

“LUCIAN BLAGA” UNIVERSITY OF SIBIU
FACULTY OF HISTORY AND PATRIMONY
INSTITUTE FOR THE STUDY AND VALORIFICATION
OF THE TRANSYLVANIAN PATRIMONY IN EUROPEAN CONTEXT

ACTA TERRAE SEPTEMCASTRENSIS

IX



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**ACTA TERRAE
SEPTEMCASTRENSIS**

IX

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Sibiu, 2010

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**BUILDING ARCHAEOLOGICAL MUSEUMS
AS PROTAGONISTS OF VIRTUAL REALITY**

Marco MERLINI

F-MU.S.EU.M. network

EURO INNOVANET - *Prehistory Knowledge Project*, Rome (Italy)

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***Keywords:** cultural heritage, virtual museum, learning model, Prehistory, Danube civilization.*

***Abstract:** How to migrate high motivated museum institutions to virtual museums online, even if they are affected by inadequate ICT competences, low Web presence and restricted financial resources? The article discusses the model-experience of the Virtual Museum of European roots realized by the F-MU.S.EU.M. Network. It is aimed disseminating toward a wide audience the acknowledgment that a major civilization flourished in Neolithic and Copper Age in Southeastern and Central Europe (the Danube civilization) and documenting how the European matrix is still now in part founded upon it. The partnership of the F-MU.S.EU.M. Network is comprised of about thirty national and regional museums of archaeology and history settled in this macro-region.*

If the presented model-experience is not the most sophisticated way to produce and manage Web exhibitions and 3D virtual reality, however it is an ambitiously realistic approach generating the necessary capacity building in order to empower the associated museum with all the necessary knowledge and skills to create and implement one's own virtual gallery provided on the Web.

An international learning community of museums to develop capacity building on Web exhibition and 3D virtual reality

Online information channels especially the Internet, virtual reality and multimedia technologies are a vital opportunity for public archaeological museums to widen their access and using e-learning to increase exposure to culture. If potentially virtual museums online rely on many factors of success, however archaeological museums are normally characterized by serious ICT lacks in the field of Internet in general and virtual reality in particular. Main gaps are in terms of competences, knowledge and abilities of human resources. Web sites, if directly generated by archaeological museums, are a pure digital replica of practical information such as opening times, location, etc. Their "virtual area" is a static and boring provision of listed artifacts with low quality and non-interactive pictures. Limited resources available for virtualization are associated with a limited appreciation of its potential. The more active museum institutions request to an external expert to

develop a dedicated Web site added with virtual reality, but he is in general unqualified and unconcerned to cultural heritage. Specular inadequacies of museum staffs and external experts to collaborate create a loop, which effects are (See the survey of F-MU.S.EU.M. 2008):

- High costs
- Unsubstantial collections delivered online
- Pure replicas in HTML of actual collections
- Images without any significant value
- Lack content and depth due to under-exploitation of multimedia potential for linking (say) a picture exhibit with associated text, music, maps, games, interactive quiz, and multilinguality
- Low added value in terms of additional information or increased culture compared to the original, physical museum
- Expropriation of museum contents
- Web pages not updated
- Prevalence of just marketing Web sites or sites selling from museum shops; few are real resources
- Under-used exhibit materials in the accession states that form part of museums tourism offer.

A network of archaeological museums of Southeastern-Central Europe has been established in order to cope with these pitfalls. It is the F-MU.S.EU.M. Network, which comprises historical and archaeological museum institutions of national, regional and local level. Its main purpose is to offer to the partner museums the opportunity to display, on the Web and in 3D, the artifacts held in trust by them without any necessity to appeal to external experts. Indeed, it works as an international learning community able to develop capacity building within the participant museums on the topic of virtual reality online.

The F-MU.S.EU.M. Network tries to “think different”, answering to the following questions:

- How to migrate high motivated museum institutions to virtual museums online, even if they are affected by inadequate ICT competences, low Web presence and restricted financial resources?
- How to fashion a proper methodology in structuring such virtual Web exhibitions aimed making the partner museums actually protagonists?
- Through what means does such an experience be developed without any expensive software or muscular hardware?
- How to make the idea concrete that even a small virtual museum online should not be just a clone of the real world, instead imagining it as a tool collaborating with the traditional museum institution by performing distinct expositive and educational duties?
- Can the method of learning by doing be effective in such a challenge? How can a museum institution make successful the experience of learning

how to deal with the Web and virtual reality while creating a virtual museum online from its collections?

- Which is an effective manner to generate an international learning community able to develop capacity building within partner museums on the topic of Web exhibition and 3D virtual reality?

The F-MU.S.EU.M. Network has as a hub the *Virtual Museum of European roots*, which provides and explores, on the Web and in 3D, exceptional prehistoric artifacts hosted by the partner museums aimed documenting that a major civilization flourished in Central and Southeastern Europe throughout Neolithic and Copper Age times. Having as backbone the macro-region individuated by the Danube River and its tributaries, it is recognized as the *Danube civilization*. It flourished for three millennia, from c. 6400 BCE to c. 3500-3300 BCE (Merlini 2005, 234; Merlini 2009, 3 ff). The *Virtual Museum of European roots* exploits the mobilization of innovative synergies between cultural heritage and internet added with virtual reality enchantments as to attract tourism with the idea that the Danube civilization by now has to be considered *one* of the “*mothers*” of modern European culture. The *Virtual Museum of European roots* is accessible from the portal <http://www.europeanvirtualmuseum.net>. It offers visitors the opportunity to surf on and across several different waves of information in four languages: English, Romanian, Bulgarian, and Italian. (Fig. 1)



Fig. 1 - Main menu of the *Virtual Museum of the European roots*.

The *Virtual Museum of European roots* is a museum of museums. The partners of the network compose an international interacting and learning community where they develop capacity building and technical cooperation on the subject of digital representation methods, exhibitions online of prehistoric cultural heritage and 3D virtual reality. Museum institutions that are partners of the European network are:

- Austria - Naturhistorisches Museum - Prähistorische Abteilung, Wien
- Hungary - Historical Museum, Budapest
- Bulgaria - National Museum of History, Sofia
- Bulgaria - Regional History Museum “Academician Jordan Ivanov”, Kyustendil
- Bulgaria - Regional Museum of History, Veliko Tarnovo
- Bulgaria - Regional History Museum, Rousse
- Bulgaria - Regional History Museum, Vratza
- Bulgaria - Regional History Museum, Dobrich
- Bulgaria - Abritus Museum, Razgrad
- Bulgaria - Regional History Museum, Targovishte
- Germany - Museum für Vor- und Frühgeschichte, Berlin
- Greece - National Archaeological Museum, Athens
- Romania - Muzeul National de istorie a Romaniei, Bucharest
- Romania - Brukenthal National Museum, Sibiu
- Romania - Banat Museum, Timisoara
- Romania - National Museum of Transylvania, Cluj
- Romania - Complexul Muzeal Arad
- Romania – Oltentia Museum
- Romania – Calarasi Museum
- Romania – Sf. Gheorge Museum
- Romania - Muzeul Județean de Istorie Teleorman
- Romania - Corvin's Castle Museum in Hunedoara
- Romania - Museum of Dacian and Roman Civilization, Deva
- Italy - Museo Nazionale Preistorico Etnografico Pigorini, Rome
- Italy - Musei Civici di Pitigliano (Museo Civico Archeologico della Civiltà Etrusca, Museo Archeologico all’aperto “A. Manzi”)
- Italy - Fiora Valley Prehistory and Protohistory Museum, Manciano
- Italy - F. R. Vonwiller Civic Museum, Farnese

Partners providing cultural and technical support also compose the partnership:

- Italy - EURO INNOVANET, research institute, co-ordinator of the network
- Romania - Lucian Blaga University – IPCTE, Sibiu
- Romania – Alba Iulia University
- Bulgaria - Cultura Animi Foundation
- Italy - City of Rome
- Italy - TRUST – Tecnologie e Risorse Umane per Sviluppo e Trasferimento

Consequently, five challenges / goals characterize F-MU.S.EU.M. Network. They aim to generate ICT and tourism-related employment by establishing a European virtual museum conceived as a web-based product specifically designed to exploit this medium and no longer merely migrated from the physical products. F-MU.S.EU.M. Network strengthens and promotes tourism offers whilst at the same time building the capacity of partner museums to develop a virtual museum of early European history. The challenges / goals are:

- Documenting that the European matrix is founded upon a common ancient background with a hub in the Danube civilization.
- Making accessible collections that are normally inaccessible not only to a wide public, but also to scholars.
- Exploiting the augmented comprehension and appeal from 3D view of the collections.
- Generating the necessary capacity building in order to empower the associated museum as protagonists of the virtual museum.
- Experimenting a story-driven model of museum.

Delivering shared heritage

Concerning the first challenge/goal, the *Virtual Museum of European roots* is disseminating toward a wide audience and scholarship the acknowledgment that the European identity was built over the millennia and is founded upon a common ancient matrix with some significant sources into the prehistory of Southeastern-Central Europe. Since the Neolithic and Copper Age time frame, Europe is the fruit of the absence of rigid boundaries, continuous migrations, wide interactions, and a plurality of cultural imprints. Several millennia ago, this continuous merge caused conflicts, compromises and stratifications between different populations and languages, divergent cultures and economies. Nevertheless, at the same time, it formed the source for the present European originality: the cultural wealth and age depth of the "Old Continent" (Merlini, Velichkov 2009, 8). (Fig. 2)

The Danube civilization composed an institutional, economic, and social network of developed societies organized as a network of nodes, i.e. micro-regions and settlements that shared the same milieu with different level of authority keeping the social system stable. This ancient European civilization developed according to a model far from the traditional state-bureaucratic political centered prototype, being centered on the concept of network (Merlini 2009).

As documented by the collection of the *Virtual Museum of European roots*, the Danube civilization was characterized by extended subsistence farming economy and lifestyle through the improvement of agrarian land and technology. It was described by a tendency toward sedentary life in permanent settlements, proto-urbanism with concentrated agglomerates organized by planned layout, solidly built dwellings, and a tendency to distinguish profane (abodes, workshops and tribal/communal dwellings) and sacral (sanctified spaces and temples) architecture.

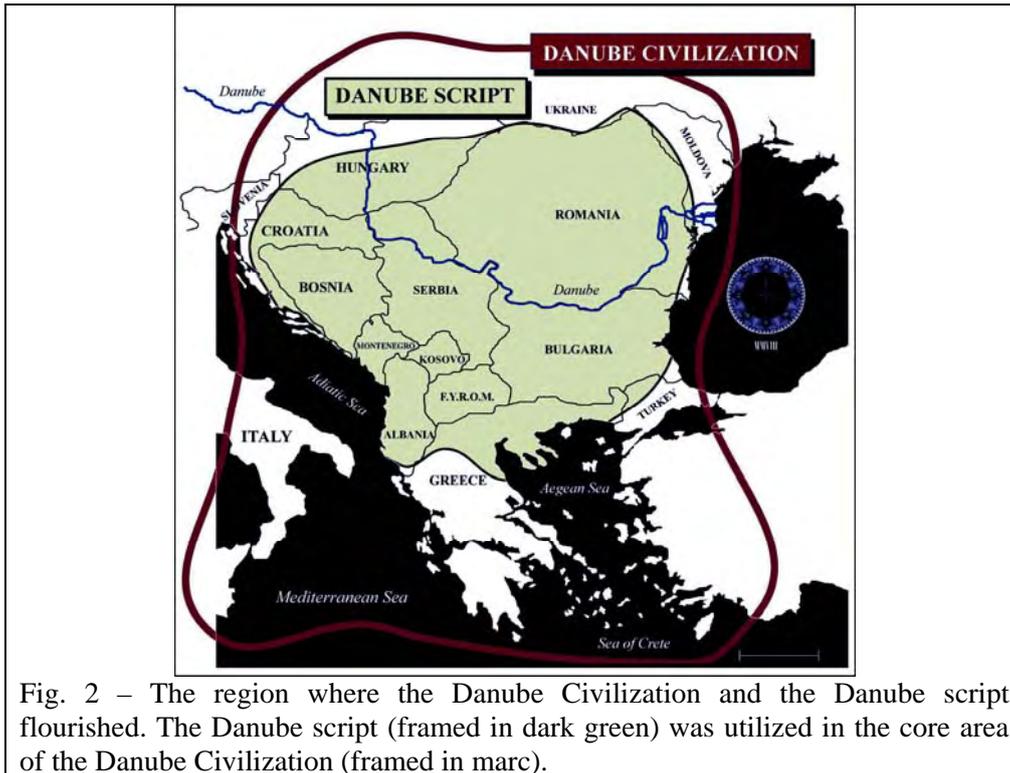


Fig. 2 – The region where the Danube Civilization and the Danube script flourished. The Danube script (framed in dark green) was utilized in the core area of the Danube Civilization (framed in marc).

The Danube Civilization was also distinctive for advanced technologies (particularly in weaving, pottery, building and metallurgy), long distance trade, and expansive exchange that even involved status symbols and luxury goods. It exhibited the development of many household activities and skills such as spinning, weaving, leather processing, clothes manufacturing, shoe fabricating, and the manipulation of wood, clay, and stone. It speaks of a specialization of labor and social complexity, even if within the context of a semi-egalitarian social structure.

The socio-economic system was associated with a complex ideological system connected to the agricultural creed of fertility and fecundity, elegant and cultured art, refined patterns of magic-religious imagery, intense spiritual life, sophisticated religious organization, and elaborated liturgies.

In brief, the *Virtual museum of European roots* disseminates to a wide audience the acknowledgment that, according to proper indicators, the early civilization status has to include the Neolithic and Copper Age cultures of the Danube Valley and beyond. The Danube civilization has to be placed in reference to other better-known ancient civilizations blessed by rivers such as Egypt, Mesopotamia, the Levant, the ancient Indus Valley, Yangtze Valley in China, and the Jiroft Valley in Iran (Merlini 2004). Besides, this common and dynamic prehistoric background -

extending from Turkey to France, from Ukraine to Cyprus - is partly still alive and goes beyond the current borders, political disputes and ethnic conflicts.

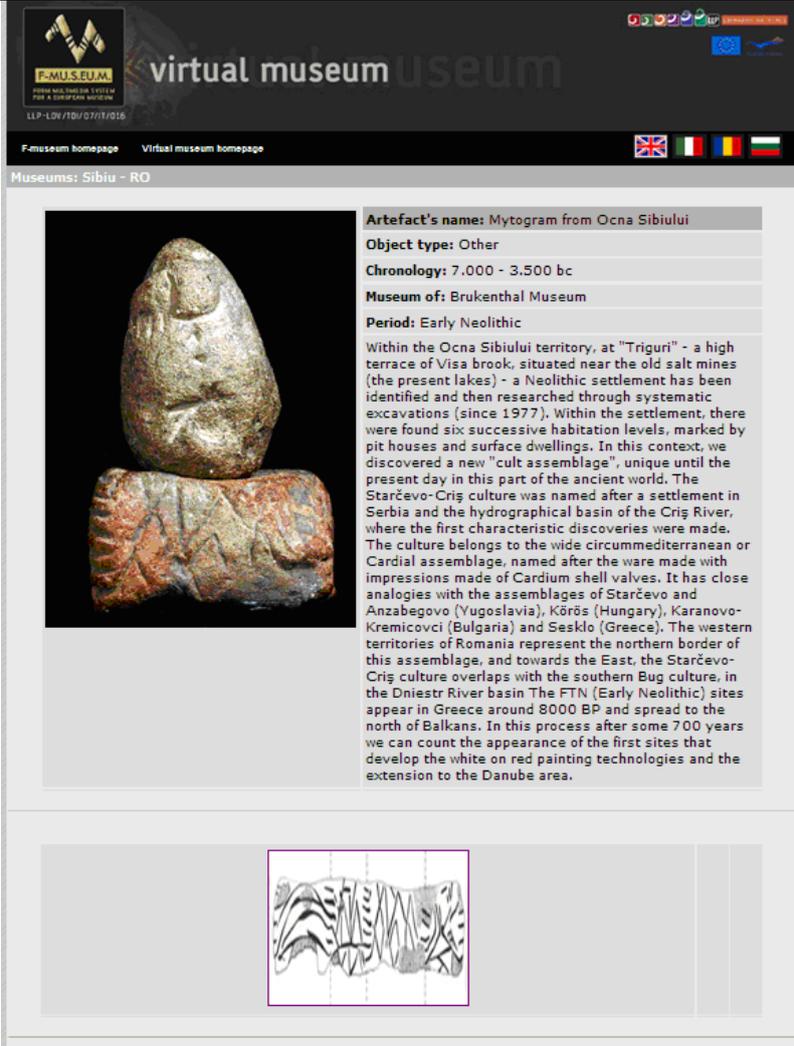
The complexity reached by the Danube civilization in the economic, social, institutional and cultural frames required an IT innovation to record, manipulate and transmit increasing packages of information. An effective system of communication was established (the *Danube Communication System*) by the means of tallies, marks, emblems, symbols and signs.

Until now, several components of the Danube Communication System have been identified: ritualistic markings; emblematic decorations; magic-religious symbols; divinity insignia; accountancy annotations; calendrical and chronographic annotations; sky atlases, constellations and motions of celestial bodies (sun, moon, and planets); personal and family identification marks; lineage recognition or community affiliation marks; and markings representing bio-energetic points of the human body. Within the Danube Communication System, indications of a rudimentary and mainly non-language related system of writing are apparent, too (the *Danube script*) (Merlini 2001; Merlini 2009).

The main effort in stocking and transferring information regarded to the mytho-religious narrative, not the economic affairs. Magic and religious information and ideas were exchanged by prehistoric people incising or painting small and highly symbolic objects made of clay, stone and bone (human statuettes, anthropomorphic pots, stamp-seals, plate-tablets, amulets, etc.) and their emblematic parts (vulvas, chests, buttocks, etc.).

Unfortunately, these ancient treasures with communicative goals are little known outside the circle of experts. In addition, the incised or painted signs and symbols are highly subjected to damage, erosion or destruction. Finally, the artifacts carriers of messages are dispersed among a wide net of national, regional, and local museums and often it is not very save to ask them to travel being delicate and fragile. Therefore, the *Virtual museum of the European roots* decided to valorize a number of these fascinating communication-driven objects displaying them in an effective 3D and friendly way. I present below some artifacts from the collection of the *Virtual museum of the European roots* that are capable in capturing the interest the wide public evidencing the high communicative skills achieved in prehistoric age.

An object found at Ocna Sibiului - *Triguri* (Transylvania, Romania) is very special, combining three communicational channels: iconic code, graphic symbolism, and a linear writing system although in *statu nascenti*. Discovered in a community dwelling devoted to a religious cult, it belongs to the Starčevo–Criș IC/IB culture dated about 6000-5900 BCE. It is one the oldest artifacts with archaic signs of the *Danube script* (Merlini 2004; Lazarovici 2006). The artifact is held in trust in the Brukenthal National Museum, Sibiu (Romania), partner of the F-MU.S.EU.M. Network (Fig. 3).



virtual museum

F-MU.S.E.U.M.

LLP-LON/101/07/11/015

Fmuseum homepage Virtual museum homepage

Museums: Sibiu - RO

Artefact's name: Mythogram from Ocna Sibiului

Object type: Other

Chronology: 7.000 - 3.500 bc

Museum of: Brukenthal Museum

Period: Early Neolithic

Within the Ocna Sibiului territory, at "Triguri" - a high terrace of Visa brook, situated near the old salt mines (the present lakes) - a Neolithic settlement has been identified and then researched through systematic excavations (since 1977). Within the settlement, there were found six successive habitation levels, marked by pit houses and surface dwellings. In this context, we discovered a new "cult assemblage", unique until the present day in this part of the ancient world. The Starčevo-Criş culture was named after a settlement in Serbia and the hydrographical basin of the Criş River, where the first characteristic discoveries were made. The culture belongs to the wide circummediterranean or Cardial assemblage, named after the ware made with impressions made of Cardium shell valves. It has close analogies with the assemblages of Starčevo and Anzabegovo (Yugoslavia), Körös (Hungary), Karanovo-Kremicovci (Bulgaria) and Sesklo (Greece). The western territories of Romania represent the northern border of this assemblage, and towards the East, the Starčevo-Criş culture overlaps with the southern Bug culture, in the Dniestr River basin. The FTN (Early Neolithic) sites appear in Greece around 8000 BP and spread to the north of Balkans. In this process after some 700 years we can count the appearance of the first sites that develop the white on red painting technologies and the extension to the Danube area.

Fig. 3 – The Starčevo–Criş IIA Ocna Sibiului - *Triguri* (Romania) mythogram to represent Sun-Moon intercourse.

The object is a small and high-schematized statue (4.5 cm x 2 cm) with phallic or conic shape, which stands on a miniaturized altar. It has been interpreted by the discoverer, Iuliu Paul, as a bearded man carved in bas-relief who is bound to a now unrecognizable woman (Paul 2004). On its right side, the statuette possibly bears the symbolic representation of Sun and Crescent Moon that identifies the cosmic symbolic couple depicted during its divine intercourse. The statuette's quadrilateral base bears an inscription composed of signs from an archaic version of the *Danube script*: "N", "X", "V", "Λ", "<", ">", parallel horizontal lines and a lozenge (Merlini 2004).

The message from Ocna Sibiului - *Triguri* is of course undecipherable. Nevertheless, one can note that if the small statue conveys mainly male symbols (its actual shape and nose silhouette are phallus-like), the altar displays an inscription predominantly composed of female signs. In particular, the lozenge – a typical sign standing for fertility - is placed in a central position and is carved slightly in relief like the bearded man on the statuette playing as obverse and counterpart to it (Paul 1990, 28).

Statuette and altar form a “cultic assemblage” that represents one of the oldest existing combinations of iconic representation, magic-religious symbolism, and linear writing. It may be construed as a conversion-table among these three different communicational channels each of which transmits, applying its own code, the same mythical drama. It might express the creation and re-creation of the world, which is closely connected with the conjunction of the opposites expressed by the sexual sacred union between a male and a female divinity, Sun and Moon (*ieros gamos*). This cosmic core-myth stands at the foundation of the primitive agricultural societies of the Danube basin and all the other myths descend from it: magic fertility, re-birth, vitality of water, etc. (Paul 2002; Merlini 2009). According to Lazarovici and Gumă, the marks on statuette and altar might be connected to cosmic fire and water and to the related offerings during rituals. The four sides of the base might represent the four universal directions (Lazarovici and Gumă 2004). What need was there to utilize simultaneously three communicational codes to express the same myth? The plastic expression of the statuette renders the cosmic drama in a visible way through a man-woman intercourse. The Sun-Moon symbolism conveys the sacred foundations of this union, communicating meanings in a synthetic way and intending to suggest rather than to explain. This astral symbolic language probably transmits the essence of a magic-spiritual message: the power and the generative effect of the divine *ieros gamos*. Finally, the sequence of script signs on the altar marks the various passages of the myth concerning the divine creation and/or illustrates the related magic-religious formula (Merlini 2009).

At Ocna Sibiului - *Triguri*, we are in presence of a “mythogram”, i.e. a text that narrates myths, stories and perhaps epopees in order to transmit a spiritual knowledge. This mythogram might have induced the spectator to recall and orally express the whole myth, as well as to perform the related ritual practices (Paul 2002).

If the Transylvanian artifact renders the super-powers that supervise the cyclical creation and re-creation of the world, a ceramic model of an oven molded 4900-4800 BCE measures practically the time according to the yearly cycles of nature. Indeed, a system of timekeeping was a vital necessity for both daily life tasks and agrarian-pastoral worship. This Early Copper Age inscribed model of a furnace bears one of the earliest calendars. It was found at the site of Chardako near Slatino (Bulgaria) and is now in the Regional History Museum of Kyustendil, partner of the F-MU.S.EU.M. Network. (Fig. 4).

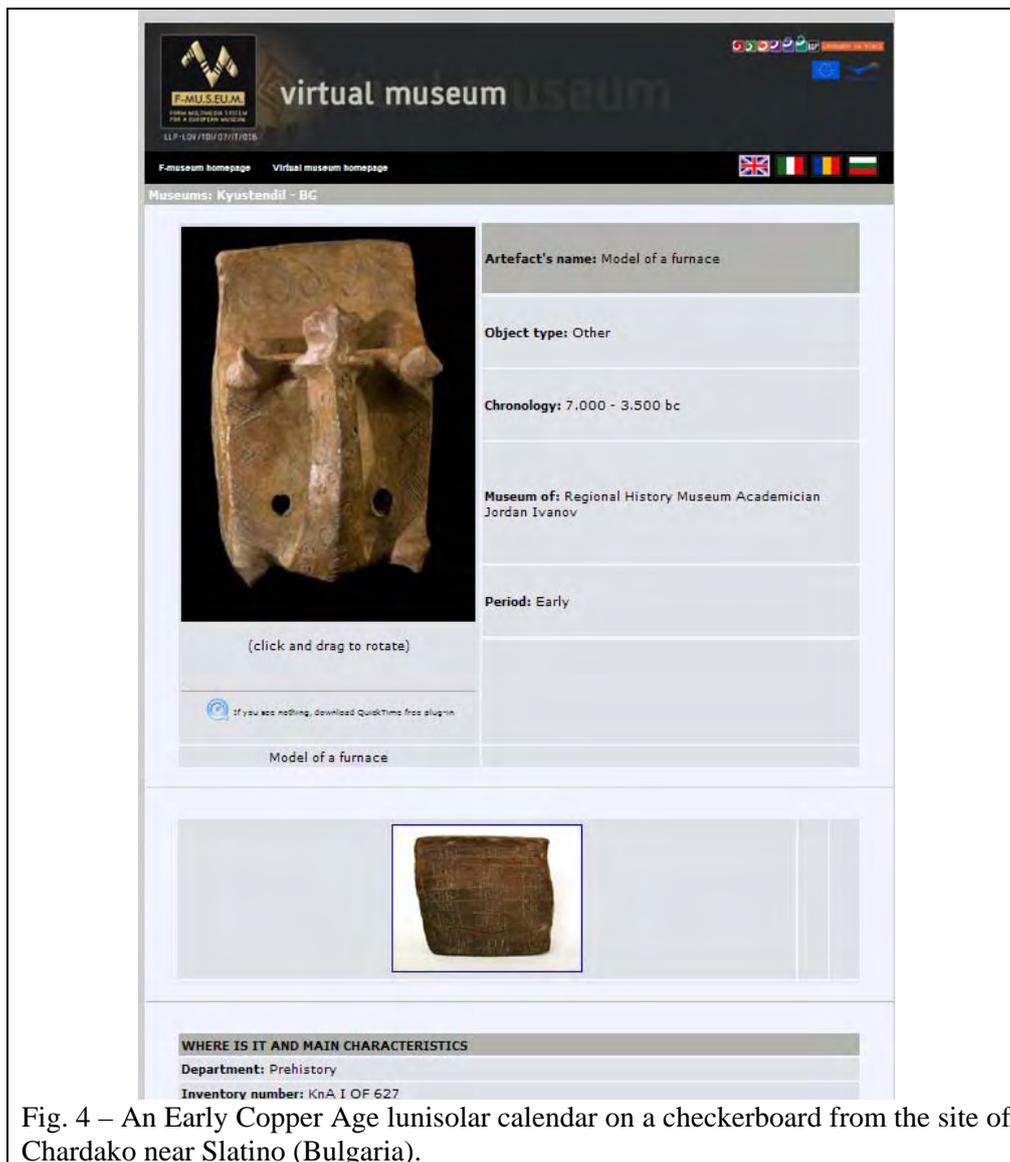


Fig. 4 – An Early Copper Age lunisolar calendar on a checkerboard from the site of Chardako near Slatino (Bulgaria).

The prehistoric time device has a rectangular shape, a small platform in front of its opening and four anthropomorphic images over the four corners of the roof. The zoomorphic (maybe a snake or a phallus) handle depicting the male principle protecting the “hearth” is a unique feature.

The linear signs incised on a checkerboard positioned on the bottom of the artifact have been interpreted by Stephan Chohadzhiev as a calendar system that has to be read in columns from top to down and from left to right. The thirty hatched compartments may be related to the days of one lunar month and be organized according to the lunar phases. The twelve compartments in red ochre may render

the twelve months of the year (Chohadzhiev 1989; 1997; 2006). Other scholars maintain that the table describes a solar calendar where the time intervals are grouped in 10-day weeks and 30-day months (Stoychev 1998).

According to Chohadzhiev, the New Moon and the crescent growing up to the first quarter phase are depicted at the beginning of the 1st column (cells 1-6), The next cells (7-12) show the Moon growing up to the Full Moon phase, marked with a blank field 12. The fields from 13 to 18, which have the most numerous incisions, represent the Full Moon phase. The next fields (19- 23) illustrate the waxing Moon up to the New Moon phase. Their incisions resemble those from 7 to 12 that precede the New Moon, that is to say that they represent one and the same state of the Moon. Field 23 is blank to show the disappearance of the Moon. The moonless period is marked with the fields from 24 to 30 (Fig. 5).

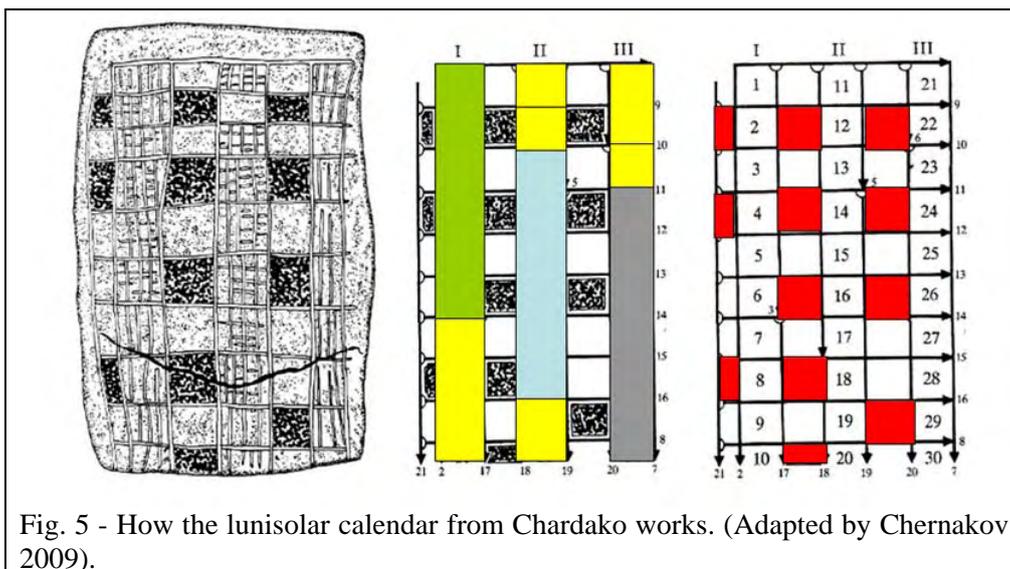


Fig. 5 - How the lunisolar calendar from Chardako works. (Adapted by Chernakov 2009).

The colored fields are grouped in three columns, respectively with 3, 5 and 4 squares. Each group is probably related to a season of the year. The first column represents the winter months. They are January, February, and March, if the beginning of the year is at the winter solstice (21-22 December). The end of the winter corresponds with the vernal equinox, 21 March. The second column covers the months of active agricultural activity up to harvest time (April, May, June, July, and August). The third column depicts the autumn months (September, October, November, and December). Such a calendar structure, comprising of three seasons, is typical of other calendar systems utilized by the Danube Civilization.

The Early Copper Age calendar from Slatino has a transitional character, because it reflects the adaptation of elements from a lunar calendar (Moon phases) to a solar one (the seasonal succession). The discrepancy between the number of the days of the year depicted in this timekeeping (12 months x 30 days = 360 days) and the

number of days belonging to the astronomical (tropical) year (around 365 days) is solved by adding five more days. They are depicted by the five lunar signs placed on the small platform in front of the oven opening.

After presenting a mignon altar with signs rendering the super-forces that organize the natural cycle and a miniature oven bearing one of the earliest calendars, the *Virtual museum of the European roots* displays magic signs on a horrifying female ghost or shaman (Fig 6).



Fig. 6 - An inscription on a Gumelnița B1 horrifying female ghost or shaman (4500-4300 BCE).

A Gumelnița B1 female figurine from Vitănești (in Muntenia, Romania) bears an inscription over the stomach/abdomen. It was created around 4500-4300 BC (Andreescu 2002; Merlini 2009). Roughly modeled, she has ugly features. However, this does not mean intended cruelty against the owner-believer. The horrifying aspect aims to protect him/her by scaring away malevolent forces, as the Tibetan or African guardian divinities do. Alternatively, was she a horrifying ghost or a shaman? The inscribed figurine is kept at the *Muzeul Județean Teleorman* in Alexandria, Romania, partner of the F-MU.S.E.U.M. Network. The *Virtual museum*

of the *European roots* exposes a similar shaman figurine from the Oltenita Muzeul de Arheologie.

The signs are not randomly distributed on the ghastly human body, but laid out according to a format specifically organized for readability. For example, the space is clearly arranged separating two inscriptions – one on the left and the other on the right side of the figurine - to express different concepts (maybe words or phrases).

The text on the left is composed of two Λ aligned horizontally. The text on the right is in block format and is composed of a \wedge , a \bigcirc , and a parallel line. The diagonal line in the centre is possibly not a unit of the script, but an auxiliary mark used to divide the space into two reading areas, as documented by its intersecting the long horizontal line composing the upper part of the metope frame. The text is framed by the use of horizontal lines incised over the chest and over the vulva. The compression of the left inscribed register evidences that the reading direction is from right to left. The statuette is also deeply inscribed under the feet, with linear signs aligned in row. It was possibly used as a human pintadera to stamp script messages. In fact, its shape makes it fit to be gripped.

Decorative horizontal lines run over the vulva and the legs. The mouth is composed of six holes. In general, they are four or five. Why is the mouth so large? Is it saying or chanting something?

Vitânești tell, located in a flooded plain and close to a terrace of Teleorman Valley (Andreescu, Mirea 2008), is the key site for the development of the script within the Karanovo VI - Gumelnița B - Kodžadermen assemblage (Merlini 2009).

In conclusion, the presented artifacts extracted from the collection of the *Virtual museum of the European roots* evidence how vital was the communication within the Danube civilization and document the occurrence of a stock of information that exploited differentiated communicative channels to store and transmit complex messages. Prehistoric societies were communication-oriented. Information was fixed not on rectangular, white, smooth, odorless and tasteless leafs of paper, but on highly symbolic objects made mainly of clay.

Making accessible collections that are normally inaccessible

The second challenge / goal of the F-MU.S.EU.M. Network (make accessible collections that are normally inaccessible) descends from the capability of web exhibitions in 3D Virtual Reality in acting as powerful tools for the preservation of objects that are delicate and fragile or that are locked being state patrimony. Even when available, in general the archaeological collections display nebulous objects due to bad enlighten showcases, dirty and opaque glasses, farness from the eyes of the visitor, little-size and decentralized captions, etc.

The *Virtual Museum of European roots* exceeds the limits imposed by the storage conditions, making collections accessible not only to a wide audience, but also to scholars and researchers as well as to students (masters, doctorates, graduate students). Providing high quality 3D images, information directly from sources and contextualization through multimedia exploitation, it allows a deep study even to

pieces that are available with difficulties or those that are unapproachable due to geographical distances, structural fragility, inclusion into the state treasure, or simply lack of personnel to ensure access to storerooms.

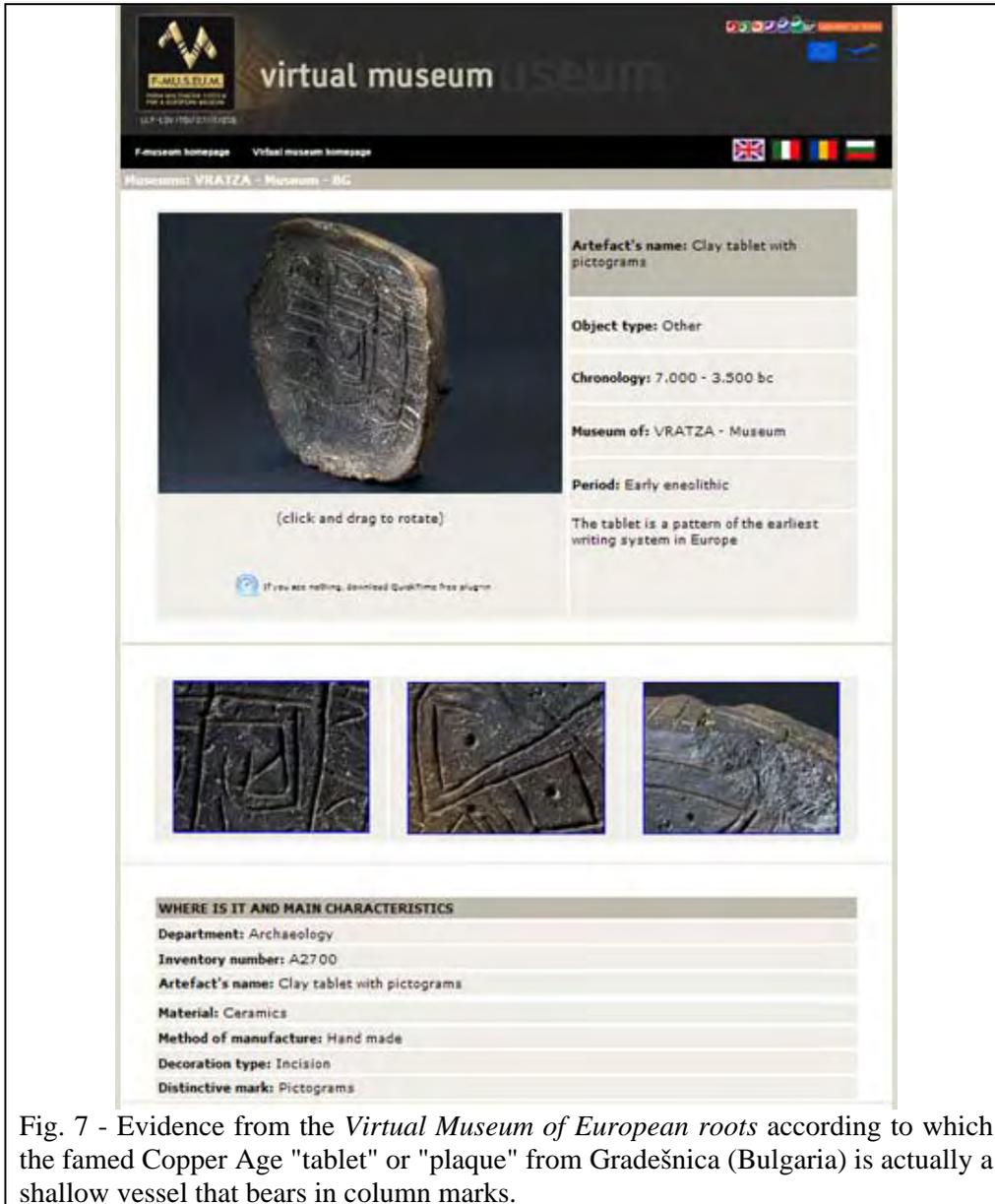


Fig. 7 - Evidence from the *Virtual Museum of European roots* according to which the famed Copper Age "tablet" or "plaque" from Gradešnica (Bulgaria) is actually a shallow vessel that bears in column marks.

It is the case of one among the most famous and hyper-studied masterpieces displayed by the *Virtual Museum of European roots*. I am referring to the Copper Age "tablet" or "plaque" from Gradešnica (Bulgaria), which is considered by the

discoverers (B. Nikolov, V. Mikov and G. Georgiev) and many other Bulgarian archaeologists as bearing the oldest signs of literacy in Europe or even in the world (V.I. Georgiev 1969, 32-35; V.I. Georgiev and B. Nikolov 1970, 7-9; B. Nikolov and V.I. Georgiev 1971, 289; B. Nikolov 1974, 33). It is worth noticing that the signs on the Transylvanian Tărtăria tablets had been relegated by them to the Coțofeni cultural horizon in order to argue that the marks on the Gradešnica "tablet" or "plaque", as well as on the Karanovo seal and other coeval Bulgarian artifacts, are the first written record in human history: the "Gradešnica-Karanovo writing" (G.I. Georgiev and V.I. Georgiev 1969). According to Gimbutas, from Gradešnica comes "one of the best examples of Old European script" (Gimbutas 1974/1982, 87). The archaeologist in charge maintained to have discovered the inscribed artifact in a room with religious function (Nikolov B. 1974). If so, the Gradešnica piece and its signs have meaning interpretable within the religious mythological system of these Copper Age communities.

The artifact is interpreted to be flat by the majority of the scholars (Winn 1981, 210; Renfrew 1973, 177; Masson 1984, 108) in consequence of a noncritical reiteration of the excavator misunderstanding who judged it to be a "plaquette en argile, ayant forme d'un petite pot, sur laquelle sont incises des signes écrits" (Nikolov B. 1974, 33).

Decades of studies did not correct the mistake due to erroneous drawings, confuse photos and the difficulty in checking directly the artifact held by the Regional History Museum at Vratza. The misinterpretation was fuelled by the exciting possibility to have discovered an inscribed tablet that predates the Mesopotamian tablets of a millennium. However, the Regional History Museum at Vratza is one of the partners of the F-MU.S.EU.M. Network and exhibits in 3D the renowned artifact in the *Virtual Museum of European roots*. From any computer connected with internet, it is easy to verify that it is actually a little, rounded shallow receptacle (12.5 cm. long by 10.5 cm. wide and 2 cm. high) with evident lips and two holes for suspension (Nikolov V. 1990, 47; Gimbutas 1991, 313 Fig. 8-12; Merlini 2006; ibidem 2009) (Fig. 7).

The *Virtual Museum of European roots* is capable to solve even a serious misunderstanding from the archaeologist in charge and the majority of scholars concerning the engraved signs on the Gradešnica flat receptacle: the idea that its inside bears a long inscription divided into four horizontal registers (Georgiev V.I. 1970, 8; Nikolov B. 1974; Masson 1984; Todorova 1986). Admiring in the collection of the *Virtual Museum of European roots* the humanoid stylized on the outside of the vessel and how it revolves (it does not reverse 90°), one can see that the signs on the inside of the artifact are actually aligned vertically and not horizontally (Nikolov V. 1990, 47; Chohadzhiev S. 2003, 115; Chohadzhiev S. 2006, 72; Merlini 2006). The in column layout has been judged strange by several scholars – blind from contemporary viewpoint - for a written text structured in supposed guidelines for religious literate worship. Therefore, they decided to loose the pictographic force of the anthropomorphic figure turning it 90°, in order to save

the horizontal alignment of the script-like marks on the inner face of the shallow vessel.

However, the vertical set of the signs was employed by several ancient writing systems (Merlini 2009). If our contemporary eye is costumed to connect *ars scribendi* with a horizontal alignment of the signs because alphabets are generally written horizontally,¹ ancient Near East and East Asian writing systems as well as other logosyllabic systems (e.g., Sumerian) were traditionally arranged in column setting. The plumb layout of the marks on the artifact from Gradešnica does not affect their script-like nature (if they have actually a script-like nature).

As any other artifact recorded in the *Virtual Museum of European roots*, the shallow vessel from Gradešnica is not only shown in 3D, but also described through a complete identity card conveying appropriate photo details and textual information. The user can chose multimedia deepening for interpretation and contextualization of it visiting - in a natural, simple, ubiquitous and engaging approach (Sumption 2006) - the thematic route "Communication in Neolithic and Copper Age, from symbols to writing".

The visual misadventure on the interpretation concerning the shallow vessel from Gradešnica substantiates that archaeology is intrinsically virtual for necessity. Understanding here relies upon the archaeologist's rationalization, which fills the gaps of data through reconstructive drawings, taxonomies, grammatical or formal regularities, and seriations based on experience and acumen as well as osmosis with other disciplines. As currently accepted (Hodder 1999), evidence is moreover based on subjectivity during acquisition and interpretation. Therefore, the 3D provision online of an artifact is just the last link in a chain having more immaterial rings than material rings (Nicolucci 2007). In the above presented instance, as well as in a number of others, the 3D link challenges established notions (Trant 1998, 110-113; Dietz et alii. 2004).

Embedding augmented comprehension and appeal from 3D view of the collections

The third challenge / goal of the *Virtual Museum of European roots* is both cognitive and attractive. Part of the aura of actual remains is transferred to a virtual gallery (Davis 1995; Mitchell, Strimpel 1997). In addition, the 3D view of prehistoric artifacts is capable exploiting the augmented comprehension and appeal on them. The three-dimensional representation of objects provided online invites, induces and allows the viewer into fuller, deeper, proxemic relationships with them. The 3D view encourages the spectator to find out, to see close-up and inside, to move-around-the-back and see-for-himself what is behind, to glimpse what is below, and what is above; and to move back again.

Walking around, the viewer establishes a radically different relationship with the artifact that he is looking at, than when he engages a two-dimensional representation and has only ever one viewpoint from which to see a single, fixed representation. Accumulating numerous different views, nothing is hidden or left

out. This cognitive process provokes the viewer to build up, to assemble, and to collect an understanding of the object being observed. The 3D visual experience triggers the spectator to shift from asking questions about what this artifact is, to interpretative investigation of it as material evidence of people, their behavior and their environment. Which are the physical characteristics of the object? How did it work in people's lives? What did it do and why was it successful in doing what it did? Which were the reactions that it evoked? How did people perceive and utilize it? The comprehension that emerges from 3D view is complex, multi-part, and never banal. It is often absent from the archaeological record (Connerton 1989, 72-79; Rowlands 1993; Van Dyke, Alcock 2003, 3-4).

For example, the three-dimensional vision of the famed Berlin Golden Hat from Hallstatt A-B period is one of the fundamentals for a real comprehension of it. The artifact is held at the Museum for Pre- and Early History of Berlin, partner of the F-MU.S.EU.M. Network (Fig. 8).



Fig. 8 – 3D view of the Berlin Golden Hat from the *Virtual Museum of European roots*.

At a first glimpse, it appears as an imposing headdress of a chieftain or a chief-priest. In fact, it is this. Nonetheless, it is much more. The 3D and zooming observation makes noticeable the highly decorative discs, rings and concentric circles in relief, leading to a fully comprehension that the hat is a masterpiece made by a specialized goldsmith in embossed work. With a more significant step further, the virtual visitor can discover that it is a lunar-solar calendar established 3000 years ago. The "ornamental" circles are actually 1739 astral symbols. Apart from the numerous circle symbols, the "decoration" includes 19 lying half moons, 19 eye models and, on the top, an eight-radiated star. The symbols are systematically

arranged along 19 horizontal registers. Among the signs, 1701 concentric rings identify single days. The magnificent gold hat was probably worn by a chief priest during ritual actions connected to cyclical events.

The *Virtual Museum of European roots* improves the 3D presentation of the intriguing Berlin Golden Hat with a multimedia enrichment according to "multiple perspectives" (Merriman 2004, 87). A distinct path contextualizes it among the other recovered Bronze Age conical golden hats as symbols of power and calendar systems made of one piece of thin gold foil. Similar artifacts are displayed and explored as tokens of power since the third and second millennia in the glyptic and plastic art from Mesopotamia to Anatolia, Cyprus and Greece to Sardinia. Even in Scandinavian and the Baltic regions, stylized depictions of revered men wearing conical hats are recognized (Gerloff 1995: 153-194; ibidem 2003: 190-203).

The trail explains also to the virtual visitor how the Berlin Golden Hat worked as a calendar and how such a timekeeping was related to mythological sceneries with astronomic-cosmological background. In short, taking astronomic calculations as a basis, the number of symbols on it corresponds nearly exact with 57 solar months ($= 3 * 19$) and 59 lunar months. The result of multiplying $57 * 4$ is 228 solar months ($= 12 * 19$). It also corresponds approximately with the 135 lunar months of the moon cycle. Both cycles individuate the metonic cycle, i.e. a period of 19 years, after the lapse of which the new and full moon returns to the same day of the year. Consequently, the number system represented on the decoration of the Berlin Golden Hat can be considered as a lunar-solar calendar settled 3000 years ago, long time before the Babylonians and Greeks developed similar timekeeping systems (Menghin 2000: 31-108; Menghin 2003: 220-237). Another path contextualizes the Berlin Golden Hat within the Sun cult in the Bronze Age.

In the new exhibition of the Museum for Pre- and Early History of Berlin at the Neues Museum, a special room is devoted to the Berlin Golden Hat (Fig. 10).

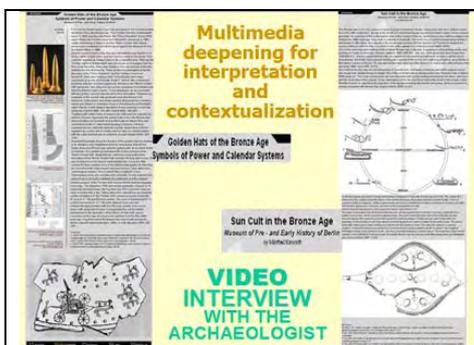


Fig. 9 - Multimedia deepening for interpretation and contextualization of the fascinating Berlin Golden Hat as a calendar.



Fig. 10 - From the virtual reality to the actual reality. The special room for the Berlin Golden Hat in the new exhibition of the Museum for Pre- and Early History of Berlin. (Photo courtesy from the Museum for Pre- and Early History of Berlin).

Capacity-building training for associated museums

The forth challenge / goal of the F-MU.S.EU.M. Network is making the associated museum protagonists of the *Virtual Museum of European roots* even if they have quite low ICT skills, Web competences and financial resources. Invest in new competence on virtual reality online acts for the re-qualification and the competitiveness of an increasingly relevant economic sector in Europe - the cultural heritage - and for the success of its key organizations – the museums.

A Learning Model has been fashioned by the F-MU.S.EU.M. Network in order to answer to the increasing demand for a set of standard competences needed to create and manage a Virtual Museum online, from the writing of the contents to the shooting of 3D photos, to the upload of textual and multimedia data. The F-MU.S.EU.M. Learning Model is based on an assessment of expertise to be used for the creation of a virtual museum, on a map of related current jobs and on the analysis and forecast of professional and skills needs.

Conferring the F-MU.S.EU.M. Learning Model a special attention to the training costs/benefits and the fruitful use of technological supplies, the centrality of the associated museums is reached by the development of a friendly and manageable Content Management System (CMS) and the provision of higher professional skills to museums' managerial, technical and operational staff coping with the fast communication innovations in cultural heritage.

The Content Management System is the “meeting point” among training experience, networking, communication and technology. It is source of:

- A dedicated database that organizes the information directly uploaded in the system by each partner.
- A platform where museums insert contents in a way that is uniform and able to guarantee the output communication according to standardized patterns.
- A reserved uploading and updating area that is accessible – in different languages - by each associated museum through password. Each partner can prepare data, fill up Access forms, upload papers, insert 2D and 3D images, check the output, and attend a forum for support.
- An operational and cultural forum where each museum contributes to implement the project, following the principles of a “social group network”.

The F-MU.S.EU.M. Network transfers to any associated museum institution all necessary knowledge and skills to create and implement, step-by-step, one's own virtual gallery provided on the Web. F-MU.S.EU.M Courseware online and F-MU.S.EU.M Training Laboratories are distinct tools – usable through password - that give to user museums all necessary know-how to manage the section Reserved Area in order to realize their own virtual exhibition online, starting from capacity

building of know-how and competences. They explain and accompany in detail all management stages of data.

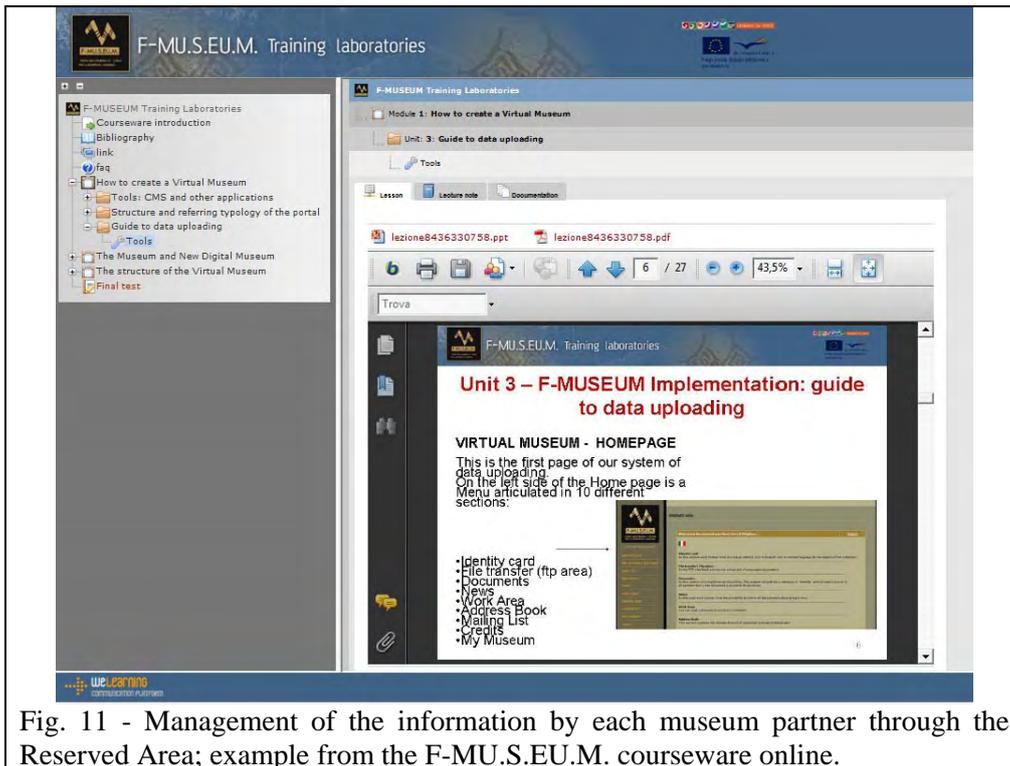


Fig. 11 - Management of the information by each museum partner through the Reserved Area; example from the F-MU.S.EU.M. courseware online.

The Training Laboratories are available only within the partners' network, in the reserved area of the portal. (Fig. 11) They provide:

- Detailed information on the building and implementation of a virtual museum
- Practical exercises with the use of the WebCMS (web content management system) provided by the F-MU.S.EU.M. portal and having the *Virtual Museum of European roots* as background
- Remote Supervision provided by the F-MU.S.EU.M. technical staff
- Individual deepening with the use of Lecture Notes
- Opportunities for interaction and exchange of experiences in presence (internally to the user organization) and at distance (in the network of partners).

F-MU.S.EU.M. supplies also four e-learning courses available in the public area of the web Portal. They have been addressed to four key professional positions involved in the design and management of a virtual museum giving them the basic expertise required: the manager coping with investment in virtual reality, the Web master specializing in virtual reality, the Archaeologist provider of content for

virtual collections, and the e-museum communicator. The coursewares are supplied in four languages: English, Romanian, Bulgarian, and Italian (Fig. 12).

As a background of the above training provision, the F-MU.S.EU.M. Network utilizes an overall architecture of competences that has been translated in a standard path of learning. The structure is comprised of three levels:

Process and output ⇒ Roles and core competencies ⇒ Competence Units

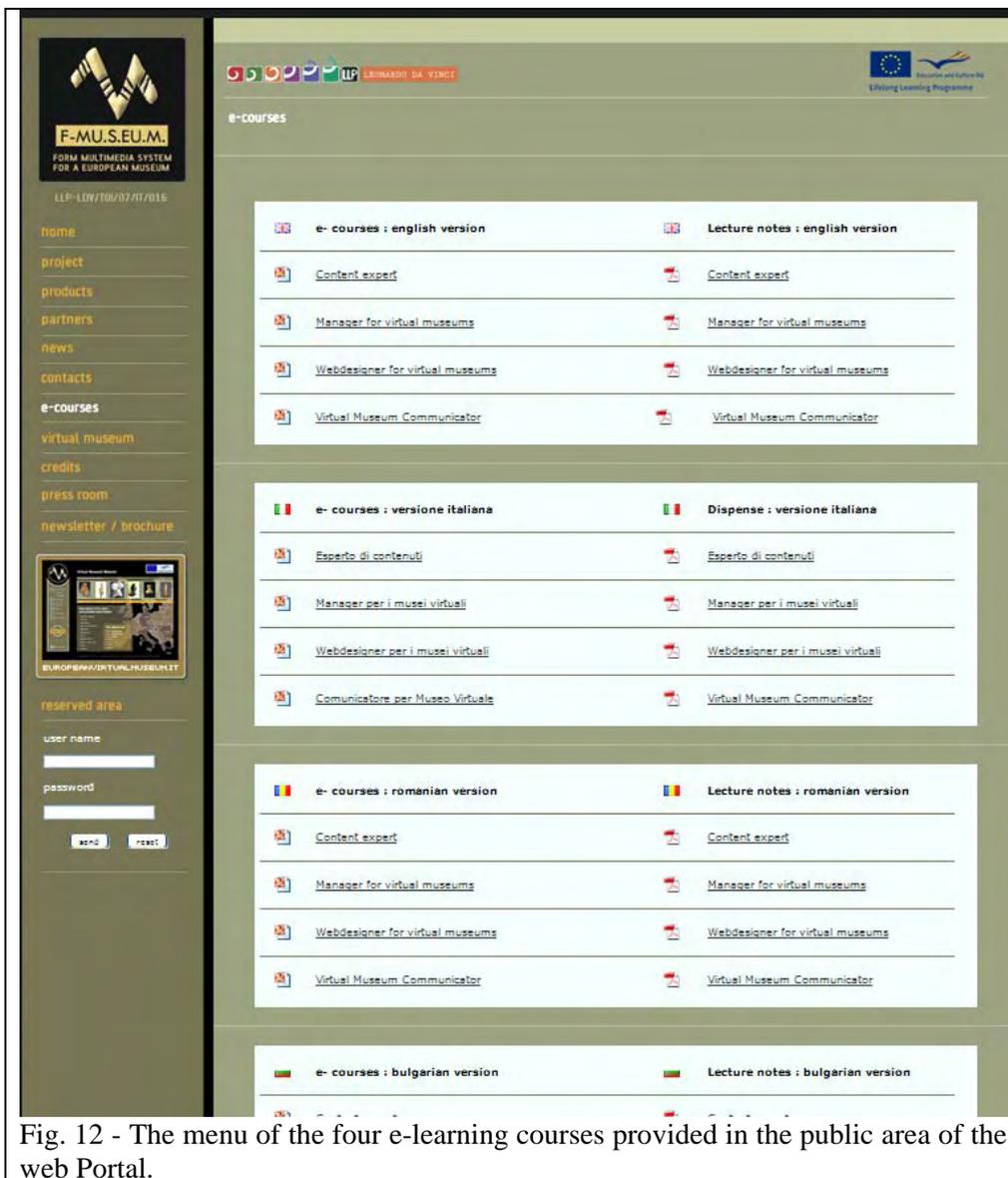


Fig. 12 - The menu of the four e-learning courses provided in the public area of the web Portal.

The rationale of this methodological procedure is that the recognition of the output for every sub-process can lead to the identification of the roles and core competences more strictly related to the efficacy in producing the output. Afterwards, the core competencies can be nearly stocked and clustered in Units that identify a homogeneous and self-consistent mix of knowledge, abilities, and behavior.

The combination of these variables expresses an effective work performance that is achievable through continuous training. Each museum trickles down its capacity training along these packaged learning paths. As learning resources, they are educationally productive, closely aligning with e-learning initiatives and potentially promoting strong transnational links. Partner museums are encouraged internalize this learning in the form of new products, new structures and new ways of working as the latest phase in the e-services trajectory. They are also encouraged exploit the learning units to build trans-national projects.

In short, the associated museums act as protagonists of the F-MU.S.EU.M. virtual collections joining three essential trajectories:

- From a training focus to a learning focus
- Form an individual learning to a collective learning
- From a top-down approach to a peer-review modus operandi.

Practicing these perspectives, the F-MU.S.EU.M. Network implements some broad approaches shared by the OCSE together with the main European and National institutions (UE and National Governments), which are pointing to the central role of learning processes as a determinant competition factor within economy and society.

Experimenting a story-driven model of museum

The narrative model (Hodder 1982; Shanks, Tilley 1992; Pearson, Shanks 2001) as main exploitation option for the visitor is the fifth challenge / goal of the *Virtual Museum of European roots*. The virtual collection based on a network system offers dedicated paths to any user, supporting the individual knowledge through the potentialities of the centralized database online. Therefore, the visitor can proceed following the rules of that mental process working through the association of ideas. The journey through the *Virtual museum of European roots* can utilize a storytelling model, since the collection is not exclusively focused on the conservation and preservation of artifacts as the traditional version of museum is. Contrariwise, it is tailored for revealing appealing stories to a virtual audience and for transforming users into interpreters of the European prehistory starting from finds never seen in that way or which are otherwise inaccessible.

The hypermedia and interactive structure and the virtual reality enchantments of the *Virtual Museum of European roots* allow individual explorative paths to the visitor. They comprise: a) a chronological voyage; b) a geographical travelling; c) a single museum journey; d) a surfing from museum to museum (because the artifacts of the same excavation or archaeological site are often dispersed around

Europe); e) a object type examination (for example the Bell Beakers phenomenon, or the Copper Age fashion for gold ring-shaped pendants); f) a thematic routes exploration; and g) touristic-cultural itineraries that start from a partner museum to explore the territory around it (often through a downloadable and printable circuit with related GIS map).

Significant is the exploration of the European prehistory via Thematic Routes. They explore the issues that the associated museums have in common, despite the geographical farness, in particular for what concerns the legacy of the Danube civilization. The Thematic Routes have been conceived and narrated through close cooperation among the museum partners. They are:

- Civilization, gift from the river
- Trade and early exchanges in prehistoric societies
- The religious places
- Cult and religion in the earliest human societies
- Thermal baths and sacred water places in ancient times
- Fashion in prehistoric times
- Ancient wine regions: The savior of a drink-food for Gods
- To be a farmer in prehistoric times
- Clay house models
- The beginning of metallurgy
- Communication in Neolithic and Copper Age, from symbols to writing
- The modern way of making music in Prehistory
- Sport and role games in prehistoric times
- The Hidden Roots of Europe: Thracians, Dacians and Etruscan
- Ritual connected to the burn of the old year
- From excavation to virtual reconstruction: How will build up an exhibition.

The Thematic Routes map the conceptual relationships being hypertexts structured in content description, active 2D and 3D images of the related items (with the possibility to enlarge them and explore links), videos, drawings, interviews, and in-depth articles.

Conclusions

In conclusion, the *Virtual Museum of European roots* establishes and accomplishes at the same time the following quality criteria and technical standards:

- Documenting the Neolithic and Copper Age roots of Europe
- Housing a substantial online collection
- Making accessible masterpieces that are normally inaccessible
- Delivering rich multimedia content and providing augmented comprehension and appeal from 3D
- Empowering the associated museum as protagonists of the virtual museum
- Putting forward user-friendly entrance and surfing
- Proposing a narrative model for fruition

- Tickling many return visits to explore collection
- Incentivizing visits to physical museums.

The proposed model-experience is obviously not the best and sophisticated way to create and manage Web exhibitions and 3D virtual reality (Deloche 2001; Manovich 2001; Dietz et alii. 2004; Copeland 2006). However, it is an ambitiously realistic approach to support the associated museum institutions to migrate to a Virtual Museum exploiting any good opportunity putting in sync culture, innovation, network, and ICT even if their technical skills, Web competences and financial resources are quite low as usual for any European archaeological museum.

The presented model-experience is also a way to force museums to think to themselves as tourism units skilled in the management of knowledge. The realization of a virtual collection online cannot be decontextualized from other key tasks such as destination management, strategic plans making, synergies and co-operative management with other public and private bodies, extended range of cultural activities on offer, pooling of resources, cross marketing, cultural mediation, and new opportunities from increased customer benefits. Each museum has to weave the virtual museum into its tourist strategic planning.

However, Western people practise the reading of vertical texts when they search for items from lists in column, e.g. surnames from telephone directory or sequence of the stations from railway timetable (Laarni et alii. 2004, 75). It is also the instance for some coins (such as the Polish 10 and 200 ZL coins) and notes (like the Lithuanian 500 litas banknote). Huey (1908) Tinker (1955), Coleman and Kim (1961), Coleman and Hahn (1966) have studied reading a column format of text from paper. They conclude that if a vertical text is typically read slower than the standard horizontal text prior to practise, text comprehension may be comparable in the vertical - and standard - text conditions from the very beginning. No acute difference between horizontal and vertical orientation was found for native Chinese (Chen, Chien 2007).

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