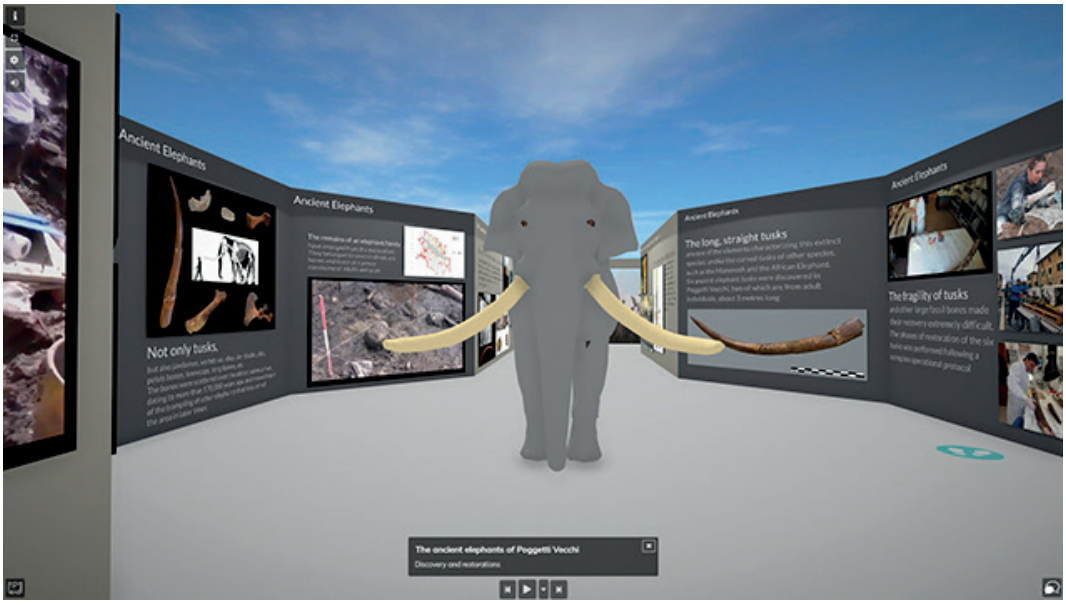


Fig. 3 - The *Palaeoloxodon antiquus* exedra, with a 3D reconstruction of the extinct elephant.

et al., 2017) through the analysis of macrofaunal remains, such as red deer, *Bos primigenius*, and even hyenas. Thanks to the study of microfaunal remains, especially mollusks, and ostracods, it was possible to determine the climate in the Pleistocene at the beginning of the penultimate glaciation. The cold may have driven the animals here to this niche of warm thermal waters. They certainly became the prey of Neanderthals at some point.

As already anticipated, the presence of humans is well testified in the site by numerous artefacts scattered on the paleosurface (Aranguren et al., 2019). There are bone instruments - about 40, made by chipping mammal bones.

But the presence of humans is also attested by about 250 chipped stone artefacts, some of them with use-wear showing that these tools were used both for slaughtering activities and for woodworking. We decided to display also a 3D reconstruction of significant bone and lithic objects.

As previously mentioned, we are in the presence of some of the oldest known Neanderthals in the Tyrrhenian area. Here starts the Neanderthal gallery, with the portraits made by Tom Björklund (Fig. 5). Our intent was to show the variability of this species, but also its "human" side.

We are now in the second focus of the exhibition, entering the exedra dedicated to wooden tools (Fig. 6). As we all know, wood is a perishable material rarely documented for the Paleolithic. This uniqueness made it important to spread knowledge of the wooden sticks of


Fig. 4 - A view of the palaeo-environmental section, with illustrations by Tom Björklund.


Fig. 5 - The Neanderthal Gallery. Illustration by Tom Björklund.

Poggetti Vecchi as widely as possible also because they are the oldest wooden artefacts found in Italy.

The aim was to communicate the incredible emotion of seeing these long sticks resting on the earth, soaked in thermal water after 170,000 years.

There is no doubt that the sticks were worked, they all have standardised features, such as a handle on one side, a round tip on the other side, the lateral branches removed (Aranguren et al., 2018). Some of these sticks have also a blackened surface and both SEM and chemical analysis confirmed that the burns are intentionally produced by fire, so Neanderthals were able to control fire for woodworking as tested in a series of experimental sessions (Revedin et al., 2020). In the middle of this exedra, there are 3D reproductions of 3 wooden sticks.

Also documented in the exedra is the ethnographic comparison, which allows us to understand that these were digging sticks, still used in today's hunter-gatherer communities especially by women.

At the end of the virtual visit, we meet again the Neanderthal woman who welcomed us at the entrance, now giving us her side of the story. Thanks to the ability to manage the fire and the opportunities offered by the elephant carcasses and the Poggetti Vecchi thermal refuge, the Neanderthal group was able to survive during this climate challenge (Fig. 7).


Fig. 6 - The wooden tools exedra. In the centre, a virtual showcase with 3D reconstructions of three digging sticks from Poggetti Vecchi, made by Martina Polig and Sorin Hermon (Cyprus Institute).

Fig. 7 - The final scene with the site interpretation, made by Tom Björklund.

## 3. CONCLUSION

Leveraging the idea that physical space is increasingly unavailable in terms of time and space, whereas digital technologies are increasingly accessible in everyday life, it was decided to exploit technology to replace the real space with a digital reality capable of expanding the visitor experience. The extraordinary discoveries made at Poggetti Vecchi deserve to be disseminated to reach the greater public. However, the peculiarity of the materials, such as the fragility of the wooden artefacts and the dimensions of the elephant bones and tusks, make it challenging to find an appropriate physical venue to display them in Grosseto, the largest city near the site. Even if this possibility materialises, we still need to keep in mind that Grosseto lacks an international touristic network, making it difficult to visit the physical exposition. Moreover, the overall management costs must be considered, especially in terms of personnel to keep the exhibition open to the public.

A virtual exhibition fills these gaps, allowing visitors to get access to Poggetti Vecchi at any time, from anywhere in the world. The most significant result of this work and the proof of its validity is surely the number of visitors

of the exhibition during the first year: more than 3,500 visitors had the chance to take a walk through the Poggetti Vecchi site.

Moreover, it allows real-time updating of the research information according to the latest discoveries made by the scientific team, simply by adding or modifying the exhibition sections. This makes the virtual exhibition expandible and updatable, but also integrable with a physical one.

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