So far, so close. Prehistoric studies and digital technologies in a changing environment

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ABSTRACT - The relationship of prehistoric science with digital technologies and methods seems to be more complex than it has been for other branches of archaeology. Analyzing three Italian case studies (the 1985 exhibition "Homo, viaggio alle origini della storia", the Casal de' Pazzi Museum, and the Palaeolithic Museum of "La Pineta"), the authors trace a reflection on the way the Western culture dealt with the representation of human most ancient past and try to look forward at possible future evolution and applications of this field of study.

Keywords: Prehistory; virtual archaeology; Paleolithic; cultural heritage; history of archaeology.

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1. INTRODUCTION

A retrospective study on how digital technologies have been used in the field of prehistoric archaeology is not only a fascinating juxtaposition of the earliest human past with the newest communication strategies; it is also a way to reflect on how people and scholars have constructed a representation of that past (which necessarily reflects the vision of their present), trying to make it more familiar, visually recognizable, and - therefore - understandable.

The visual approach seems to have been a fundamental requirement in prehistoric studies since their inception. The very original definitions of "paleolithic" and "neolithic" as ages of the "old" (chipped) stone, in contrast to the "new" (polished) one, clearly demonstrate the need of managing the entire anthropological complexity of a long-lasting evolutionary process through a well visible fossil aspect. In this sense, it is not surprising that prehistory has resorted to visual devices, as well as digital representations, before other fields of study. In fact, attempting to trace a historical path of the so-called "Virtual archeology" (Caravale and Moscati, 2021), its first diffusion, in Italy, could be dated back to some theoretical frameworks lasting to the second half of the 1990s (Forte, 1996; Forte and Williams, 2003); while some interesting examples of computer-aided multimedia approaches for museum applications significantly precede them, and it

is interesting to note that they were related to prehistoric contexts.

2. "HOMO: VIAGGIO ALLE ORIGINI DELLA STORIA"

In 1985, the exhibition "Homo, viaggio alle origini della storia" ("Homo, journey to the origin of history") was held in Venice and organized by Ferrara University and the CNR, and for the first time made significant use of computer applications to better disseminate paleontological contents to a wide audience, thanks to the support of IBM (Weisser, 1985; Peretto, 1985; Peretto and Sala, 1985).

It was the very first stage of the diffusion of personal computers: in Italy, the earliest wide-marketed brands were advertising their models, such as the Commodore 64 and ZX Spectrum, mainly to teenagers and students, and it was truly a pioneering case to use PCs for the dissemination of contexts related to our biological and cultural evolution. The visitor's path implied 27 terminals managed through specific, tailor-made software. The user could interact with the system, asking for specific information and following self-configured paths.

Images and texts were obviously created through a "pixel art" approach (as we call it today): modeling letters and figures through square pixels with low resolution

and few colors (Fig. 1), nonetheless, it took a long time to reach such contents, while today it would only take a few mouse clicks to achieve a much better result in terms of graphic taste. However, the Venice exhibition, in addition to its romantic dimension, represents the earliest example in Italy of a computer application for archaeological dissemination during a very early phase of PC development.

Given the limits of the newborn technology, its contribution to the exhibition mainly consisted of a sort of newly shaped "explanation panels" represented by the displays, whose innovative elements were the interaction and the high-tech flavor. Anyway, lasting for six months, the Homo exhibition held some 250.000 visitors, was widely discussed by mass media, and was visited by the responsible of the highest Italian political institutions, thus representing a unique case in the history of this kind of initiative.

3. CASAL DE' PAZZI MUSEUM

A few years later, at the Museum of Casal de' Pazzi, in Rome (Gioia 2016, 2020) (Fig. 2), which was still under construction, a structured multimedia system was designed and set up for the same purpose, based on a narrative approach and a computer-based projection device (Fig. 3a). Once again, the distant Prehistory was the driving force behind this communicative choice.

Ten Middle Pleistocene sites are located both in the surroundings of the Italian capital and within the town itself (Anzidei et al., 2004). Many of them were found in the lower Aniene valley. Before the Second World War, this territory was open countryside. Sand and gravel quarries were under exploitation and numerous Pleistocene deposits, including archaeological sites, still existed at the time.

Casal de' Pazzi is the only surviving one among these sites, now well within the new Rome quarters. It was discovered in 1981, during excavations to prepare infrastructures for a neighborhood under construction (Anzidei and Ruffo, 1985). A 200,000 years old fossil branch of a Pleistocene river was at that time unearthed. More than 2000 faunal remains were discovered in the deposit: straight-tusked elephant (Palaeoloxodon antiquus), extinct aurochs,

hippopotamus, bear, rhinoceros, horse, wild boar, hyena, wolf, fallow deer, deer, waterfowl, and also fossil leaves of a tree of the Ulmaceae family. The remains of Elephas struck the imagination of people already during excavation, because of their size and quantity: some thirty tusks were found, together with molars, skull, and basin fragments, as well as some long bones. The human presence is also attested: in 1983, a human parietal bone fragment was discovered under a tufa block. Furthermore, more than 1,500 stone tools were collected, made from small pebbles, as is usual in this coastal part of central
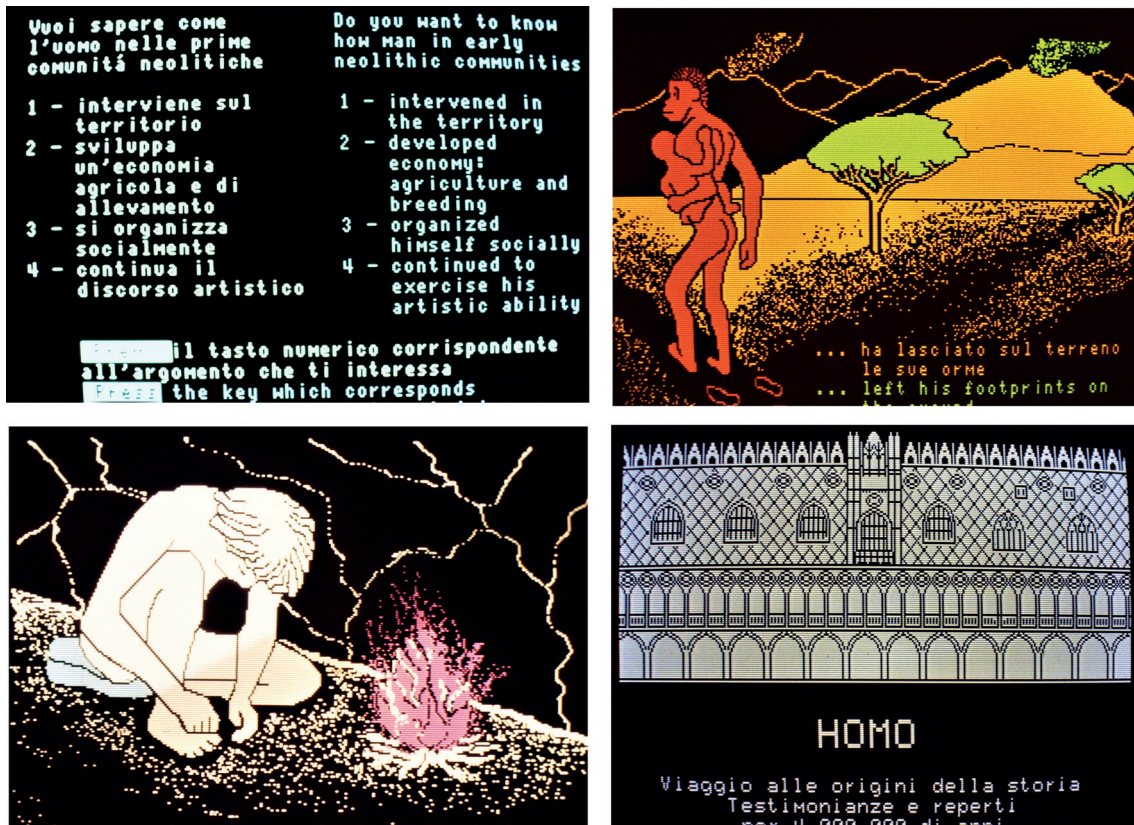

Fig. 1 - Some screenshots of the information system of the Exhibition "Homo, viaggio alle origini della storia" (1985).

Fig. 2 - The Casal de Pazzi Museum application "Pleistostation", and the museum's general view.
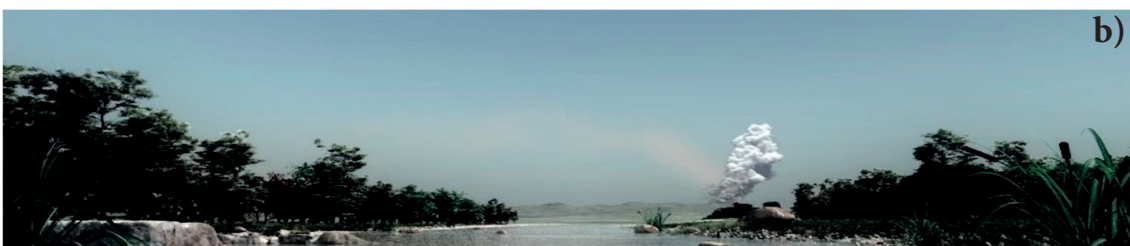

Fig. 3 - a) Casal de Pazzi Museum: landscape reconstruction of the prehistoric environment in the first application (drawing) and b) in the new one (digital model).

Italy (Anzidei and Gioia, 1992).

The value of the deposit relies on many issues: it is exceptionally well preserved, in the heart of the modern city; it allows to reconstruct and depict an ancient landscape as well as identify the animal species present at the time; it shows the presence of hunter-gatherer human groups in the territory of Rome since early times; it is the only Pleistocene site to be preserved and visible today, out of the many once existing in the lower Aniene valley. For this reason, the deposit has always sparked great interest among scholars and common people, thus supporting a process of conservation and promotion of the site (Gioia, 2015). So, the Pleistocene deposit became an integral part of a museum through a long process that began in the '90s. Due to the dual marginality of the site, owing both to its peripheral location compared to the historic center, and the preeminence of Rome's classical archaeology heritage, the search for effective communication strategies has always been of fundamental importance.

At the time of the system setting, approximately some ten years had passed since the Venice exhibition, and computer science had undergone significant advancement. The Casal de' Pazzi setting involved a computer-based video projection in which the graphic reconstruction of the environment and of the Elephas was managed according to a storytelling approach. We are not still in the phase of explication texts and pixel compositions: PCs are starting to work as managing agents of multimedia systems, enabling immersive experiences.

The system was updated only a decade ago through new computer graphics features and more current virtual reconstructions (Fig. 3b), but based on the same logical structure and narrative content (Palombini et al., 2012, 2013).

4. ISERNIA LA PINETA

After many years and with a different communicative logic, a computer application has been realized at the National Museum of the Paleolithic of Isernia "La Pineta" in 2018 (Palombini et al., 2020) that allows viewing virtual scenarios created from the current landscapes closer and similar to prehistoric environments.

The famous site of Isernia La Pineta (Molise, Southern Italy; Fig. 4), dated about 600,000 years ago (Peretto et al., 2006), preserves remains that the many interdisciplinary studies carried on date back to the end of an interglacial period when in the place there were large open areas and various wetlands with thicker vegetation and then woods with oaks, pines, birches, beeches, hornbeams, ash trees, walnuts, and chestnuts. These environments were populated by macaques, bison, rhinos, straight-tusked elephants, and even bears, hippos, tahrs, beavers, and cervids. There were carnivores such as lions, leopards, and hyenas. The remains allow us to reconstruct a human occupation in the close proximity of a small lake basin, recognized thanks to the presence on site of travertine rocks, which men had frequented intensely, accumulating large quantities of animal bones and numerous lithic finds in flint and limestone (Coltorti et al., 2005). Some areas have been identified that can be attributed to specific activities, from stone chipping to the slaughter of animal carcasses. In 2014, a child's deciduous tooth was identified which, at the current state of research, represents the oldest human remains on the Italian peninsula and is attributed to Homo Heidelbergensis, based on morphometric and chronological characteristics.

Although in the past the Museum used realistic life-size models of the straight tusks elephant and numerous artistic reconstructions that have contributed to imagining life and environments of 600000 years ago, the recent communicative choice entrusted to virtual reconstructions, usable with a complex system of projections and a touch screen, was that of an approach which enhances the interrelation between present and past and does not limit itself to comparing our behaviors and thoughts with those of our millennial ancestors. The goal is also the enhancement of the local territory through visits outside the museum, giving the opportunity to see landscapes still preserved in the Molise region, and close to those of 600,000 years ago. In this sense, the Isernia application mixes high-resolution computer graphic reconstructions of Paleolithic environments with Ultra HD pictures and video of the current landscape (Fig. 5). The interaction between CNR, University and experts from different sectors was very important, as the final work is the result of a very careful finishing process, both from the archaeological and graphic point of view, taking into account the different targets to which it was directed.

5. PAST AND MODERNITY

These examples are the tip of the iceberg of countless experiences related to the disclosure of prehistory, in terms of visual impact through digital technologies. It is noteworthy to realize that, from the spread of virtual archaeology in the late 90s (when technology reached a satisfactory graphic quality), a dozen years were necessary to overcome some skeptical approaches and prejudices from many archaeologists, due to the difficulty of showing the degree of reliability of virtual reconstruction (Palombini, 2021), above all in the domain of classical archaeology; while on the other hand, as we have seen, prehistoric studies had already recurred voluntarily to digital resources well before.

Anyone will wonder why prehistory, long before other fields of archaeological study, has resorted to the opportunity of newborn computer facilities to enhance museums and exhibitions, given that, ideally, prehistoric landscapes lack significant architectural characteristics of many historical periods of the past and therefore can also be shown through a simple juxtaposition of current landscape images, that do not necessarily require virtual reconstructions (or need them less than historical

Fig. 4 - Isernia Museum of "La Pineta": screenshots of the application and general view of the archaeological deposit and museum general view.

contexts).

Probably, the lack of macroscopic archaeological data has always stimulated prehistoric scholars to draw information from every smallest data available and to use techniques and methodologies common in other fields of study which only afterward have been adopted in other branches of archaeology.

Something similar has happened, for example, in the field of quantitative analysis: quantitative methods and spatial analysis have been performed first in prehistoric contexts, and only at a later stage adopted in other archaeological fields (Clarke, 1978; Binford and Binford, 1968); as well as the theoretical basis of spatial archaeology were set up, thanks to the analysis of pre and protohistoric contexts, well before the spread of GIS and PCs (Hodder and Orton, 1976).

The reasons may be similar for both processes: prehistoric research has been forced towards quantitative approaches as it lacks written documents and engraved texts which were initially considered primary sources

Fig. 5 - Isernia Museum of "La Pineta". a) Landscape reconstruction and projection of an example of b) a current landscape close to the ancient one.

of information. At the same time, prehistory lacks architectural elements which mark in a macroscopic way the anthropic action on the landscape and characterize it in clearly visible shapes. The common imaginary universe of archaeology, in fact, since about three centuries ago, implies the vision of architecture, walls, and columns in ruins, and in Italy, this trend was even stronger, both for the Roman heritage and for its enhancement by the neoclassicism (before) and the fascist ideology (later). Therefore, the simple representation of the landscape has a limited effect on the public and must be accompanied by adequate representations and explanations. Indeed, the conceptual path behind visible reality is a characteristic of any type of archaeological context, but where architecture is quite evident, its impact is often sufficient for approximate aesthetic satisfaction, and classical archaeology has been forced on this path since its inception: Winckelmann's only failure was an excess of aesthetic. mysticism, but it was the only successful aspect of his thinking (Bianchi Bandinelli, 1976).

The "lack of landscape", understood as strongly characterized by human intervention, is a two-sided theme: on the one hand, especially in Italy, the Roman heritage has pushed the romantic myth of a lost civilization and has enriched the imaginary of scenarios, with anthropic forms, with ancient ruins and remains; on the other, where Roman influence was not so heavy, as in northern Europe, between the nineteenth and twentieth centuries, the prehistoric theme was common in artistic

creation, also representing paleolithic topics, but always following an anthropocentric vision, where the Homo (in its different versions) has always been the protagonist of the representation. The bare landscapes, once again, were not considered worthy of being the object of exhibitions and artistic creations.

The actions of reflection and dissemination of prehistoric archaeologists and paleontologists were therefore forced along a conceptual path, posing the problem of how to represent to a large and culturally heterogeneous audience a visible reality of man and landscape: an essential theoretical framework for understanding human evolution, to be told to the public through appropriate tools.

Therefore, such a search historically led to the creation of many "reconstructive" premises in museum settings, such as the use of models, dioramas, and paintings, and when computer-aided technologies began to be available, they represented a very valuable tool.

6. THE NEW SETTING: COMMUNICATING THE PAST THROUGH THE PRESENT, EXPLAINING THE PRESENT THROUGH THE PAST

The cited examples of dissemination projects related to digital technologies are mainly focused on the visual impact of landscape representation. Nowadays, some forty years after the Venice exhibition, we are aware that the digital revolution has had a strong impact on various

aspects of archeological research and dissemination.

One of these aspects is represented by the digitization of all the research data in order to be analyzed and correctly inserted into coherent cultural frameworks. Once again, Prehistory seems to have first opened this way. Since its early stages, prehistoric research has been forced to a careful collection and study of any element that emerged from the excavation, thus recording plant and faunal remains, stone blocks, flakes, fragments, and so on, collecting a large number of materials, analyzed by several scholars, to be studied and then integrated into a coherent reconstruction.

The digital revolution was therefore crucial in helping this process, giving the possibility to manage all kinds of information, allowing a more complete,

Integrated, and interdisciplinary approach to all the components of archaeological research (Peretto, 2002, 491). At the same time, it allowed scholars to recover all the information coming from previous analyses and surveys, check their correctness, and include them in a complete data framework (Laurenza and Palombini, 2005).

Moreover, the chance of creating "virtual bibliographies", tagging and connecting different digital contents to tridimensional worlds, to be explored immersively (Fanini et al., 2019, 2021), allows making a visible enormous amount of information related not only to the archaeological context but also to the history of its discovery and study (episodes of scholars live, remains of notebooks, etc.): an approach that makes it possible to understand how the process of discovery, conservation, and valorization took place, making visible all the by-products of the cultural operation which led to an archeo-anthropological conquest, thus valuing all human effort and work spent in its development.

In addition to these arguments, for a couple of years (also thanks to the digital management of large amounts of data), the importance of the landscape and the need for a different, more correct relationship between humans and the environment are relevant and current topics and therefore there is ample space for a new approach to the representation of prehistory, emphasizing the modernity of such themes.

"Ecological transition", "settlement strategies", "nutritional balancing", and "migration and displacement of human groups" are themes well present in the collective imagination, and their link with ancient human life is recognized in many studies based on an ethnoarchaeological approach to evaluate the social model of current societies in comparison to the ancient ones, in particular (but not exclusively) referring to the third world (Bollig et al., 2013, Brooks et al., 2007; Di Lernia and Palombini, 2001). But the same arguments can also open new ways of dissemination for museums and exhibitions: in this sense, the museums of prehistory (and, above all, referred to the Paleolithic) have today the unique opportunity to be interpreted and set up as a representation of the enduring relationship between man and environment: a "hub" to help visitors to travel the

territory also according to a paradigm of environmental tourism. Early examples of this dimension are evidently some of the applications described, such as the Virtual Museum of Isernia "La Pineta" (Palombini et al., 2020) and the "Pleistostation" at the Museo Casal de Pazzi (Palombini et al., 2012) (Fig. 2). It seems therefore possible, today, a new, more holistic approach to the representation of prehistory, which can be expanded to have a role in enhancing the dialogue between past and present, between man and the environment over time, and can also give the opportunity to present in a new perspective the history of research: the stories of scholars, their findings and discoveries. Any path of knowledge cannot be complete if it lacks the dynamics and stages that have determined its deployment and success: the succession of events and situations, random or not, that lead to a common goal, shaping the historical identity of a complex process such as archaeological research and the consequent museum design. In the digital age such a "story" can be considered as the opportunity to preserve all the thoughts, documents, and images of its history, allowing not to lose the "resolution" of the recent historical phenomenon that led to the understanding of the ancient ones and, at the same time, stressing their links to our dimension through the never-ending relationship between men and environment. It is increasingly necessary to have tools to illuminate, enhance and disseminate the quantity and strength of human work beyond the evidence that emerges from research, to present the activities surrounding scientific research, which are - or have been - as fundamental as publications; the stages of fieldwork, meetings, people and their words, faces, acts, reinsert insights and ideas in their original time.

As the process of digitization goes on, making available an ever-increasing amount of material, the reconstruction of the human past becomes a gigantic whole of interconnected information whose analysis may draw and strengthen strategies to face our future. In such a perspective, even the traditional definition of "prehistory" as opposed to "history" may lose its sense. The juxtaposition of two phases on the only basis of the presence or absence of written sources is historically understandable in a society aiming to distinguish a more "animal" stage from a "modern", "rational" one, but it represented, since its beginning, a weak approach (it was necessary to create the "protohistory" concept), and, today, such a distinction seems to have no more justifications in terms of archaeological methodological approach, nor in terms of the definition of causal links determining social transformation.

On the other hand, a new analytical approach to such a wide amount of interconnected information makes it possible to imagine new types of narratives about our history and the way we have constructed its representation, on the development and the origins, so distant and so close, of our long journey.

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