

INTEGRATED METHODS FOR DOCUMENTATION AND ANALYSIS OF ARCHAEOLOGICAL HERITAGE: THE RESIDENTIAL BUILDING ALONG THE WESTERN SIDE OF THE CANOPUS AT HADRIAN'S VILLA. INITIAL RESULTS AND RESEARCH PERSPECTIVES

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Abstract

The paper presents the initial observations on a lesser-known but extremely interesting monument at Hadrian's Villa, the so-called *Tabernae*, partly restored and used at present as *Antiquarium* of refined marble statuary, and partly closed to the public and still under excavation. The building consists of two adjoining structures on high substructures resting on two different levels of the tuff layer. In recent years, on the occasion of some works for the museum, an excavation has brought to light some remains; from then onwards the team has taken an interest in the building built on the upper terraces, proving its rectangular plan with a central courtyard thanks to additional archaeological excavations. Research activities are still ongoing; however, a complete terrestrial laser scanner survey of the whole building has already been started, considering both levels, in order to analyse in depth the remains and the architectural structure of the complex.

Keywords

Hadrian's Villa, *Tabernae*, *Antiquarium*, archaeological excavation, 3D digital models for Cultural Heritage

1. Premise

The aim of the present paper is to focus particular attention to a monument at Hadrian's Villa that, despite its central position and the good state of preservation of its structures, has remained until today almost unknown.

This is the great vaulted substructure that regularizes and closes the western side of the Serapeum-Canopus complex, also known as "Tabernae" (Fig. 1). In the late Fifties of the past century, part of the environments has been renovated and used as *Antiquarium* to hold the permanent exhibition of the precious sculptural group recovered in the Canopus basin during the excavations carried out by the Italian archaeologist Salvatore Aurigemma (1885-1964) (Aurigemma, 1954, 1955, 1956, 1961, p. 119).

On the occasion of subsequent works for adaptation to standards of the museum building installations, further parts of the structure were brought to light, hence starting a research project on the monument.

Direct analysis on the building, supported by a reliable survey carried out in different campaigns with terrestrial laser scanner and close-range photogrammetry, along with targeted archaeological excavation, is finally providing knowledge to the characteristics of this structure, that seems to appear as an impressive building, as well as to "rediscover" the upper area of the building resting on the substructure.

2. Introduction

One the most world-famous image of Hadrian's Villa is the monumental complex of the Canopus (Fig. 2), characterized by a large *triclinium* with a *stibadium*, covered with an extended polygonal vault¹, and overlooking a long porticoed basin decorated with marble statues of exceptional artistic quality.

¹ On the survey of the vault of the so-called Serapeum and on the reconstructive hypothesis of the façade cf. Adembri, Di Tondo, and Fantini (2013).

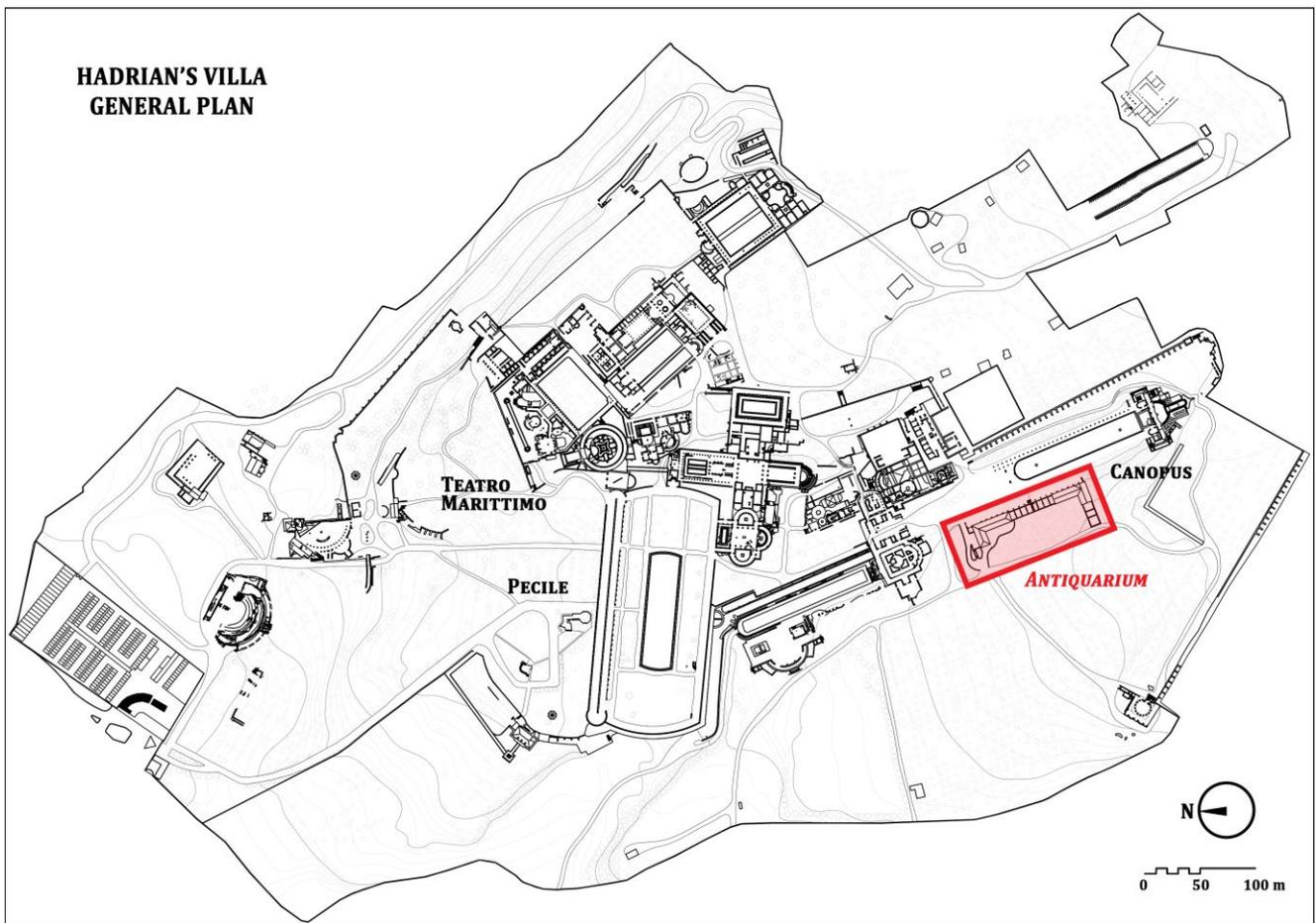


Fig. 1: Plan of Hadrian's Villa; highlighted in red the location of the *Antiquarium*, on the western side of the Serapeum-Canopus complex. Plan credits: G.E. Cinque

Undoubtedly, this architecture created a remarkable visual effect thanks to the quite original architectural concept, enriched by the refined sculptures², and associated with the use of water, both static in the large elongated basin and dynamic in the watergames and small waterfalls surrounding commensals under the vault of the Serapeum.

The complex is located in a preexisting small valley thanks to a massive work of orographic regularisation, that allowed the creation of high building structures standing on imposing substructures: on the eastern side known as *Praetorium* and on the western one known as *Tabernae* (Fig. 3).

Both substructures have been considered very little from previous researches, notwithstanding

the intrinsic architectural importance of buildings of such dimensions.



Fig. 2: Hadrian's Villa, Serapeum-Canopus, view from North of the small valley. Image credits: P. Allende

² Among them including Caryatids, replicas of the Korai existing in the Erechtheion of Athens. On Canopus statuary, see Pensabene (2009, 2011) and its references.



Fig. 3: Hadrian's Villa, substructure of the so-called *Antiquarium* on the North-West side of the Serapeum-Canopus complex. Image credits: A. Ottati

However, while one can notice an early interest for the structure of the *Praetorium*, starting from architect Pirro Ligorio (1513-1583), who provided that name aware of the importance of the structure and supposing the presence of imperial rooms above the terrace (Ligorio, 1723, Cod. Vat. Lat. 5295, Libro Taur.), with regard to the western substructure scholars have not gone beyond a superficial mention.

The only recent scientific studies concern plasters of the so-called *Tabernae*, presenting wall paintings in the cross vaults considered to be poorly made and dating back to a later period compared to the Hadrianic project (Fig. 4) (Molle, 2004), and also graffiti etched on the walls³.

Thus, if the complex of rooms, divided into three floors at least, has been almost completely ignored, very little has been considered the large building resting on the upper terrace and overlooking an internal courtyard, which was partially renovated as a farmhouse in the eighteenth century by Dukes Braschi Onesti⁴.

³ Actually, the poor state of preservation of most of the vaults and ceiling coverings of Hadrian's Villa does not allow to have a wide record of cases of pictorial decoration of the Hadrianic period for a comparison with the examples found in the *Tabernae*: therefore it cannot be ruled out that these paintings date back to the Hadrian age, considering the refined quality of the motifs decorated within the geometrical frames. For some images of the details of the restored vaults, cf. Adembri (2000, p. 40-41). On the graffiti decorating the walls of the southern latrine, see Molle (2011). On restorations activities of the years 1995-96, see Gizzi (2000).

⁴ Aurigemma (1961, p. 119) only mentions the retaining wall that delimited the small valley on both sides.



Fig. 4: Hadrian's Villa, *Tabernae*, painted fresco of a barrel vault. Image credits: A. Ottati

The good state of preservation of the substructure, the only original visible part of the building, would have suggested to Renaissance scholars and illustrators that even the upper building had the shape of an L or a three-winged portico (Fig. 5).

The uncertainty of reconstructing the original appearance of this building, even in more recent times, is also evident from the different solutions documented in the two versions of the maquette by architect Italo Gismondi (1887-1974) (Ten, 2007; Sgalambro, 2010, p. 174, n. 5).

In the first model, preserved in the Museo della Civiltà Romana at EUR (Rome), the building consists of an L-shape structure with annexed three-winged portico and inner courtyard, where the scholar reconstructs two little temples overlooking each other. The portion of the southern side of this building consists only of one structure along the Canopus small valley, in front of which a small temple and a semicircular exedra are positioned; there seems to be no traces of both (Fig. 6).

The only scholars who dwell upon this area of the Villa are De Franceschini (1991, p. 294-296; 559-562) and Vincenti (2017, p. 241-253) with references.

In the most recent version, created in the 50s for the Archaeological Area of Hadrian's Villa, the author reconstructs only the visible part of the building at that time, the one occupying the northern terracing, adding a further southern wing to the structure – of which there is no remains on the ground – specular to the minor arm of the Museum, this way reconstructing a C-shaped plan (Fig. 7).

The South-East section of the structure was in fact brought to light only in the early Nineties of the past century thanks to an archaeological excavation campaign carried out by Roberto Righi, at the time the official archaeologist of the Superintendency, which was followed by a project for restoration and protection of the remains of walls and floor mosaics by a roof on metal pillars (Fig. 8).

A large part of the complex remained totally unknown until a few years ago, as it was located in an area closed to the public, except for the rooms of the former farmhouse renovated in the 90s and reused for permanent and/or temporary exhibitions.

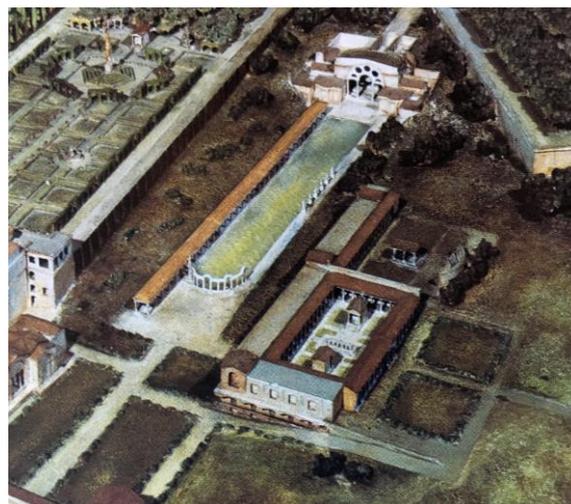


Fig. 6: Museo della Civiltà Romana. Maquette of Hadrian's Villa by I. Gismondi: detail of the building above the western substructure of the Serapeum-Canopus. Image credits: (Sgalambro, 2010)



Fig. 7: Hadrian's Villa, maquette by Italo Gismondi: detail of the building above the western substructure of the Serapeum-Canopus. Image credits: A. Ottati

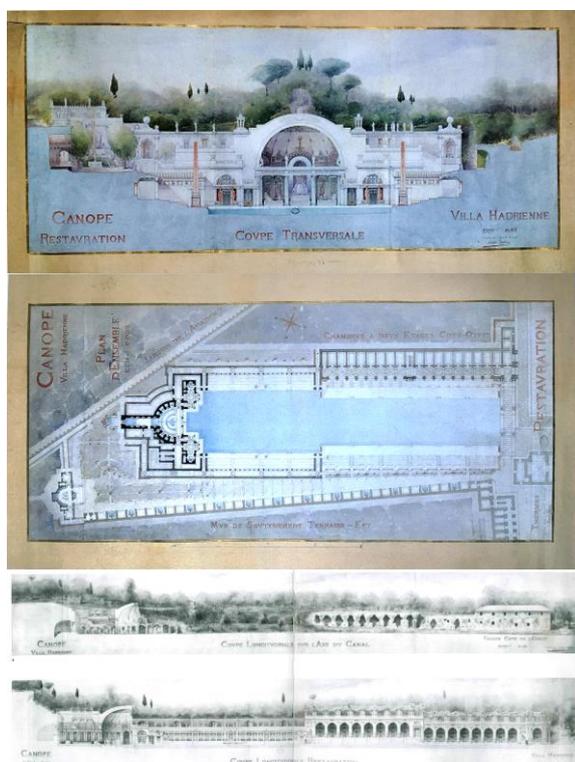


Fig. 5: Top: Hadrian's Villa, Serapeum-Canopus, year 1894 reconstructive drawing by Louis-Marie-Henri Sortais (1860-1911). Image credits: Top (Sirano, 2000); Bottom (Jacques, Verger, & Virlovet, 2002, p. 146-147)



Fig. 8: Hadrian's Villa, building above the western substructure of the Serapeum-Canopus, South-East remains. Image credits: A. Ottati



Fig. 9: View of the partial point cloud of the *Antiquarium*. First laser scanner survey campaign carried out in August, 2018. Survey by S. Bertacchi and F. Fantini. Image credits: S. Bertacchi

The excavation surveys preliminary to the works for installations for the Museum, starting since 2007, have led to the confirmation that the area in front of the rooms of the upper building was free from structures: in fact, it is an area where a courtyard or a garden were located, crossed by a drainage pipeline that ran lengthways the northern terracing coming from the South. This fact was confirmed by further investigations carried out in the same area, which also revealed the existence of walls and floor remains in a symmetrical position with respect to the Museum spaces.

Subsequently, additional archaeological excavations, carried out to verify the typology of the building structure, brought to light some badly preserved remains of at least two rooms, similar to those already known along the front towards the Canopus, with traces of floor mosaic.

The discovery has definitively proved that the building built on the upper terraces had a rectangular plan with a central courtyard⁵ and consisted of two adjoining buildings, characterized by a difference in height similar to the difference existing between the substructures.

So it has become evident the need to carry out a more in-depth study of the building, starting from the gathering of all data available so far, the observation of emerging structures and a reliable survey of both the upper and lower buildings, with topographic positioning of the area carried

⁵ Hypothesis adopted in the recent work on mosaics by Vincenti (2017, p. 244), who had the opportunity to visit the site to verify mosaics floors and to gather information about the news emerged from the recently concluded archaeological investigations.

out with traditional methodology for the detailed features of the masonry and digital technology for the whole building, which first results are presented in the paper.

3. Survey of the archaeological remains

At present, digital methodologies for 3D data gathering and model construction are commonly used in the architectural and archaeological field (Remondino & Stylianidis, 2016; Vincent, López-Menchero Bendicho, Ioannides, & Levy, 2017; Inglese, Docci, & Ippolito, 2019).

Latest technologies applied to the cultural asset have in fact allowed a better accuracy and colour fidelity with reduced costs and speed for acquisition (Gaiani, Remondino, Apollonio, & Ballabeni, 2016; Gaiani, Apollonio, Ballabeni, & Remondino, 2017; Gaiani, 2018).

In recent years particularly archaeology – often dealing with irregular, fragmented and partial remains – has taken advantage due to the difficulty of high-accuracy shape acquisition by means of traditional survey, finding a solution to document heritage in 3D with reliable representation of the object thanks to available digital techniques, both terrestrial and triangulation-based 3D laser scanner or photogrammetry (Guidi, et al., 2009; Russo, Remondino, & Guidi, 2011; Remondino & Campana, 2014; Cipriani, Fantini, & Bertacchi, 2017). The availability of digital models whether on an architectural or detailed scale, have offered new opportunities for the use of 3D simulacra; in particular at Villa Adriana it is worth mentioning the recent experiments aimed at the anastylosis

of the architectural decoration finds (Adembri, Di Tondo, Fantini, & Ristori, 2014; Adembri, Cipriani, & Bertacchi, 2018).

The study of Roman modular design system, based on grouped measuring units together with the standard units of area used for determining the surface capacity of the building, have gained a renewed interest. In fact, the possibility of displaying reliable surveys on a general architectural scale, such as fragments, has allowed scholars to establish correlations between elements, which were formerly much more complex to identify (Adembri, Cipriani, & Fantini, 2019). The survey step plays indeed an important role for the following phases, especially for interpretation of the original design, in other words, it lays the foundation for the whole analysis and documentation and should therefore be based on a well-established methodology and workflow (Bianchini, 2012). The relationship between drawing (2D) and design (material execution), even in the digital age dominated by 3D representations, is a research field that does not diminish its importance for the correct interpretation of structures, favouring synoptic readings able to give a general framework to the activities of archaeologists, architects and restorers (Inglese & Pizzo, 2016; Ippolito, Attenni, Bianchini, Inglese, & Griffo, 2017).

For this particular case study, precisely because of the interdisciplinary nature of the research, authors undertook a general reflection for drawing a comprehensive overview of the complex, useful for multiple domains, namely able to describe correctly the whole building, its single parts, up to the details of construction and texture, so to have a different level of information for further in-depth analysis. This survey in fact is part of a more general activity, coordinated by the Istituto Villa Adriana and Villa d'Este, which has among its objectives the integration of contributions by individual research groups into a single framework. In this context, the work carried out by the University of Bologna includes, among its objectives, the documentation of the monuments of one of the best-known areas of the villa, i.e. the Serapeum-Canopus complex (Adembri, Cipriani, & Fantini, 2019).

According to a the latest research on Hadrian's villa, this study makes a progress on apparently less important buildings that nevertheless fall within a general framework of

knowledge and interpretation of the archaeological site.

The team has planned a complete and detailed survey of the archaeological remains found during the excavations with the goal of integrating them with previous archaeological survey of the area lead by University of Bologna, in particular the two campaigns, the first on the foundation wall of the *Praetorium* plateau, the latter on the almost unknown small triclinium located South-East of the Serapeum. Hence, the survey had the ambitious objective of connecting all the elements surrounding the partially artificial valley of the Serapeum, acquired starting from 2015 (Adembri, Cipriani, & Fantini, 2019).

An important role is then played by the topographic surveying, that facilitates the general alignment of independent terrestrial laser scanner campaigns. For the documentation of the whole *Antiquarium* (Figs. 9-10), a new survey was planned with the focus of adding a new element for the documentation of the site. In order to achieve a full description of the external surfaces of the building also a close-range photogrammetric survey was performed for gathering information about materials and colour.

The used surveying methodologies (TLS and SfM applications for reality-based 3D modelling) have become nowadays widely established and widespread⁶ and have increasingly been used by researchers in the Cultural Heritage domain for digitally document, visualise, interpret and reconstruct the previous conditions of a building/complex (Adembri, et al., 2016; Bianchini, Hess, Inglese, & Ippolito, 2017).

The purpose of the surveying project is twofold: firstly, to fully document the present state of preservation of the lower and upper levels of the structure, including the western area where the excavations has been carried out (at present closed to public) to provide scholars with a global knowledge of the building. Secondly, starting from the collected metric information, to delve more deeply into the building's design with a particular focus on both geometry (study on proportions) and relationships between spatial requirements and ancient measurement systems (Adembri, Cipriani, Fantini, & Bertacchi, 2015).

⁶ See the extensive research literature on the subject, e.g. (Remondino, 2011; Guidi & Remondino, 2012; Gonizzi Barsanti, Remondino, Jiménez Fenández-Palacios, & Visintini, 2014; Quattrini, Malinverni, Clini, Nespeca, & Orlietti, 2015; Attenni, et al., 2017).



Fig. 10: Partial point cloud of the *Antiquarium*. Plan, front and section views. Image credits: S. Bertacchi

Concerning this last aspect (observed dimension in pedes and conjectured target in standard feet (Duncan-Jones, 1980)), it is worth underlining its heuristic importance since it may suggest – through ancient dimensioning criteria and architects’ target measurements – clues and hints for further excavation campaigns and following reconstruction hypothesis.

For the first point, given the dimensions and the complexity of the building, it has been decided to divide the documentation campaign in different steps, also due to logistical aspects.

In particular, some issues related (i) to time-consuming procedures for documenting a big number of environments – both outside and inside – located on two levels and partly covered with infesting vegetation, especially in the closed area, (ii) to the presence of numerous leafy trees around the building – in most cases evergreen olive and oak trees –, even very close to the fronts and obstructing the view (possible obstacles blocking the laser signal of the device), and lastly (iii) to the considerable difference in height between the two main levels.

The ongoing surveying activities with 3D laser scanner started in August 2018 with the first documentation campaign of the upper terrace, partly closed to the public, and the outside of the main building where the museum is located. This initial step consisted of 38 scans by means of a Leica ScanStation C5, located as shown in figure 11. The resolution value, defining the horizontal and vertical distance between the points of the scans, has been set to medium resolution (1 cm @ 10 m); since the range of the device arrives up to 35 metres, it has indeed been necessary to capture multiple and quite close scans owing to the many obstacles and the luxuriant vegetation impeding the view. For the lower façade, some scans of a previous campaign (year 2015, Z+F 5010C laser scanner) documenting the Serapeum-Canopus complex have been added for a complete result, nevertheless the lower facade hidden by the thick vegetation is still incomplete.

As regards the second point, starting from a general study on measurements of the structures discovered so far, some hypothesis have been put forward to be subsequently examined in depth when completing the survey.

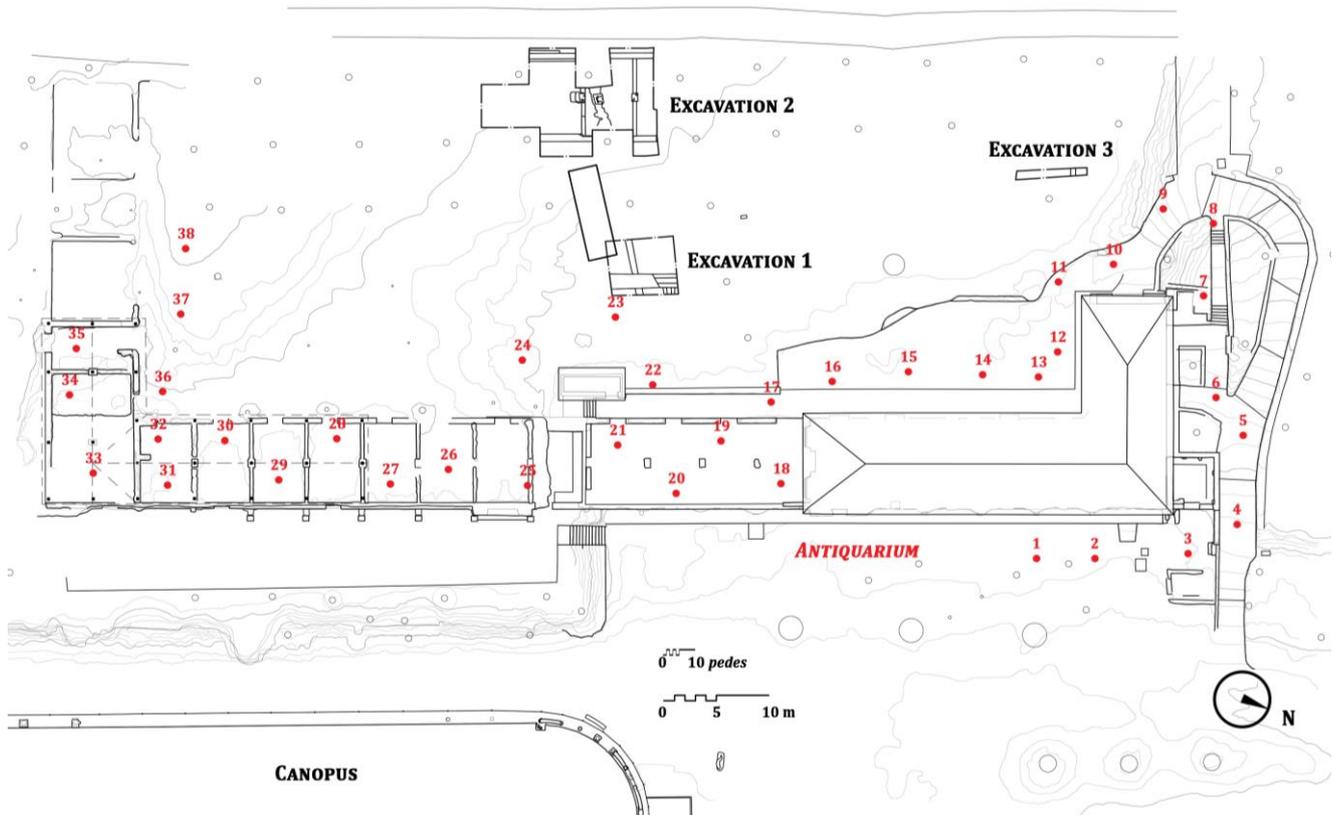


Fig. 11: General plan of the complex; highlighted in red, positions for scans and excavations. Image credits: S. Bertacchi

The study of proportions of structural elements and plausible original dimensions of the complex has been conducted using technical drawings and digital models achieved thanks to the 3D survey (Fig. 12). Such documents, including plans, elevations and cross-sections, represent a reliable key tool to understand spatial distribution, modules, internal and external correspondences, finally the relationships among spaces.

In order to form some hypothesis we must consider the Roman design system, commonly using three-dimensional modular grids to proportionate the whole building and its single parts and to facilitate the composition (Bianchini, Fantini 2015). On this basis, the first observation concerns the general dimensions in relation to the Roman ancient units of measurements⁷.

It follows that the main side of the building (East facade) has a length of 360 *pedes* (about 106

m = AB side), equal to 3 *actus*, while the discovered ruins on the southern wing measuring 150 *pedes* (about 44 m = side AD), for a total area (ABCD rectangle) equal to 54000 *pedes constrati* (PC), that is $3 + \frac{3}{4}$ *actus quadrati* or 15 *climata* (≈ 4718 m²) (Fig. 13-i).

This could probably be the global area covered by the original building, nowadays still existing on the eastern side but remaining only traces on the western one (the dark grey hatched area in Fig. 13-iv represents the still existing building), and certainly provided with a central courtyard (one or more?) for the access to the upper level. Considering the built area and the remains on the East and South front, one can calculate a depth of approximately 30 *pedes*; supposing the building to be symmetrical, as common rule in the treatises and teachings of the period, it is possible that the original covered area was a ribbon of 27000 PC (ABCD - EFGH = nearly 2360 m² of covered surface on the upper floor) (Fig. 13-iii), obtained by the subtraction of an inner patio measuring 300 P x 90 P = 27000 PC (EFGH rectangle) (Fig. 13-ii). So the ratio between covered and uncovered area is a round number, that is 1:1.

⁷ Units of length: 1 Roman foot = 1 *pes* (P) = 29.56 cm (plur. *pedes*); 1 *actus* = 120 *pedes* \approx 35.47 m (plur. *actus*). Units of area: 1 Roman square foot = 1 *pes constrato* (PC) = 0.0874 m²; 1 *scrupulum* = 10 x 10 *pedes* = 100 PC \approx 8.74 m² (plur. *scrupula*); 1 *clima* = 60 x 60 *pedes* = 3600 PC \approx 314.56 m² (plur. *climata*); 1 *actus quadratus* = 120 x 120 *pedes* = 14400 PC \approx 1258 m².



Fig. 12: Rendering of the preliminary three-dimensional model of the building and surrounding area (plan and façade). In red, the 3 *actus* fitting the front perimeter wall of the *Antiquarium* and the western wall of the remains found with the excavation.
Image credits: S. Bertacchi

The module of 30 *pedes* fits also the space overlooking the main front, considering the alignment with the wall of the “latrina” and other ruins investigated by the excavation of the North area (BMNO rectangle).

This additional area could probably be extended also to the north façade (BOPQ rectangle) (Fig. 13-iv).

The change of level between the southern and northern terraces for a gap of nearly 7.5 feet in height, where at present we find the collapsed vault (J point), is not exactly placed in the midpoint of the rectangular space: in fact JK is shifted towards left of six feet respect to IL centre line (Fig. 13-iv).

As regards the surviving eastern front of the building, there are two levels: the left planking level is nearly 7.5 feet higher than the lower one and arrives up to 30 feet on the upper terrace floor; on the right side the original level of the

building is visible up to nearly 22.5 feet, where the uncovered terrace still exists. The left slope reaches the same height measured between the two terraces (nearly 7.5 feet) (Fig. 13-v).

Original openings are an evidence of the number of the ancient rooms and the presence of two latrines, at each corner, suggests the identification of the lower building as a residential one, counting 9 rooms in the left side (including the one with collapsed vault, where the level changes) and 10 in the right side, which match respectively with the southern and northern part of the actual building along the western side of the Canopus basin.

With the exceptions of the two corners where special solutions had to solve the particular spatial extensions, there is an evident repeat of the module of 18 x 30 *pedes* fitting a single space (see the orange rectangles on the front view of the building in Fig. 13-v).

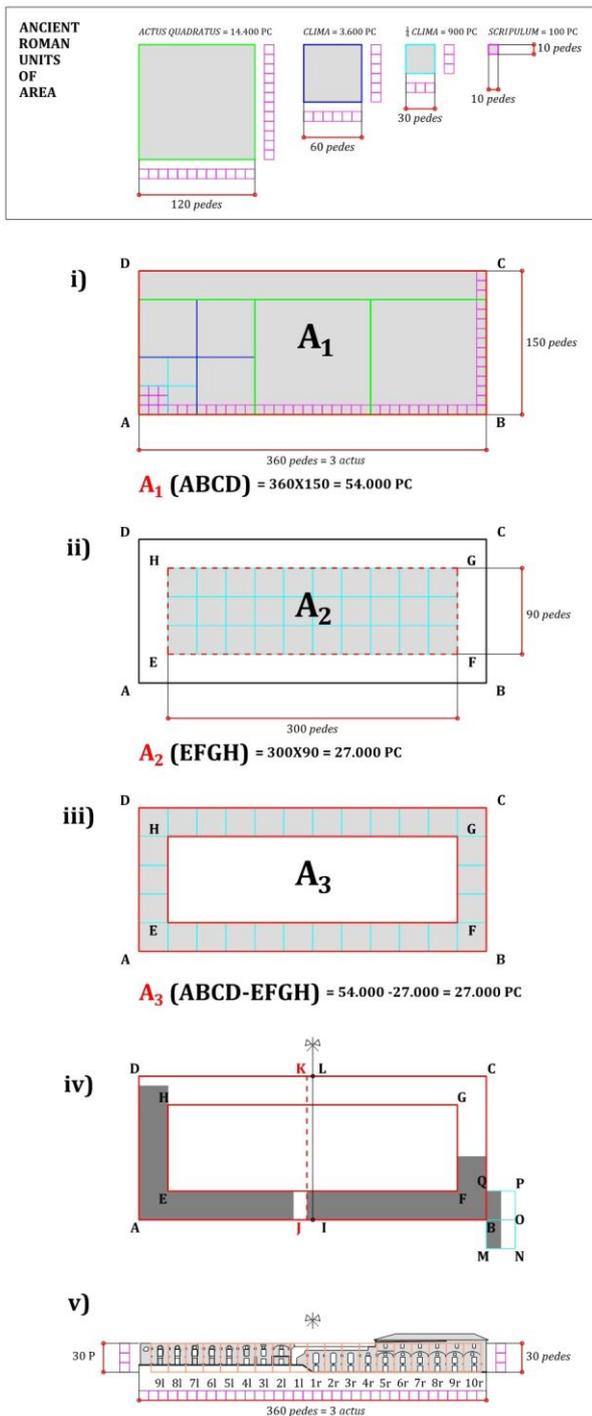


Fig. 13: Diagram of the preliminary hypothesis for the plan of the original building: Roman units of measurement for surfaces; i) estimate of the global area of the upper building considering the plausible design of the plan (A_1); ii) estimate of the courtyard according to preserved remains and excavations (A_2); iii) possible covered area of the building (A_3); iv) current existing upper structures (dark grey hatching); v) proportions, height difference and modules of the eastern front. Image credits: S. Bertacchi

This module reflects the same spatial organization on both upper terraces, as proved by shreds of walls, save for some measurement dispersion (about $\frac{1}{4}$ foot), possibly as an effect of the different thickness of the masonry (from 1 to 2 feet) and of negligible misalignments of the right angle ($<1^\circ$) between two incident perpendicular walls.

Maybe the presence of a pillar at the centre of the walls of each room of the upper building, partly used as museum, to make them stronger could have corresponded to the existence of an additional upper floor extruded from the terraces level, of which the remains of a stair in the inner south-east corner bear witness.

In general, it seems that the useful floor area corresponds on average to $17 P \times 26 P = 442 PC$.

On the contrary, in the southern wing, spaces are not regular, except for a nearly square space in the midpoint; the topic will be discussed in detail in future work being now information on this area incomplete because of lack of metric data (the survey will be completed in the area with a second campaign) and of archaeological data (other excavations are planned in the area actually closed to public, especially along the western side).

4. Analysis of the structure

4.1 The substructure: the so-called *Tabernae* and the *Antiquarium*

The “L” shape substructure, almost exactly orientated in the North-South direction, is actually separated from the southern one by the collapse of the central room (Fig. 14), connected with the level change of the whole building, and for this reason probably weaker: this change of the local tuff rock plateau originally formed on the upper part two terraces at different levels.

The two parts of the substructure, on two different levels connected by stairs, originally supported the upper building.

The modern name of the substructure, that is “*Tabernae*”, is due to the front aspect, characterized by a repeated sequence of rooms opened on the front side of the building, accessible by an external balcony, just like ancient Roman shops; every room was separated from the others. The upper rooms were completed by protruding arches on travertine corbels (Fig. 15). The walls are in *opus mixtum*; the restored portions (1979) are in tuff blocks of small size.



Fig. 14: Hadrian's Villa, western substructure of the Serapeum-Canopus, so-called *Tabernae*, collapsed vault. Image credits: A. Ottati



Fig. 15: Hadrian's Villa, western substructure of the Serapeum-Canopus, so-called *Tabernae*, view from South-West. Image credits: A. Ottati

The rooms are ten on the two levels in the northern substructure and nine in the southern one; their size is equal to 7.50 m (around 25 Roman feet) in length and from 4.75 to 5.17 wide (from 16 to 17 Roman feet).

The rooms had barrel vaults, which are partially still covered by frescoes with fine figurative elements⁸: imaginary maritime animals, female figures, fruit baskets. In front of the lower level there was a narrow balcony on masonry pilasters (0.45 x 0.60 m = 1 *sesquipedal* x 1 *bipedal* = 1 and ½ *pes* x 2 *pedes*) (Fig. 16).

Along the southern substructure, a portion of the balcony has been rebuilt in the Nineties, using

⁸ Molle (2004), who also studied the graffiti at the southern common latrine of the substructure building: Molle (2011).

the original holes (0.22 x 0.25 m) for wooden beams, as in ancient times. Inside (Fig. 17), the two levels were originally separated by a wooden floor, supported by still existing travertine corbels; there were four corbels on the long sides of each room. A door with a lintel with oblique bricks (1.50 x 2.10 m) allowed the access to each room. In the upper level there was a little window above the door, to enlighten the interior space.

The masonry arches on corbels above the balcony were probably a protection for the windows, built to keep the rain out.



Fig. 16: Hadrian's Villa, western substructure of the Serapeum-Canopus, so-called *Tabernae*, view from North-West and detail of the restored balcony. Image credits: A. Ottati



Fig. 17: Hadrian's Villa, western substructure of the Serapeum-Canopus, so-called *Tabernae*. The interior of the room originally separated by a wooden floor, supported by still existing travertine corbels. Image credits: A. Ottati

There is no doubt that it was not used as another balcony for the upper building: this one had doors only on the other side; in fact as we can observe from the masonry remains, the upper building has a perimeter wall along this side without openings.

The differences between the two parts of the substructure are due essentially to the fact that the northern one (Fig. 18), which today houses part of the museum, has been incorporated into the building during renovation carried out at the beginning of the nineteenth century by the Dukes Braschi Onesti, which became at that time the owner of almost all the villa. The noble family intended to use the area for agricultural purposes, especially for the cultivation of olives, and so they built a farmhouse for the countrymen working for them on the ancient remains along the western side of the Canopus.



Fig. 18: Hadrian's Villa, northern substructure of the Serapeum-Canopus, so-called *Tabernae*, today part of the museum. Image credits: A. Ottati

4.2 The upper building

The upper building had a rectangular shape, with a sequence of rooms on each side, overlooking the inner court or garden; as the substructure, the upper building consisted of two adjoining bodies at different levels, due to the difference in height of the tuff rock in the central area of the terrace: perhaps there were stairs to connect the two parts of the court⁹.

⁹ The room in correspondence with the level change of the tuff rock had a different destination from other rooms: this environment was a connecting space between the two buildings with the staircase to reach the balconies of the two blocks; the vault, now collapsed, was originally gooseneck-shaped.

The masonry, in *opus mixtum* (*reticulatum* and *latericium*), is currently preserved for a height not exceeding 1 metre; rooms have white mosaic floorings, decorated by a simple black pattern near the walls (Fig. 19).

The walls were built with a pillar at the centre, today no more existing; it is possible to assume its presence because of the travertine base, still preserving the channels for the metal casting that originally fixed the base of the pillar.

The space in the middle of the southern side was probably the main room (Fig. 20), perhaps of the two bodies; on the opposite side there was the entrance of the whole building. There are also two large rooms with inner pillars, built at each corner of the east side of the building, in correspondence with the substructure: they may have had a different function than the others, all of smaller dimensions, which formed a sequence of repeated environments.



Fig. 19: Hadrian's Villa, mosaic flooring on the lower terrace: eastern side. Image credits: A. Ottati



Fig. 20: Hadrian's Villa, upper building, central room of the southern side. Image credits: A. Ottati

At the South-East corner of the court there is a masonry stair. This means that the building had another level, and perhaps a second floor (Fig. 21).



Fig. 21: Hadrian's Villa, remains of a stair in the South-East corner of the upper terrace. Image credits: A. Ottati

5. The recent excavations

5.1 The latrine at the North-East corner of the substructure

The substructure building was provided with two shared toilets: one inside a room at the South-East corner, one external to the North-East corner (Fig. 22-top). The excavation of the latter gives us more information about its use. There is a channel along all the sides, except for the eastern one, where the threshold indicates the original entrance; but only two sides had a drainage channel: the third one along the southern side, less deep than the others, was a channel for abducting water, certainly coming from above and also incorporating rainwater from the roofs. This hypothesis is confirmed by the travertine corbels for seats, partially preserved, which stand only along the northern and western sides. The size of the latrine suggests that it would be used by six people at the same time.

The room leans against the building, as well as elsewhere, for example at the Caserma dei Vigili, where the common latrine is an external body along the West side. But the excavation of the area has highlighted other environments, close to the latrine of the northern substructure: as one can see from the badly preserved remains, we can assume that this structure was made not only by a single room, but it was articulated in different

environments, perhaps also including a cistern, of which there is some traces close to the entrance of the latrine (Fig. 22-bottom).



Fig. 22: Top: latrine on the North-East corner. Bottom: new structures found nearby after excavation. Image credits: A. Ottati

5.2 The drainage channel of the upper building

In 2005, during the works for the air conditioning system of the museum, some excavations were carried out in the area of the central courtyard of the upper building¹⁰. Here a drainage channel has been brought to light at a depth of 1.4 m, oriented North-South, dug into the tuff rock (Fig. 23). The collector is 1.45 m width and the sewer channel is 0.50 m width: the sides were lined with *opus reticulatum* walls, and the bottom with bricks (*bipedals*). On the west side a minor channel enters into the main sewer.

5.3 The survey on the western side

Besides the excavation at the centre of the complex, on the occasion of this first campaign,

¹⁰ Excavations were carried out by the archaeologist A. Blanco, who also authored the documentation.

two exploratory trenches have been excavated where it was thought that walls could be preserved, based on a hypothetical specular correspondence on the western area of the structures still preserved in the eastern side.

Actually trenches confirmed that indeed there was the presence of walls. It was therefore decided to open a larger excavation, in correspondence with the area where we presumed the existence of a height difference as presented in the eastern building (Fig. 24).

Once removed the layer of superficial humus, there was a rather homogeneous stratigraphic situation in all the surface and without particular singularities, apart from some masonry remains¹¹ (Fig. 25). The removed layer was full of tuff fragments but lacking in mortar fragments (US2); under there exist two different situations: on the South-West side there was a layer of dark brown earth of brittle texture (US9) immediately above the tuff layer; while in the northern part there was filling including numerous medium-sized fragments of mortar, plasters and shingles (US10, US13). The removal of the layers has brought to light the two environments: the northern one with a white mosaic floor, while the southern one only preserving the level of the tuff layer completely without the flooring.



Fig. 23: Drainage channel with North-South orientation found in the central area of the complex (excavation 1).
Image credits: A. Blanco

Finally, it is worth noting the layer of dust and fragments of plaster and reed matting (US35), cemented on the mosaic after the collapse of the coverings (Figs. 26-27), demonstrating the

¹¹ For the stratigraphic information, authors would specifically like to thank the colleagues in charge of the excavation, Luigi Tortella and Elisa Iori.

presence of a false vault made of a reed matting. From the image it is clear that this layer seals the mosaic phase, already widely restored with very fluid mortar (see below).

The excavation has therefore allowed to bring back to light most part of the two lateral rooms and part of two adjoining spaces, fully confirming the existence of the western wing of the building and intercepting the same height difference present in the substructures.

The first extremely interesting information is that the difference in height is present even in the tuff layer. In the excavated environments it is clear that the southern foundations rest directly on the tuff layer: the planking level is clearly visible from the cutout of the foundations, even though the original flooring is completely lost.

The adjoining room towards North has the planking level at a lower height of approximately 1.30 m and it is evident that, in order to insert the travertine plinth for the positioning of the pillar, in ancient times workers needed to partially dig the tuff layer (Fig. 28).

The excavated areas have similar formal characteristics, but with small differences, such as the lack of the black frame in the white mosaic floorings, as in the western and southern environments.

In this area of the building, rooms were divided by walls in irregular work including a central pillar: the which travertine plinth is still preserved (75 x 50 cm). The environment with mosaic measures 4.50 x 7.40 m.

The extremely poor quality of the partition walls enclosing the pillars could suggest a later intervention, a modification during construction or in a second phase, when it was decided to divide the building into several rooms. In demonstration of this, the fact that also partition walls lean against the perimeter walls. The layer of plaster, where preserved, demonstrates a unitary phase covering both walls.

However it is possible to observe that the western wall was built directly on the tuff layer, which is partly used as foundations. Hence, the construction of the partition walls in irregular work can only be contemporary to the first phase of construction of the building. Probably the division into rooms by means of these partition walls is due to changes during construction and dates back to a time when the perimeter walls had already been built, but the mosaic floors were not yet existing.

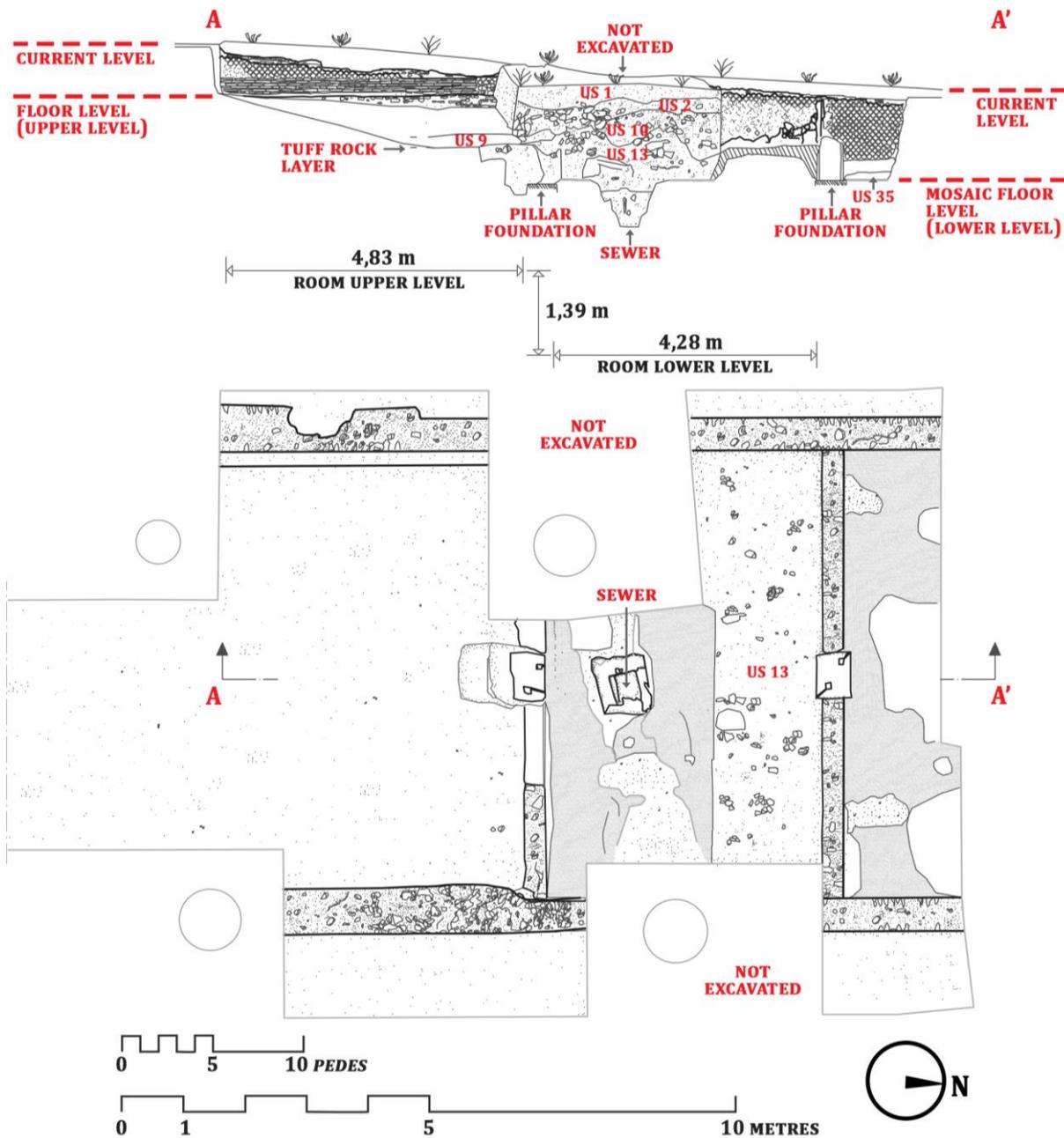


Fig. 24: Archaeological excavation n. 2 of the western area, plan and cross-section. Image credits: A. Ottati

Probably the poor quality of the wall is caused by its role, that is simple partition without any supporting role, contrary to pillars. Even the mosaic flooring, made with medium-sized tiles, does not present particular accuracy in the execution. In this regard, scant attention was paid to the construction of the whole building, as demonstrated in particular by the different size of the rooms: in fact dimensions range from a minimum of 4.70 m to a maximum of 5.17 m in width.

Subsequent phases of use of the building are confirmed by the mosaic floors, as said before, in this side without the black frame and renovated in large areas by simply pouring fluid mortar; this fact denotes a fruition of these environments during later periods when the quality of previous restoration was not important (Fig. 29).

Furthermore, it should be noted that the South-East corner of the building was subject to structural changes due to a subsequent reuse, probably with production functions.



Fig. 25: General view of the archaeological excavation n. 2. Image credits: L. Tortella



Fig. 26: Hadrian's Villa, excavation n. 2, layer with fragments of plaster and reed matting (US35), cemented on the mosaic after the collapse of the coverings. Image credits: L. Tortella



Fig. 27: Hadrian's Villa, excavation n. 2, layer with fragments of plaster and reed matting (US35), cemented on the mosaic after the collapse of the coverings. Image credits: L. Tortella

The mosaic, even in that case without the black frame, is covered with a thin layer of mortar, undoubtedly with waterproofing function, in close connection with the installation of some tanks in the same area.

Finally, another fact emerging from the excavation is the presence of a covered sewer (*cappuccina*) that runs longitudinally through the

mosaic flooring (Figs. 23-24). It was possible to find it since a small portion of the floor collapsed inside. Moreover, the remain of the mosaic is concave near the possible path of the pipeline and this made possible to follow it, founding that it was the same sewerage entering in the larger main canal discovered at the centre of the complex during the previous excavation campaign n. 1.



Fig. 28: Hadrian's Villa, excavation n. 2, detail of the plinth found in the southern space; floorings and subsequent restorations. Image credits: L. Tortella



Fig. 29: Hadrian's Villa, excavation n. 2, detail of the plinth found in the northern space; floorings and subsequent restorations. Image credits: L. Tortella

6. Initial considerations on the structure

The study of the monument is only at an early stage, however some considerations can already be made.

In the first place, the substruction system has appeared to be much more complex than supposed: in order to overcome the differences in height of the tuff layer along the western side of Canopus, the substructure consists of two distinct and staggered adjoining buildings, even if perfectly integrated. The shape of the building solves the difference in height by creating a

higher level, which in turn consists of two terraces on two distinct levels. It should also be noted that the complex may have had the function of connection between the area of the Canopus and the terracing of the *Accademia*.

Secondly it was possible to gather new data on the architectural conformation of the upper building consisting of two buildings, of which the southern one, that has not undergone renovation contrary to the northern portion (reused as a museum), allows a detailed exam of the structure.

Rooms are characterized by partition walls that incorporate travertine pillars.

At this stage, one should discuss about the structural function of this sequence of pillars: originally they were not freestanding but enclosed in the walls, as it can be clearly observed, namely the walls enclosing them were built at the same time of the pillars and floorings of the various rooms of the building. It is unlikely that pillars would have been necessary as support for a possible wooden covering structure, even in case of a wide sloping roof, for which the perimeter walls were strong enough. Definitely, underneath the covering, one could hypothesize a false vault, as proved by the fragments of plaster on reed matting found in the rooms.

The possible function of the pillars can probably be explained thanks to the traces of masonry preserved at the South-East corner of the southern building; here there exist the remains of stairs accessible from the courtyard/internal garden. Due to the presence of the staircase one can form the hypothesis that there was a walkable level above the still preserved one, which in turn was covered with wooden trusses; the construction of an additional level would have required the presence of supporting pillars to support its weight.

According to this reconstruction hypothesis, the upper building on the western substructures of the Canopus would have reached a similar height to the opposite building, the *Praetorium*, developed on the eastern substructures of the Canopus.

7. Conclusions

To date, the research carried out has allowed to outline the characteristics of the building and above all to highlight the critical issues.

The following steps of the study will have the purpose to examine in depth the other wings of the upper building, which is in the shape of a

rectangular structure consisting of two buildings, with the aim to:

- verify and complete the planimetric system that has come to light here and there in different excavation samples;
- bring the access to the building and to the internal courtyard to light, along the northern front;
- study the residential environments and the possible presence of latrines, as in the substructure building;
- deepen the examination of the area where there is the gap of level between the two courtyards, with the aim of identifying the architectural solution adopted to solve the level difference;
- study the uncovered space of the two wings of the upper building: even if the presence of small temples – suggested by the reconstruction of the maquette at the Museo della Civiltà Romana – is to be definitively ruled out, as proved by the excavations carried out so far, nevertheless the courtyards could have presented an internal planimetric structure of the spaces and could still preserve traces of the original solution.

The typology of the whole complex and the floor coverings would exclude the possibility of imperial attendance of these spaces and rather suggest a fruition by staff or guests.

This interpretation is plausible also considering the formal characteristics of the structure, similar to the hadrianic apartment blocks in Ostia Antica¹², such as the *Caseggiato di Diana* (Gismondi, 1923; Pellegrino, 2007) (Fig. 30), and comparable with some examples within Hadrian's Villa, such as the buildings recently studied by the Columbia University of New York¹³, located near the so-called Macchiozzo area between *Piazza d'Oro* and the *Grandi Terme*, or also even the *Hospitalia*. In those buildings, all with residential function, we can observe floorings in white mosaic framed by a black band¹⁴.

¹² On the topic of middle imperial architecture in Ostia, see Calza (1915, 1923).

¹³ The excavations by Francesco De Angelis and Marco Maiuro are still ongoing.

¹⁴ After all, even the *frigidarium* and the hall in front of the gymnasium at the Great Baths, which are not attended by imperial members, have the same type of floor; on this aspect see Vincenti (2017, p. 241-243).

A building of such size probably had to be multifunctional.

With regard to the substruction building, a clear difference can be observed between the two floors, proved by the presence of a series of elements on the first floor that are lacking in the lower one:

- presence of a window to guarantee illumination and a sufficient air renewal; the window was protected from the rain by the large arches provided with corbels along the upper part of the facade, above the door;
- higher spaces for the rooms;
- refined pictorial figurative motifs decorating the vault. Paintings date back to the late second half of the II century A.D., but actually the figurative motifs denote an artistic quality similar to sculptural examples of trabeations surely dating back to the Hadrianic age – above all with regard to imaginary maritime animals –, of which there still exist various examples at Hadrian's Villa (*Piazza d'Oro* and *Maritime Theatre*). It seems rather that the elements of geometric partition of the panels decorated with figurative designs can be attributed to a subsequent renovation or restoration, perhaps in the Severian age, as hypothesized by Molle (2004), fact that contributes to give the impression of a cursory realization. It is not excluded that the wooden floor of the upper rooms of the substructures could have been decorated accordingly to the quality of the pictorial motifs.

Further considerations can deal with possible functions of the building. The upper “gallery” was a protruding cornice on corbels, probably used exclusively for maintenance activities, since the rooms of the upper building on this side present a perimeter wall without access; doors were positioned on the opposite side, in correspondence with the inner courtyard/garden. Such protruding cornices, same as in the case study, can be found in Hadrian's Villa, for instance in the nearby *Torre di Roccabruna*. Beyond the aesthetic function of cornices that characterized

and articulated the façade, it is clear the practical application for protection of the openings against the rain.

This kind of solution denotes a particular care in the construction of buildings aimed at ensuring functionality and preservation.

The presence of two multiple latrines, one inside the first environment of the substructures at the southern side of the building, the other placed against the external perimeter of the northern side, confirms the residential function of the substruction complex. The abundance of services suggests the presence of numerous occupants.



Fig. 30: Ostia Antica, detail of the corner of the residential block (*Caseggiato di Diana*). Image credits: S. Bertacchi

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