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EXPERIENCES OF DIGITAL DOCUMENTATION OF CARSULAE ON THE FLAMINIAN WAY IN UMBRIA

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Abstract

The Umbrian territory crossed by one track of the ancient Roman Flaminia Way, presents settlements, monuments and art works connected with the old road network. During the centuries, the road track called Martana, which was marked in 223 a.C. by the Consul Flaminio, has coagulate an amount of settlements, like the town of Carsulae (Terni e Acquasparta), Sangemini, the settlement near S. Maria in Pantano (Massamartana), and monuments, like the Massamartana catacombs, rural churches, monasteries and castles. The conservation and the accessibility of all the sites lay down problems not only concerning merely the management of the survey, study and conservation campaign, but also, if the aim is to create a museum network, those related on one side with the improvement of a correct use of the sites, on the other with the realization of an executive program of digital documentation in order to guarantee the dissemination of the data in a Virtual Museum of the heritage itself.

Keywords

3D Survey, Archaeological survey, Virtual Museum

1. *The aim of the project*

The Umbrian territory crossed by the ancient Roman road, the Flaminian Way, which goes through the municipalities of Massamartana, Acquasparta and Sangemini, presents monuments and art works connected with the old road network. During the centuries, the Roman road track, which was marked in 223 a. C. by the Consul Flaminio, has coagulate an amount of settlements, like the town of Carsulae (Terni e Acquasparta) and the settlement near S. Maria in Pantano (Massamartana), and monuments, like the Massamartana catacombs, rural churches, monasteries and castles. All these products prove the remarkable anthropologic activities of the last two millenniums and they embody therefore a great interest for the archaeology, but also for the history, the architecture and the environment.

The conservation and the accessibility of all the sites lay down problems not only concerning merely the management of the survey, study and conservation campaign, but also, if the aim is to create a museum network, those related on one side with the improvement of a correct use of the sites, on the other with the realization of an executive program and planning of the works in order to guarantee the best conservation of the heritage itself. These considerations must be taken especially regarding the open-air archaeological fields, which are constantly exposed to stress caused by tourism and by the necessity of keeping pace with the economical and social development of the whole region.

The aim of this project of research is to value territories of Sangemini, Acquasparta, and Massamartana and to analyze the disposition of such structures connected with the old road Flaminia network in this territory.

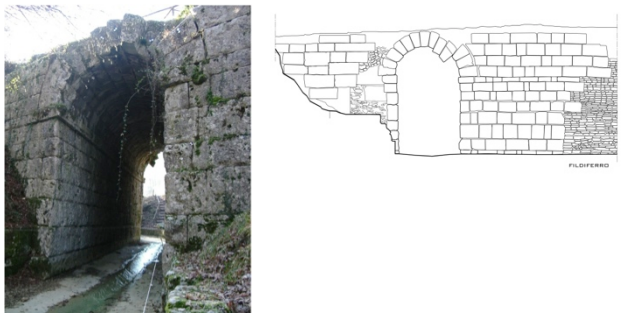


Fig. 1: The bridge Fonnaia on the ancient Via Flaminia in Municipality of Massa Martana; archaeological survey for the analysis of walls

The disposition of the remains can now appear casual at first, but otherwise it is configured as the natural composition of human activities that accumulate and stratify in this place.

Museums, with a functional specificity to communicate their contents, are containers of collective memories and icons, often considered as the instruments through which a community identifies with its territory, tangible traces of relations between human beings as well as between them and the territory in which they live.

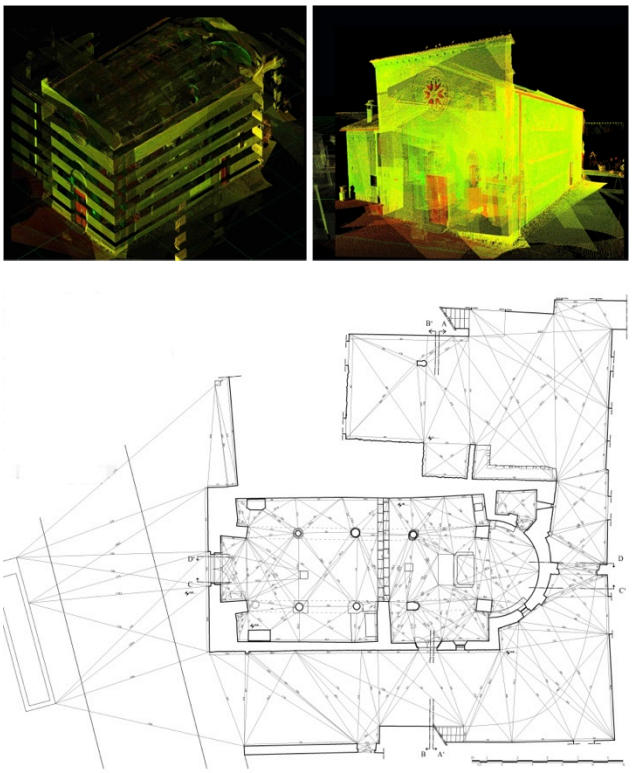


Fig. 2: The complex of Santa Maria in Pantano; 3D laser survey for the correct understanding of the stability of the walls

The complexity of preparation and museum building implies cognitive and research activities, based on some studies, which focus on the heritage itself represented inside the museums by multiple elements that are ordered through research activities, generally linked with a specific direction of social "marketing". The current strategies of preparation and museum building are oriented towards a re-examination of the past and addressed to a non-specialized public in order to answer the growing demand for less ideologized preparation and museum building.

Fig. 3: The church of San Faustino in Municipality of Massa Martana; 3D laser survey and photogrammetric restitution of the facades for the analysis of blocks walls

The "territory museum", intended as socio-cultural space, serves to articulate a common conceptual data as the different themes and data around the territory result as an open museum arrangement of the elements in a place, with the consequent world of relations established between those two, and the dynamics that determine the activities and the cultural capacities of a certain museum system. The aim of a territory's museum, as well as museum didactic, is to highlight and facilitate the construction of such connections within the cultural patrimony.

The project of a territory's museum is a process that implies a series of events that allow an element, or a general context, to be recognized as museum worthy; this operation often coincides with a re-qualification process. A preventive conscience is emerging towards goods and towards the patrimony ad the territory that must be safeguarded; this conscience resorts, through social organizations and institutions, in order to safeguard a specific set of goods or an environment which is exposed to devaluation or de-signification.

Therefore, structures or systems of relations are being projected in a way to be able to transform a place into a museum, focal points of cultural aggregation which sometimes transform the qualities of an environment or a territory in order to have a museum. The object to be safeguarded is even moved to another dimension, spatial or virtual; some of its aspects are captured and transformed to allow its availability and "'net-surfing". In order to make the information

accessible, the image or the real status of the elements to be safeguarded can be manipulated; this is all probably part of the same process to conserve collective memory, as well as research and "social target or marketing". The first steps of this process are the documentation and the survey for conservation and interpretation, using new technologies for interpretation, for territory's museums management and for qualifying the architectural space and the territory of the remains.

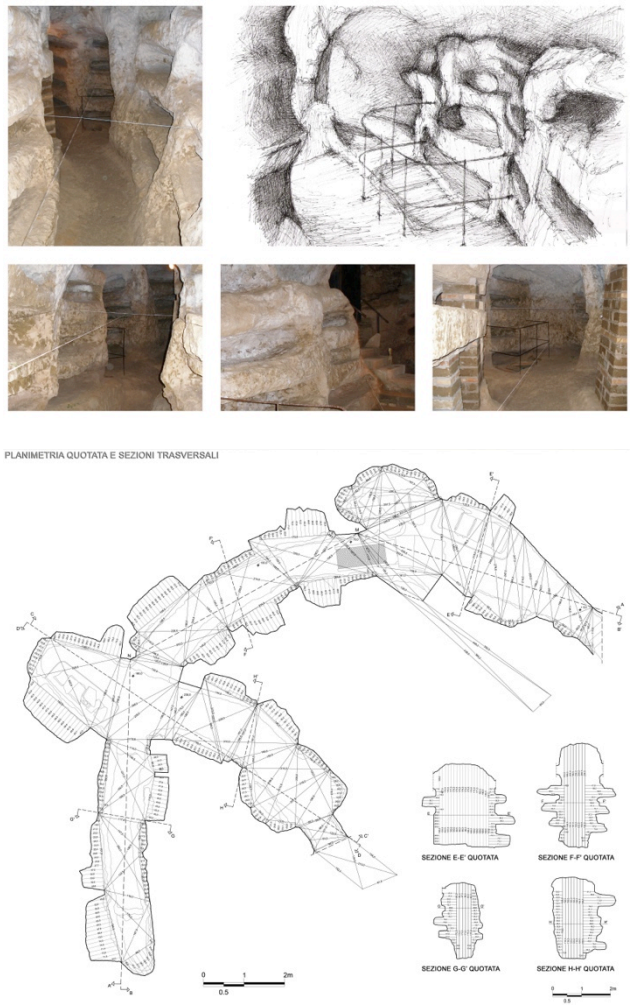


Fig. 4: San Faustino Catacombs in Municipality of Massa Martana, archaeological survey for the study of the underground buildings

The two methodologies of the remote sensing and the photo-interpretation with the integration of site survey and documents are used during the research in order to gain definition and structure of the connective principles of the revealing material and the digital data bases, in order to get an aimed use for the project purposes.

The air photo-interpretation, the study and the creation of virtual models with the support of the laser scanning are determined steps for the generation of a connecting system, which supports the drawing records, the cognitive research and the conservation of the heritage.

One of the principal aims of this project would be the constitution of a G.I.S. (Geographic Information System) that with its characteristic of flexible use, also on different levels, becomes a basic support for the development of an open-air museum network which tries not only to preserve the image and the survey data of the single finds and the monuments related to the Flaminian Way, but also to build a procedure for the management, the accessibility, the protection and the conservation of the heritage itself.

Fig. 5: A church build on a roman bridge along the way of the ancient Flaminia route, in Acquasparta municipality

1. The digital documentation in Archaeology

Today the term "context" has cultural, chronological and spatial and environmental meanings. The architect, as expert in describing events in terms of space and environment, can therefore be included with good reason among the scholars who, in the specific field of each archaeological research, have a key role like other professionals. The architect is expert in charge of the excavation and of recording the finds work together with archaeologists, historians, restorers and laboratory technicians[1]. Measuring a wall

[1] For example radiometric dating, pollen analysis or microfauna specialists. The archaeological survey also uses the formal and stylistic comparison with other similar items (e.g. finds out of context), the archaeometric scientific techniques, and it can take advantage by survey and dating

Fig. 6: Digital documentation using 3D models for historical town settled along via Flaminia near Martani mountains

structure and its functional and aesthetic nature, can become a fundamental support for the historic and architectural study. From the archaeological point of view this activity, if correctly carried out, is aimed at comparing masonry structures, the characters of wall outer layers, the architectural and finishing techniques in the whole geographical area. This is also the case of extended archaeological regions of great interest as the site of Carsulae on the Flaminian way, where the remains of buildings both of monumental interest and of lesser importance are present in the area. Infographic technologies and digital surveying systems can be used in various fields of archaeological studies and, first of all, they offer numerous applications concerning the management of the extensive documentation of the excavation and survey for each campaign. Generally one of the main purpose is to prepare a database concerning the documentation of each site, that can be easily consulted and updated, organized in order to be online in consultation and at research teams disposal, even internationally, due to the interdisciplinary nature of the study. These databases are essential tools for the management and the archiving of survey documentation, for instance of notes taken during the fieldwork, of surveys made by means of digital equipment, of source files up to definitive documentation and drawings, of images and pictures. If well organized, this data gathering can offer the possibility to carry out studies for didactic works or researches in various fields.

Fig. 7: Aerial photograph of the archaeological site of Carsulae

The introduction of such devices, adapted to the requirements of each different sector, allows the enhancement of the wide iconographic and documentary material gathered by a team of scholars and experts working in a particular area. In the end, another distinctive element is the GPS georeference of the topographic data of the buildings described by the drawings, that allows a quick maps updating with any new information (e.g. excavations campaigns). Digital maps can be the support for the gathering of GIS data systems, useful for researches that are directly based on the cartographic map of the site, and they can provide thematic maps for each different level of the study[2].

techniques or by scientific analysis, as described above, generally developed in other disciplines.

[2] The potentiality by S.I.T. or G.I.S. systems in the field of archaeology are known to everybody and, specifically, in the sector of archaeological survey and urban and regional

A digital database should give needed information for the management of an archaeological site, especially for the scheduling of excavation activities, for the planned preventative or emergency maintenance, for the monitoring of the state of preservation of a site.

2. *The site of Carsulae an example of digital documentation*

The construction of the Via Flaminia was promoted by the consul Gaius Flaminius in 233 B.C., and is part of the system of roads that stretched over the entire territory conquered by Rome, constituting an irreplaceable means of connecting the political, economic and commercial as well as military with other regions. Departing from Rome, Via Flaminia crossed Umbria and Piceno, using existing ways used since prehistoric times as a way of transhumance, leading to Fano and follow the Via Emilia. The main function was to be a quick crossing along the Italian peninsula: in fact, the design of the structure was traced with his performance as straight as possible, overcoming the difficult terrain through bridges, viaducts and roads construction on the pole to cross the marshes.[3]

This road then worked mainly as a link between Rome and the Adriatic Sea, crossing territories such as the ager gallicus and gradually produced a unifying tendency, even among the Umbrian people who began to abandon the archaic patterns of living linked to the culture of the village, with a different system of land management. In 20 B.C. Augustus, within the program of renewal of Rome and its possessions in "shining robe imperial" constituted a veritable "collegium of curatores" of the Via Flaminia, which he supervised. The Via Flaminia in Umbria develops much of its route (about 210 km.), Crossing the first urban center to Otriculum, reaching Narni with a journey characterized by numerous works of art branched off into two diverticula: the Flamina Carsulana, which followed a more tortuous path before in the western valleys of Umbria and the Flaminia Spolentina to the east.

The Spoletino way bought it in time greater importance than the old western stretch, leading to the gradual decline of the centers arose as *statio* along the primal journey.

In late antiquity, with the first barbarian invasions that often undermined the state organization responsible for the control, maintenance and functionality of roads, and the forfeiture of Carsulae thanks to the contemporary development of the Lombard Duchy of Spoleto, the western route of the old street was finally abandoned for the other one.

The archaeological site of Carsulae at Terni covers an area of approximately 20 hectares. The city named *Carsius*[4] arose on the trail of a path, which later became the Via Flaminia.

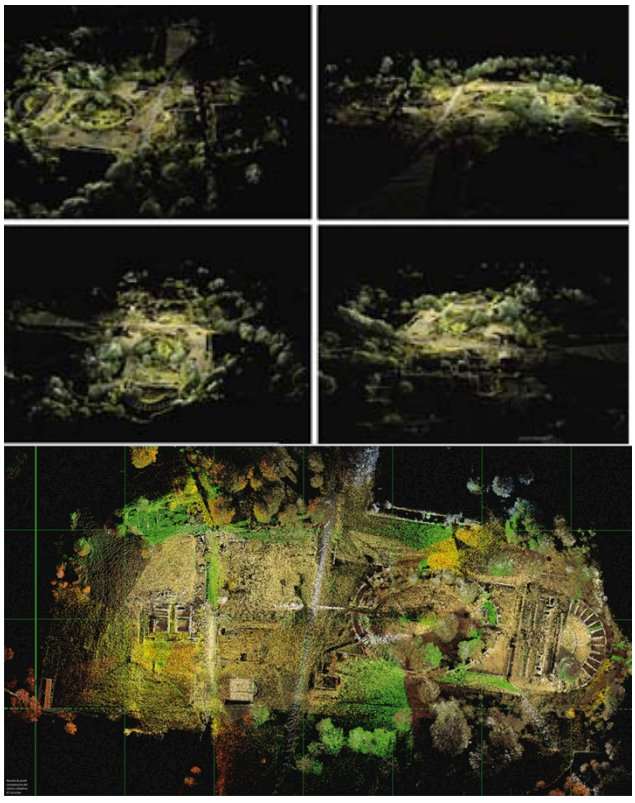


Fig. 8: The database 3D laser point cloud of the archaeological site of Carsulae

This tracks that date back to prehistoric times, and has its greatest development in the Roman era to the Via Flaminia itself, capable of catalyzing

analysis. Their use is more and more common as a necessary tool for the organization of information in the specific field of survey and data management, in order to plan the conservation of interesting sites from an architectural point of view, even at a territorial scale.

[3] Someone think, as Nicolas Bergier (XVII sec.) in the *Histoire des grands Chemins de l'Empire Romain* and Leon Battista Alberti (1404-1472) in *De re aedificatria*, that romans realized routes that were on a high level to help roman military to see the enemy.

[4] C. Marcato, s.v. *Carsoli*, in *Dizionario di toponomastica. Storia e significato dei nomi geografici italiani*, Torino 1990.

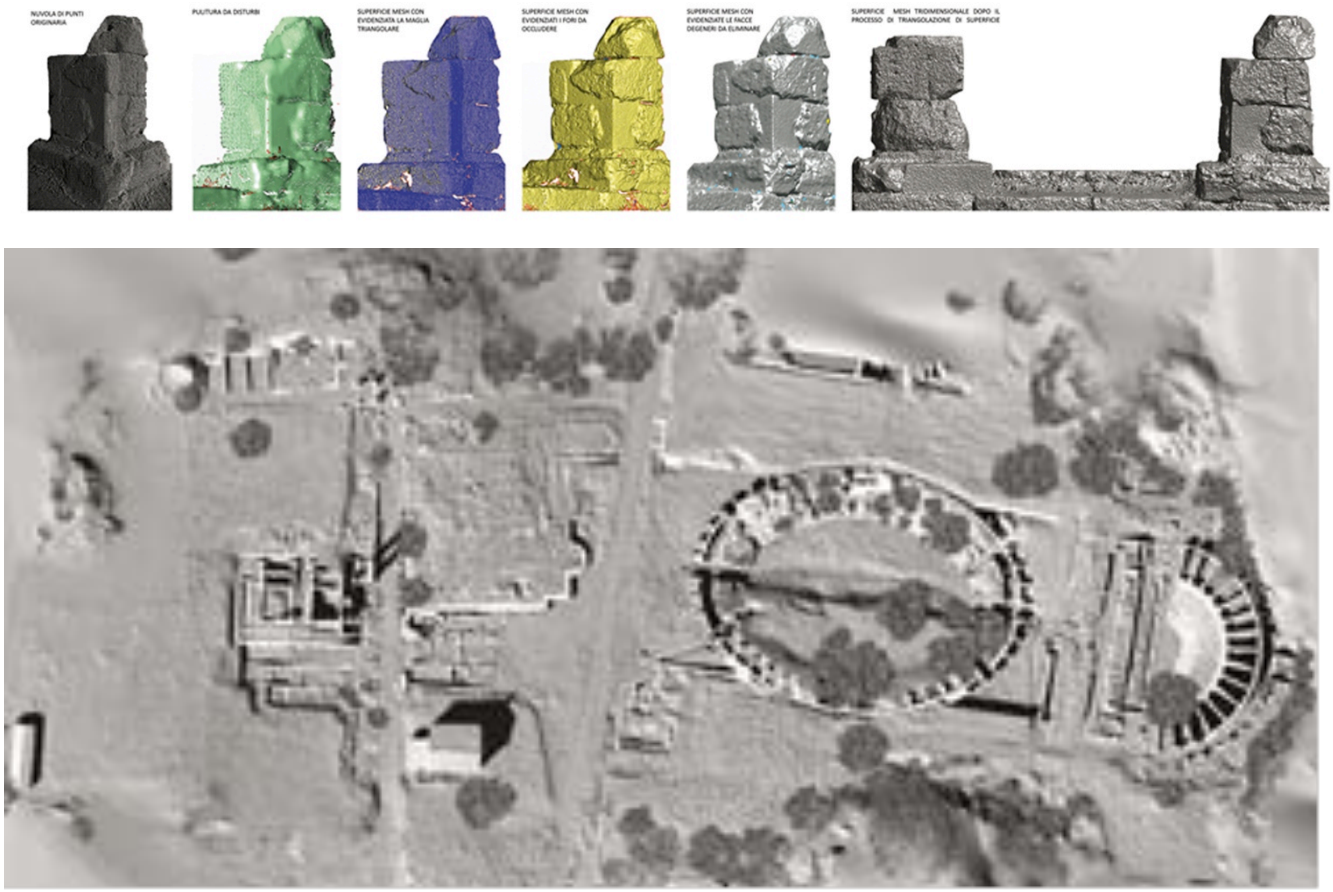


Fig. 9: Stages of data processing 3D laser for the creation of the 3D model of the site

the trades of the Umbrian communities that found further downstream.

The transformation of Carsulae in an urban core structure made it into the main settlement in the territory, given its strategic position in the context of the road. His first feature statio along the route of the Via Flaminia is witnessed by a reality-consolidated settlement dating back to the period preimperiale of which there are many traces. The central residential district is organized along the axis of the main street and has on both sides of the remains of buildings, presumably shops and housing. There are the remains of a Roman aqueduct which, supplying and connecting three monumental cisterns arranged in the highest areas of the urban area, confirms the systematic exploitation of water resources for productive purposes; masonry structures incorporated under the stalls of the temples of the area of the hole seem to witness an older building with civil service. The audience of the hole has a porch on the south side and the remains of tabernae, located in the substructures of the square beneath the temples of the Republican era.

In 27 B.C. with the ascent to the throne of the Emperor Augustus, Carsulae was elevated to the rank of municipium, undergoing urban renewal as a monument, which has remained a deep trace in the image of the city that even today there is now returned to its important ruins. The logic of the new image of the Roman city is in tune with the simultaneous promotion of the great works along the Via Flaminia. Renewal is readable in the spread of Roman architectural models, as well as related construction techniques, such as opus reticulatum, accompanied by the spread of marble like coating of public buildings.

To this period belong the monumental gate, the entrance to the town of celebration - which looks like a triumphal arch with three arches crossed by the Via Flaminia -, the system of large public buildings, theater and amphitheater - which reorganizes along an axis transverse tissue of the city center -, and the monumental necropolis along the Via Flaminia just outside the monumental gate.

With the presence of Christianity has the reuse of a building, perhaps a public building,

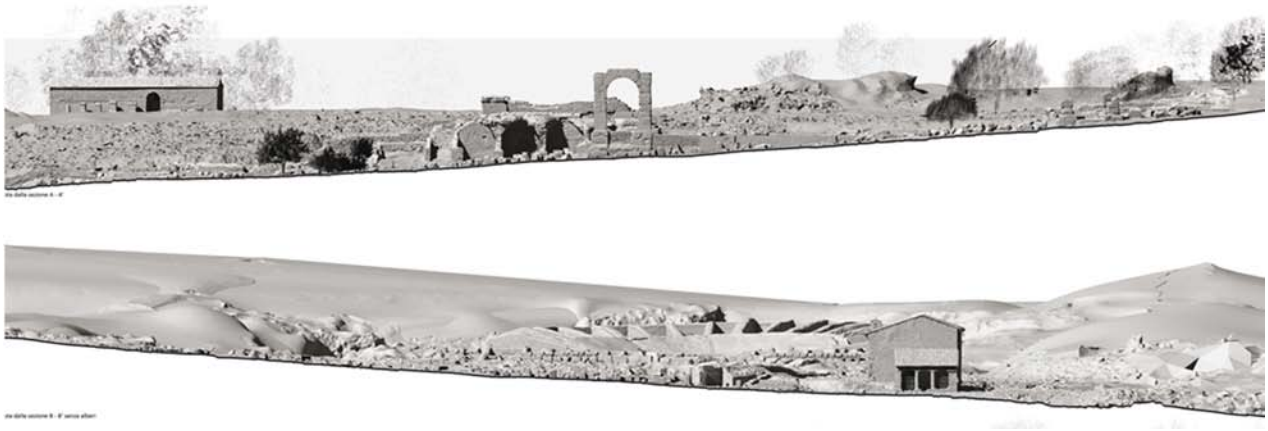


Fig. 10: Sections of the 3D model of the archaeological site of Carsulae

always willing along the central axis of the Via Flaminia, transformed into a church dedicated to Saints Cosmas and Damian. Further evidence is the presence of Christian sarcophagi and inscriptions dating from the first half of the fourth century.

Fig. 11: Detail of the models in the area of the Temples. The presence of a several stones and blocks on the ground complicate the process of filling holes in the point cloud and require a lots of scans in the acquisition data procedure

With the arrival of the barbarians the western branch of the ancient route of the Via Flaminia military lost its importance in connection with the development of the eastern side of Terni and Spoleto; it is also considered that the abandonment of the city center of Carsulae go correlates with the emergence of a new urban center along the same path, *Casventum*. The architecture of the city, which remained in a state of disrepair, are subsequently served as a quarry for material reuse.

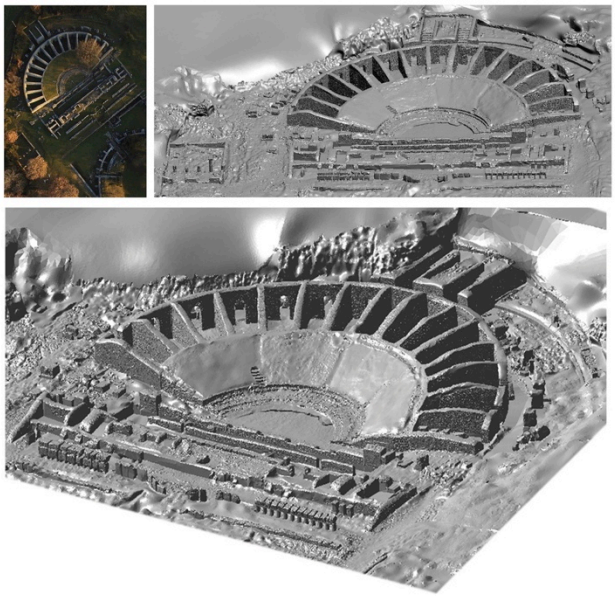
Early research focused on the recovery of archaeological materials Carsulae date back to the sixteenth century, when many artifacts were removed to adorn the palaces of the principal towns of Umbria. The first source antiquarian chart which indicates the presence of the urban center of Carsulae, a document dating back to 1637.

Fig. 12: 3D model in the area of the monumental tombs outside the boundary walls of the town of Carsulae

Following a second excavation campaign was organized organized a research promoted by Pope Pius VII in 1783, which put in partially light the theater and the amphitheater. These excavations, however, were aimed at mere recovery of works of art that were collected in setting up the museum Pio-Clementino. After a further excavations, organized in 1851, Carsulae was again abandoned, a victim of illegal excavations; only in 1897 it was decided to demarcate and fence the site and set up surveillance. Systematic investigations were carried out true in 1951, when they began the excavations and scientific surveys, which, extending up to 1972, with further interventions accommodation for the use of the area and the construction of the small museum and

educational center, gave the appearance of the site are still visible.

The surveys conducted in archaeological sites located along the Via Flaminia near the Martani mountains, have produced a useful database on the territory. For each site investigation surveys were conducted through multiple methods of measuring integrated. In Carsulae the laser scanner survey has allowed us to develop an archive from which digital 3D models have been developed for the use of the remote site. After drawing floor plans and detailed surveys of each masonry or archaeological substructure were processed three-dimensional models of the monuments for the visualization and reconstruction of the original appearance of the main architectures, in addition to the development of interactive platforms for the creation of a virtual museum on the territory.[5]



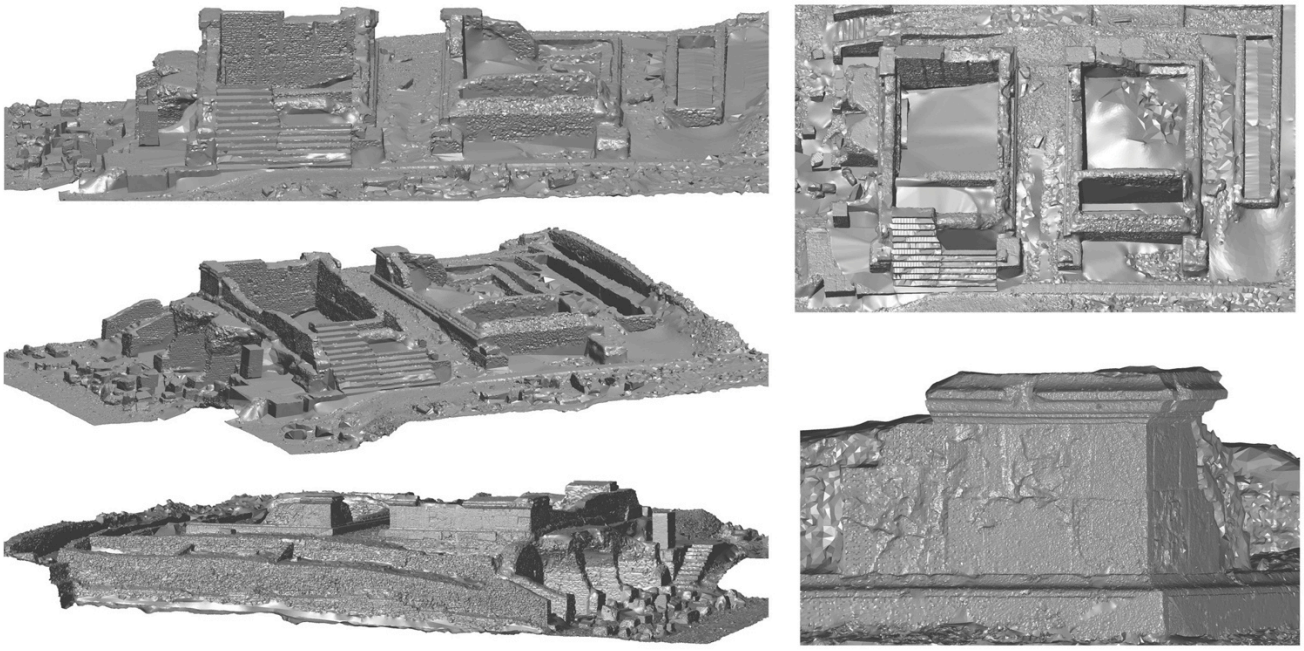


Fig. 13: Processing of 3D models for the theatre ruins inside the general 3D model of the ground for the development of the virtual museum system and the 3D model of the Temples area; the elaboration of the data finalized to find an high quality of the model with a low number of mesh

[5] The archaeological surveys of "Carsulae" were conducted in the period 2005-2010 in accordance with the Archaeological Superintendence of Umbria. Within the research there are three Master thesis in architecture: Daniele Secco, "Rilievo dell'area archeologica di Carsulae, metodologie e prospettive"; Luca Torelli "Il sistema Flaminia nel territorio martano: rilievo per le indagini archeologiche e territoriali"; Alessandra Tursi, "La documentazione del sito archeologico di Carsulae in Umbria".

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