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DIGITAL TECHNOLOGIES AND THE ARCHAEOLOGICAL TOPOGRAPHY OF CASTELLITO (SICILY): THE RECONSTRUCTION OF A ROMAN VILLA

1. Introduction

This paper focuses on the use of digital technologies and the potential of 3D computer-based visualization as research tools to support the interpretation and modelling of archaeological data during the field work carried out in the site of Castellito di Ramacca (Catania, Sicily) (Fig. 1) (Spigo 1982-1983; Albanese Procelli, Procelli 1988-1989, 7-22; Patanè 1997-1998, 200-201, n. 146 and Patanè 2001). A tested workflow of 3D modelling and visualization applied to the case study of the Roman villa of Castellito will be described. It will further explore how the 3D model of the archaeological excavation, obtained with photogrammetric techniques, has been used in combination with the reconstructive 3D model (Bezzi *et al.* 2010; De Felice, Sibilano 2010; Ferdani *et al.* 2019).

Castellito is one of the few contexts attributable to an early imperial age Roman villa located on the western edge of the Plain of Catania (Brancato 2020a, 292-298). The site was partly excavated in the second half of the 20th century and interpreted as a *villa rustica*, likely related to the *massa Capitoniana* attested in ancient sources (for an up-to-date review of Roman villas in Sicily, Sfameni 2019, 233-236; see also Wilson 1990, 194-214). The building, located on the top of a low hill (106 m asl) W of the Dittaino river, extended over an area of at least two thousand square metres (Fig. 2a). Built during the early Imperial age, its role as a central place declined during the fourth century CE, not experiencing the outstanding architectural development that characterized other villa contexts in Sicily and in the Mediterranean region (Sfameni 2006, with references).

2. Applied methods

2.1 *Legacy data integration*

The resumption of investigations in the site was preceded by the systematic examination of the bibliography and archives, in order to verify what had already been documented in the past but remained substantially unpublished (Brancato 2019a). The new programme of research at Castellito began in 2019 with the digitization process of the available archaeographic data for the site (Brancato 2019b; see also Anichini, Gattiglia 2012). The GIS management of data from previous research, the so-called legacy

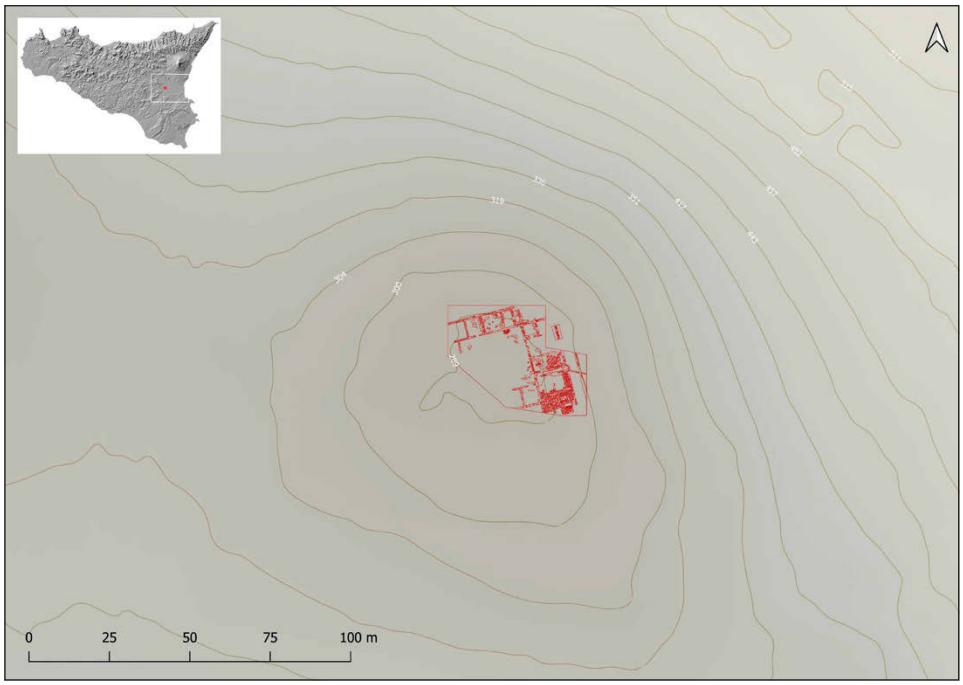

Fig. 1 – Location of the Castellito villa site in Ramacca (Catania, Sicily) (in red) on a topographic map obtained from a 2×2 m LiDAR Composite DTM (ATA 2007-2008, Regione Sicilia).

data (Bogdani 2020), enabled their integration with the new archaeological and topographical data collected in the field. The detailed analysis of the legacy data (including photographic documentation, graphics, inventories, excavation journals, written reports, etc.) made it possible to understand how much of the site had already been brought to light and then covered up in the past: it is clear that this undertaking was of fundamental importance to understand the extent of the taphonomic processes that have affected the archaeological deposit and to establish the necessary relationships between the few data already known and those derived from the new planned activities.

The discovery of the site, and its unfortunate history, has to be seen in the context of the indirect effects deriving from the reclamation of the Piana di Catania carried out in the first half of the 20th century (Brancato 2020b). The southern sector of the villa was probably destroyed during these years: in fact, from the analysis of an aerial photo from 1967 it is possible to infer that the archaeological site had already been seriously affected by the planting of olive trees (Brancato 2020b). Archaeological proper research on the site began in 1978 (Albanese Procelli, Procelli 1988-1989), when seven trenches

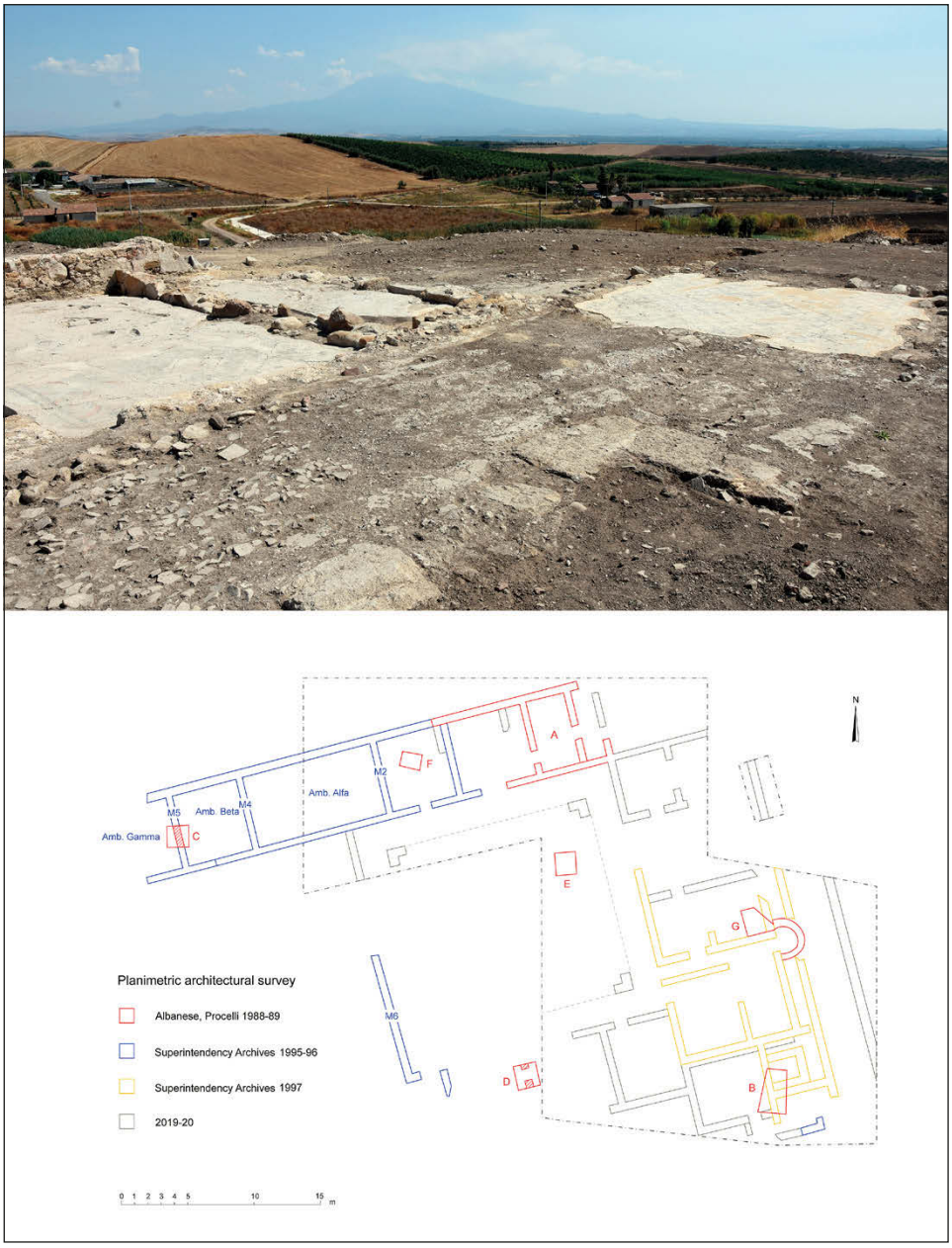

Fig. 2 – View on the archaeological site of Castellito (top): the remains of the NW sector of the villa with Mount Etna in the background. Planimetric palimpsest of topographic legacy data from previous research campaigns carried out in the site (bottom).

(A-G) were excavated in order to assess its extent. In 1995, the resumption of research revealed the structures, which were documented in a partial plan (Patanè 1997-1998)[1]. The synoptic analysis of the graphic documentation from the archival research made it possible to arrange a digital palimpsest of previous investigations. The planimetric documentation, properly digitized, was georeferenced in a GIS environment (Fig. 2b). The georeferencing process involves establishing a set of ground control points – known x, y coordinates – that link positions on the raster dataset with positions in the spatially referenced data.

Indeed, the process of georeferencing heterogeneous topographic data (e.g., a scanned map or aerial photograph) makes it possible for them to appear "in place" within the GIS. By associating features of the scanned image with real-world x and y coordinates, the software can progressively deform the image so that it fits other spatial datasets. Unfortunately, at the moment it is not possible to reconstruct the succession of actions that have affected the archaeological deposit of some sectors of the area. However, within the geo-referenced basis on which the new survey project of the site was set up, the available archaeographic documentation converged: the GIS management of the data from previous research allowed their profitable integration with the archaeological and topographical data that emerged during the new research conducted on the site from May 2019 (Fig. 3)[2].

R.B.

2.2 *UAV-based photogrammetry*

The drafting of the archaeological, digital and multiscalar documentation of the site was conducted through the integration of traditional survey techniques and remote/proximal sensing for aerial and terrestrial photogrammetry, exploiting the potential of each method in order to maximize the final result (Russo *et al.* 2011; Campana 2017). The first step was the planning of several aerial photogrammetric surveys by means of a UAV to understand the extent of the site and to analyze the relationships between the different sectors of the archaeological complex (Fig. 3). The photographic datasets were obtained by flying over the area at low altitude (about 30 m above ground level) while maintaining a high frontal and lateral overlap between shots (≥ 80%) and making use of known points on the ground, surveyed using a GNSS antenna

[1] Before 1995, the site had been largely excavated under the direction of E. Tomasello (Superintendence of Catania): unfortunately, there is no documentation of this activity, nor has it been possible to reconstruct the contexts of the discovery of the materials now in storage at the Ramacca Civic Museum.

[2] This paper presents the results of the fieldwork carried out within the agreement between the University and the Superintendence of Catania (2019-2021) under the direction of M.T. Magro to whom goes the deepest gratitude for her engagement in the salvage project of Castellito's mosaics.

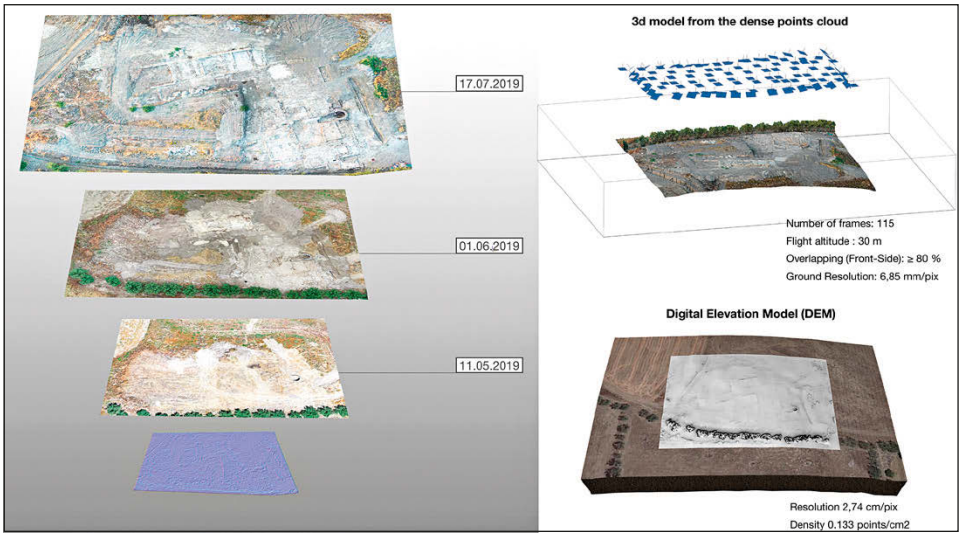

Fig. 3 – Sequence of flight missions and restitution of the Digital Elevation Model.

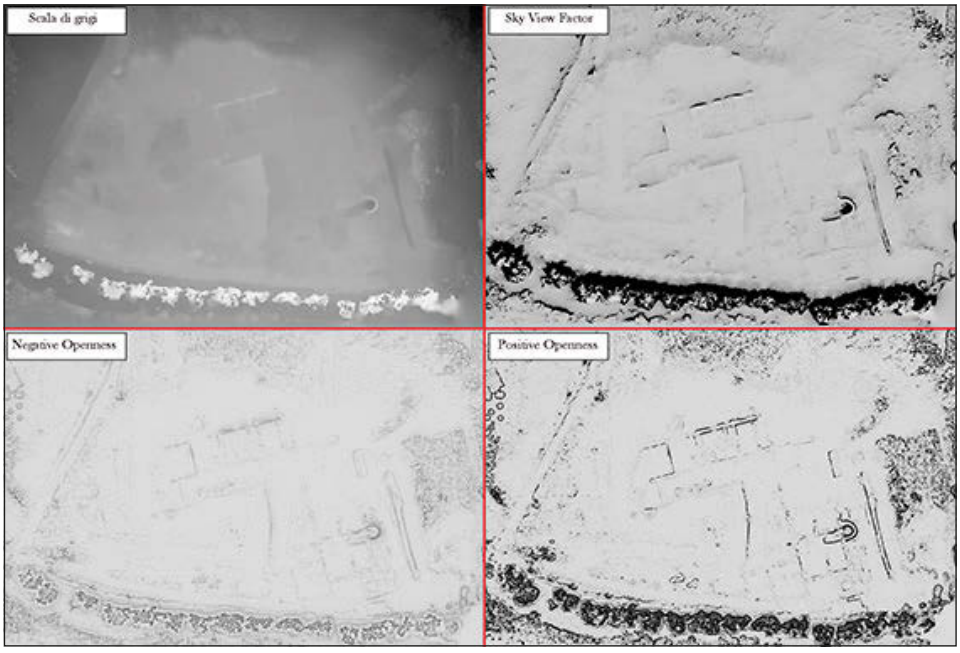

Fig. 4 – Comparison between different relief visualization techniques on the Digital Elevation Model.

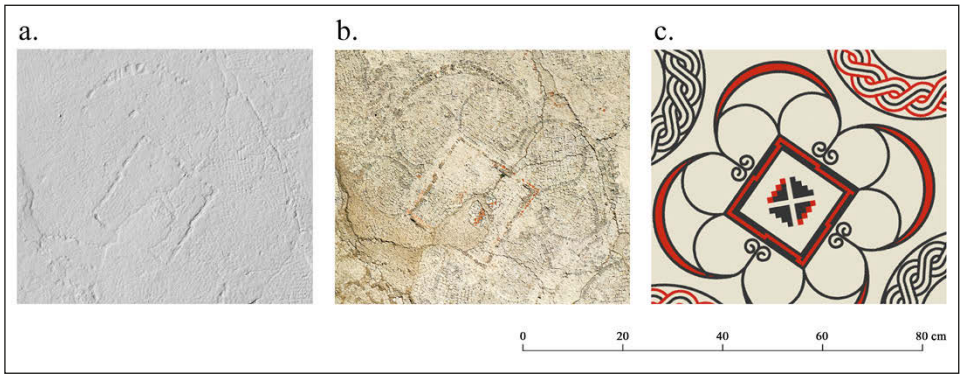

Fig. 5 – From the analysis of the micro-relief to the digital restoration of the mosaics.

in RTK (Real Time Kinematic) mode. Once the floors of the individual sectors of the villa were brought to light, they were documented using a camera with an FX sensor installed on a telescopic rod. This has made it possible to acquire the very high-resolution images necessary for the digital reconstruction of the decorative motifs of the mosaic floors, and to document the building techniques used during the various occupation phases of the complex. The data acquired in the field were subsequently processed using SfM (Structure from Motion) software, returning high-resolution 3D models, orthophotos and DEMs (Digital Elevation Models), which proved decisive both for the typological characterization of the site and for delineating the planimetric development of the structures[3].

The orthophotos of the floor plans, in particular, constitute the basic documentation on which the hypotheses of digital reconstruction of the decorative motifs and chromatic features were subsequently developed (Fig. 5). Moreover, through the processing of the DEMs in a GIS environment it was possible to carry out an analysis of the micro-relief, through specific visualization techniques such as Sky View Factor and Openness, which make it possible to significantly increase the degree of visibility of the positive and negative anomalies of a given element, adapting both to the morphology of the terrain (Fig. 4) and, in this case, also to the surface of the mosaic floors (Challis *et al.* 2011; Kokalj *et al.* 2011). During the work, thanks to the periodic cadence of the aero photogrammetric surveys, it was possible to identify several areas in which the previous archaeological documentation had gaps, and which were therefore made a focus of

[3] The site's 3D model (date of flight: 17.07.19 - Mesh face count: 500.000) obtained from aerial photogrammetry can be viewed on Sketchfab at the following link: https://skfb.ly/oEvn7.

activity. Thus, the use of photogrammetry allowed a thorough analysis of the entire context, generating a qualitative and quantitative increase in the archaeological data surveyed, with rapid acquisition times and particularly low costs when compared to those inherent in range-based instrumentation, such as laser scanners and LiDAR sensors, while still guaranteeing a high level of accuracy in the final data.

V.M.

2.3 *Architectural analysis*

The most notable achievement of the project is the first complete planimetric survey of the villa, conducted by a direct method with the help of photogrammetric material taken via drone and telescopic rod. Of the entire architectural complex, the quadrangular sector investigated measures 36×44 m. Oriented NE-SW, a total of 21 rooms gravitating around a peristyle measuring 19.8×19 m (52.25×54.45 Roman feet) were documented. The architectural design of the complex was originally strictly symmetrical, as is evident from the arrangement and concatenation of the numerous rooms arranged along the northern and southern sectors (Fig. 6).

During the archaeological work on the site, the application of an integrated approach calibrated to the scale of intervention made it possible to collect data not only on the topography and architecture of the villa, but also on its history. The stratigraphic analysis applied to the masonry and the few dating criteria arising from finds associated with the patches of surviving stratigraphy investigated allow us to suggest a preliminary sequence of the building's construction phases. Already in the course of the survey work, the existence of at least two construction phases had clearly emerged, in some cases with obvious overlapping of structures (SE corner), partial obliteration of the oldest floor levels (E wing) and the subdivision of rooms and changes in their use (N wing) (Fig. 7). The presence of white limestone blocks, some of considerable size, at the base of the walls and for in use as some of the thresholds could be a clue to the complex genesis of the early facility, a phase yet to be investigated. The few indications available might, however, suggest that these elements can be traced back to the phase of the building's foundation phase, the chronology of which is yet to be confirmed, but which on the basis of comparisons could be placed in the early imperial age. This at least is suggested by some materials and, above all, by a plan comparable to some coeval Sicilian rustic villas, among them the first phase of Patti Marina and phase V of S. Biagio, Terme Vigliatore (Tigano 2008).

In the villa's visible structures, the most widely seen building technique is that which has been identified with Phase II: a roughly-hewn and -squared irregularly-sized yellow sandstone ashlar facing, bonded with mortar of good

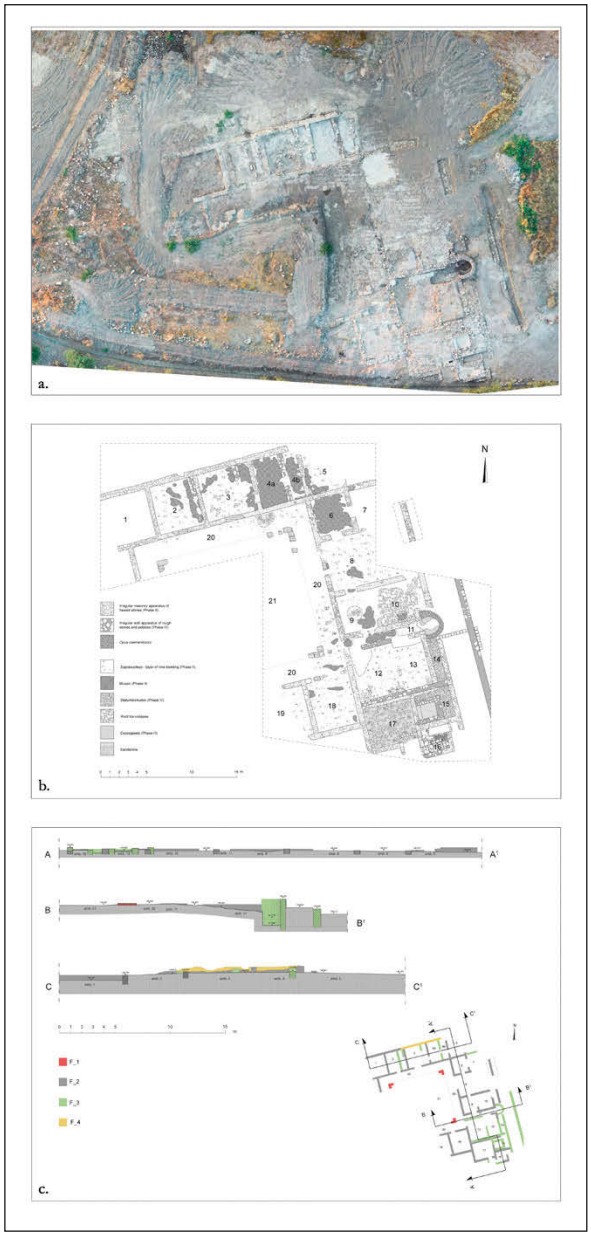

Fig. 6 – a) Orthophoto plan of the archaeological site at the culmination of mosaic restoration (July 2020); b) planimetry of the site with indication of building techniques; c) site plan and sections with an indication of the main construction phases.

Fig. 7 – View of structures belonging to the Phase II of the villa; the white arrow indicates the remaining red plaster fragment, zoomed in to the right.

quality and strength, to form walls 55 cm thick (Fig. 7). At this stage, the floor levels were uniformly provided with mosaic carpets with geometric decoration, and the walls certainly received a covering of red painted plaster, as a surviving fragment preserved in Room 4 seems to show (Fig. 7). A number of rebuilding efforts should probably be placed within this phase, including the construction of a cold apsidal basin perhaps closing the corridor of the eastern sector. Traces of fire under the collapse of Rooms 9 and 10 and signs of structural failure readable in some parts of the structure, on the basis of the material culture data, allow us to identify a caesura in the life of the villa in the second half of the fourth century, perhaps a consequence of the earthquake of AD 361, a traumatic event that left numerous traces in the monuments of eastern Sicily, notably in the villas of Piazza Armerina and Gerace (Wilson 2019).

The later structures (Phase III), about 60 cm thick, appear to be in *opus incertum* of medium- to large-sized river pebbles, bonded with low-quality earthy mortar (Fig. 7). The stability of the built structures, two cores that were perhaps not contiguous, was ensured by the construction of a retaining wall that was identified on the eastern side of the plateau. The two macro phases – also evidenced by the material culture, whose study is ongoing – clearly define sectors and rooms referable to different building situations in terms of both chronology and function. While the aristocratic nature of the villa is quite clear from the monumentality of the architecture, the degradation caused by agricultural work and clandestine excavations makes it very difficult to understand Phase III of the building. What remains allows us to propose a reoccupation of the site during the fifth century, probably with the insertion of a productive installation relating to the basin visible in the SE sector of the building (Fig. 8a, Room 15).

R.B.

2.4 *The mosaics*

The Castellito villa boasts a substantial number of mosaics, which are potentially diagnostic and of fundamental importance because of the wealth of information they can release. However, the severe degradation of the numerous surviving pieces and the widespread disruption of the mosaic fabric and the images represented have made the process of cognitive analysis and consequent digital restoration particularly complex (Moscati 2009; Limoncelli 2012). The work presupposed a lengthy preliminary phase of study and appreciation of the basic geometries and modules adopted, implemented by means of a direct and indirect tracing operation, replicating geometric portions in the CAD environment. The process of proportioning the individual compositions obtained was carried out by superimposing DWG files and orthophotos, taking account of variations in the images caused by surface sinkage or the detachment of *tesserae*. Working digitally allowed the creation of a complete working model of the whole space in 2D which could nevertheless later be altered as necessary.

The second part of the work involved the calculation of the thickness of each individual geometric element, derived from the measurements and quantity of the individual *tesserae*, and the chromatic reconstruction of the individual modules using Adobe Illustrator, trying to employ shades as close as possible to the original and enhancing the artistic dimension of the entire composition. Finally, the floors were placed in their specific original location, i.e. the floor plan of the original second-phase complex (Fig. 8a), reconstructed by referring to the contextually-made scale surveys and the technical-structural relationships of the many different wall structures.

The monoscopic terrestrial photogrammetry of the individual rooms and the digital restoration of the relevant floors were necessary for a functional reading of the rooms and for their dating on an iconographic and stylistic basis. They have also made it possible to record all the phases from the condition of the tessellations at the time of their discovery up to the restoration of their design and colour. The ten floors are uniformly characterized by linear and isotropic geometric mosaics, variously composed of white and black (b/w) or white, black and red (b/w/r) medium-sized *tesserae* (Grandi, Guidobaldi 2006, 36). The elements that make up the geometric patterns are annotated with the relevant measurements and bear the reconstruction of the modular geometric pattern generating the decoration (Fig. 8d). These elements comprise meandering swastikas in three distinct variants (Fig. 8b, Rooms 2, 6, 9), double-scored Solomon's knots associated with opposing *peltae* (Room 20) and pelta pinwheels (Room 8), circles and squares alternating with lozenges and triangles in the resulting spaces (Fig. 8c, Room 3), compositions of circles and quadrilobe *peltae*, free (Room 4) or inscribed in a circle (Room 5),

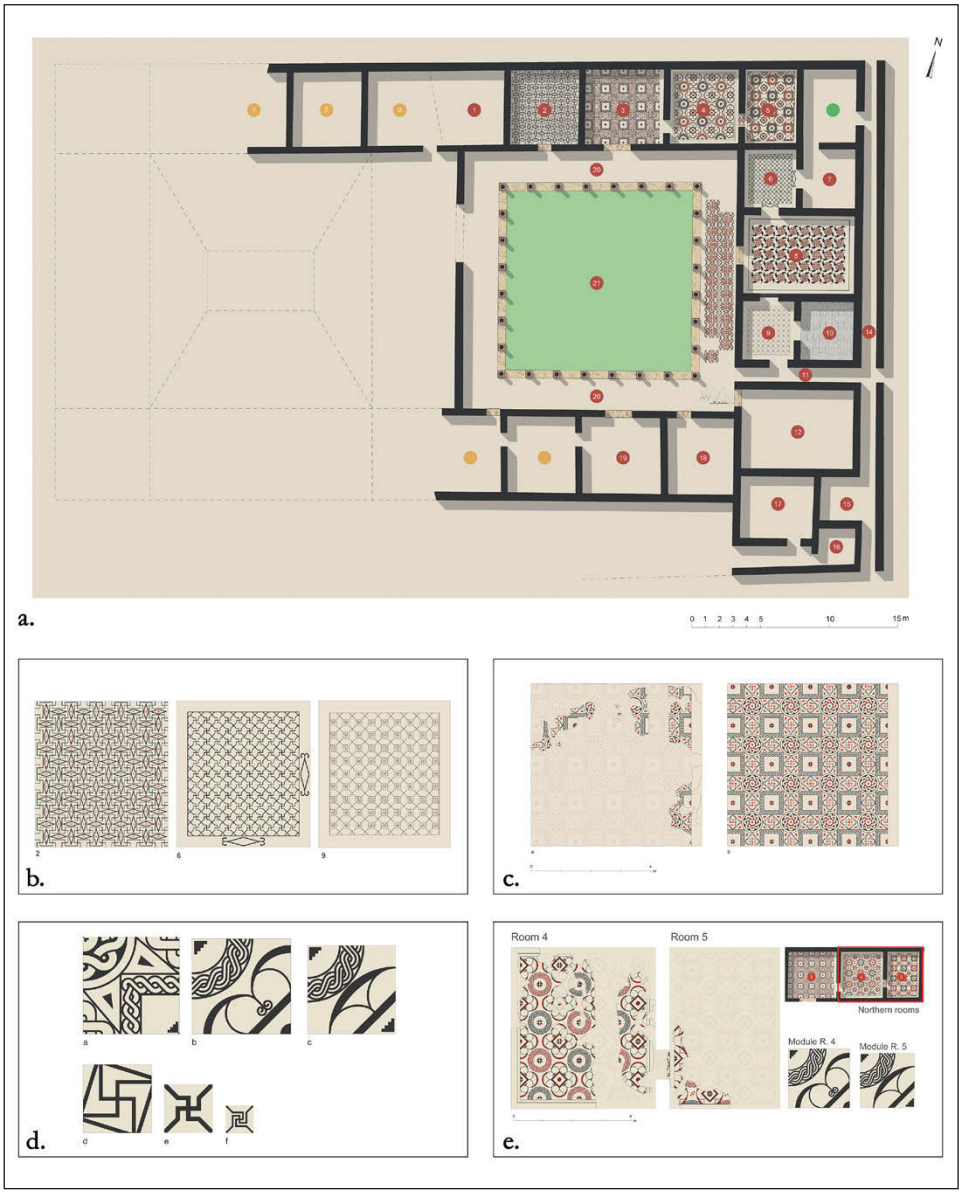

Fig. 8 – a) Graphic and chromatic restitution of the reconstructed plan of the villa in the mosaic phase; b) digital restoration of the floors of Rooms 2, 6, 9; c) reconstruction drawing of the floors of Room 3; d) basic geometries and forms adopted in the mosaics of the villa; e) reconstruction drawing of the floors of Rooms 4-5 and their respective modules.

isodomic-structured patterns (dallage) with white tiles arranged according to 'graphisms' (Room 10) and monochrome white carpets (Room 11).

The entire production is of a single period (Brancato *et al.* 2021, 251), but the distinct chromatic and iconographic features of the individual mosaics prompt a subdivision of the tessellations into two distinct groups and attest the survival of two different cultural phenomena in the same house. The first group, dominating in environments with a secondary function, has bichrome (b/w) patterns of ancient central Italic tradition (Brancato *et al.* 2021, 252-253), attested since the first century BC and widely reposted in the third (Rooms 2, 6, 9, 10, 11). The second is trichrome (b/w/r) and preferred in environments with a public or semi-public function (Rooms 3, 4, 5, 8, 20) and exhibits typologies that originated between the end of the second century AD and the latter part of the Severan age. An eloquent example is offered by the mosaic decoration recorded in the *cubicula* of the northern private apartment (Rooms 4 and 5): orthogonal compositions of circles and quadriconic figures generated by four strongly pronounced converging *peltae*, terminating in curled volutes and arranged outside the vertices of squares rotated on diagonals in Room 4 and differently inscribed in a circle in Room 5 (Fig. 8e).

This type of decoration, which probably originated in Italy in the black and white mosaics of the early imperial age (Cassieri 2000, 244-245, Fig. 8), seems start spreading at the end of the second century AD and then began to become more common during the third century, at first in the simplest form, later with growing complexity as more intricate decorative motifs were added within the geometric figures and in the resulting spaces, and then with more pronounced polychromy in the fourth century.

The main motif falls within the evolved typology of the combination of circles and squares, which, in association with strongly pronounced *peltae*, result in quadriconic figures[4]: quadrilobal motifs are thus created, free in Room 4 and inscribed in Room 5, which can have for their center, indifferently, either the circle or the square, with the sides placed diagonally as here, or parallel to the walls (Brancato *et al.* 2021, 254-255). The two most precise comparisons for the tessellated floors of Rooms 3 and 4 come from *Africa Proconsularis*: a specimen from Uthina (Ben Mansour 1992-93, 39-41, fig. 1) of the second half of the third century may be related to the mosaic in Room 3 (an orthogonal composition pattern of circles and squares), and a floor from Bulla Regia (Hanoune 1989, 539-542, fig. 24) attested in the hall/cell of a late second-early third century temple building, which has

[4] The geometric pattern corresponds to n. 457 (composition of circles and quadrilobes of non-contiguous pelts) of the Graphic Repertory of the geometric decoration in the ancient mosaic (Darmon, Rebourg 1973).

strong similarities to the mosaic of Room 4 both in syntax and in the use of the same decorative motifs.

Such compositions find their greatest diffusion in the provinces of Africa from the beginning in the Severan age. Beyond, in the middle of the third century, they impose themselves in the western sphere, especially in areas with strong African cultural links such as Sardinia and Spain, but they are also found in Sicily and Calabria, as well as in Northern Italy, albeit not before the fourth century AD (Brancato *et al.* 2021, 254-258). To the same time span seems to belong the decoration of the triclinium (Room 8), distinguished by double-scored knots between pinwheels of *peltae* (Brancato *et al.* 2021, 248-249).

To conclude, attempts at dating on a stylistic basis would seem to place the mosaic production of the Castellito villa in a period between the late second century AD and the first half of the fourth. However, a number of features seem to indicate for the Calatino villa a phase of restructuring of the rooms and their floor plans that can be placed between the end of the second and the early third centuries AD and middle/end of the third century. These are: the predominant white background, the reduced and core colour scales, the absence of chiaroscuro and perspective effects, the simple and redundant decorations and the limited variety of fillers (cruciform rosettes with squared petals, Solomon's knots and circles divided into four quarters and fielded by diagonally opposite colours) (Brancato 2020c; Brancato *et al.* 2021, 259).

L.M.

3. The 3D modeling: reconstructive proposals for architectural structures

The analysis of the data deduced from the planimetric drawing and from the limited remains *in situ* allows us to reconstruct, with limited margins of uncertainty, the plan and the elevation of the walls and roofs of the eastern sector of the Castellito villa in the construction phase of the second half of the third century AD. This contribution proposes a preliminary reconstruction of the structural, functional and aesthetic elements of the building, reproduced in the form of a digital model (Fig. 9) to be considered, as well as on top of its informative purpose, as a framework in continuous evolution and a platform for the simulation and verification of hypotheses. It should be seen not only as a representational image, but as part of the holistic and constructional research. The 3D model – which can be viewed on Sketchfab (https://skfb.ly/oBYGV) – of the archaeological excavation, obtained through aerial and terrestrial photogrammetry techniques, has been essential to the reconstruction hypotheses (see § 2.2).

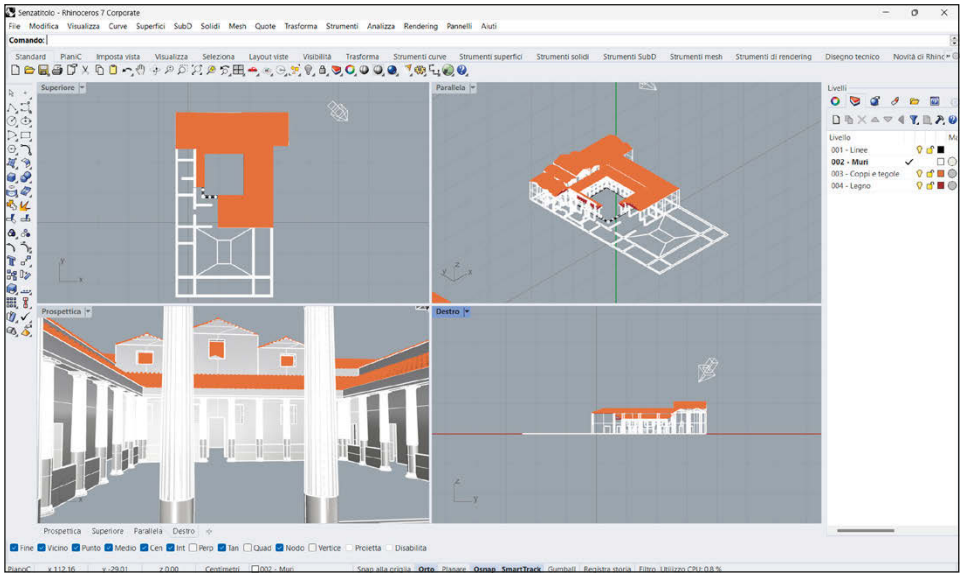

Fig. 9 – Schematic plan of the villa, screenshot of the modelling software used.

Examination of the building technique and wall joins suggests that the construction of this phase was the result of a unified project, based on proportional and symmetrical modules (Fig. 9). To reach this conclusion, it had first been assumed that the design was a rational process and that there is some coincidence between the planned and existing structures, or what remains of them. The original design is then reconstructed by schematising the plans. This simplification is generally accepted, as it is believed that in ancient times architects or master builders used schematic design drawings to convey basic information to the construction site, leaving the definition of details to later stages of construction (Jones 2000, 49-50). That said, the linear unit of measurement identified is the Roman Foot of 29.65 cm, with a building extension in the NS direction of 108 RF, or 72 *cubiti* (1 *cubito* = 1.5 RF). In the EW direction 96 *cubiti* are ascertained. Assuming the size of the extension of the structures towards the W (as found in the NS direction, where no sub-multiples of the identified modulus are considered), the whole area of the villa could be about 140 *cubiti* (210 RF) or 1 and ¾ *actus*.

The investigation carried out on the plan also allows us to draw some general conclusions about the heights of the walls, windows, roofs and upper stories of the villa. In proportion to the area covered, to the size of the rooms and taking the architectural order of the four-sided portico to be

about 9 *cubiti* high, the structures could have reached a height of between 20 and 25 *cubiti*, with the reception hall having a double height and a possible upper floor on part of the building.

Although no stairwell was found, the construction of the walls, their thickness (between 0.68 and 0.52 m) and how they are built could support, without further intermediate supports, not only the roof but also a planking on the upper floor. It would be reasonable to envisage an upper level in the complex, but given that the northern sector saw, in the next construction phase, a doubling of the thickness of some of the walls in rooms 2-4, this may have been the case only in part of the complex and not the whole (Fig. 9). Regarding the stairs (Campbell, Tutton 2014, 13-74) and access to this additional level, one does not necessarily have to imagine them in stone, as wood is perfectly possible (Adam 2008, 217-221), the traces of which would only be found on the elevation of the relevant retaining walls. Unfortunately, no remains of the walls are preserved to a useful height.

Similarly, the characteristics of the walls allow us to suggest a clay-tiled wooden truss roof (Adam 2008, 221-230) of the double-pitched capriata type with a pitch of slightly less than 20° (Fig. 10, cfr. Fig. 7). Leaving aside on this occasion the special elements (ridge tiles, chimney pots and corner tiles) and the decorative elements (antefixes), for which no evidence has been found, the roofing system can be defined as 'mixed' or 'hybrid', consisting of flat tiles of the Protocorinthian system and semi-cylindrical tiles of the Laconic system, of which only a few examples are preserved. Some of them can be dated to the early Imperial age, the discovery of which testifies to a continuity of use and reuse from a previous building that should not surprise us[5].

The wall and floor coverings consist mainly of plaster and mosaics, in which the colour white predominates. This prevalence led to the optical amplification of the space and the maximisation of luminosity. The small amount of fragmentary material that has been preserved does not allow us to elaborate even hypothetical restorations of the decorative systems in detail and makes it difficult to make a chronological proposal. However, the stratigraphy of the substrate and the preservation of some painted fragments of the plinth of the wall face in Room 4 could be attributable to a division into monochrome red panels alternating with yellow or white panels, with a glossy and polished pictorial surface (Fig. 10). The reds, the only colours still visible on a preparatory layer of mortar, are generally characterised

[5] The examples of the roofs of the major Roman basilicas with ancient tiles studied by Archbishop Pietro Crostarosa are well-known (Shepherd 2021, 228-230). The temple of *Portunus* in the *Forum Boarium* also reused about a hundred ancient tiles in its roof, datable between the late Republic and the late Antique age (Shepherd 2021). See also: Shepherd 2007, 2015, 2016; Bukowiecki, Pizzo, Volpe 2021.

Fig. 10 – 3D reconstruction of the eastern part of the complex (top); interior of Room 4 seen from the N (bottom).

by iron-based pigments, but the presence of various impurities facilitated their degradation (for more details on the problem of composition, see for example the analyses of plaster mortars carried out by Frizot 1977; Adam, Frizot 1983). In Castellito's case, however, these are mainly attributable to exposure to the weather.

The floor mosaics with geometric compositions differ little in colour, alternating between monochrome milky layers, two-coloured with black and white and three-coloured with the addition of red. Mosaics, as well as decorating the interior reception rooms, also covered the portico. The wings of the portico are 2.11 m wide and have an average length of 19.20 m. They are bordered by six columns on each side with a distance between centres of 1.90 m, enclosed at the corners by two heart-shaped columns or corner pillars. The columns were not fixed to the stylobate blocks by *empolia* but were fastened to them by means of a thick layer of mortar.

We are not able to say whether the columns were made of bricks or of limestone blocks, as is part of the stylobate on which they stood, or whether they were smooth or fluted. What we can say is that they had to be finished with stucco and topped by a wooden architrave, also stuccoed (Fig. 10). Between the intercolumniums it is probable that there were masonry handrails, but unfortunately there remain only a few of the limestone diatonic blocks that supported some of the columns on the N and E sides. No evidence remains as to how the *viridarium* must have been decorated. The lighting and ventilation of the interior spaces could have been provided by windows. These, probably made of wood (Wright 2009, 134-135) like the doors, were open both to the outside and inside of the structure (Webster 1959; Velo-Gala, Garriguet Mata 2017), with a greater exposure to the cooler NE winds. Arranged at a height of more than 2 m above ground level, they were probably narrow and high, to avoid the entrance of birds, rodents and thieves.

C.L.

4. Conclusions

The building complex must certainly have been much more intricate than what is visible today: looting activities and the incomplete publication of past excavations have compromised the possibility of reconstructing the building's appearance. However, on the basis of archaeological, technical and architectural considerations, thanks to the application of digital technologies, it has been possible to digitally restore the *pars dominica*, its rooms paved with geometric mosaics, and the central *viridarium*. Using non-destructive prospecting methods (aerial photogrammetry, fieldwalking survey, architectural relief), precise location with RTK GNSS and spatial legacy data integration in a GIS platform, the villa was re-analyzed in its functional architectural characteristic, and contextualized as a focal point of the rural settlement system (Brancato 2020c). Based on the topographical data obtained from the survey campaign, conducted through the integration of direct and indirect survey techniques, the hypothesized reconstruction of

the villa's elevation at its *acme* may be the basis of future research projects and for enhancement actions.

Indeed, when a research project focuses on *disiecta membra*, it must necessarily have as a priority objective not only understanding but also visualizing the past, bridging the gap that separates realities from imagination (Manacorda 2008). Digital technologies are thus important tools not only for quantitative and qualitative archaeological analysis, but they can also contribute to other aspects of research, that is, the essential tasks of reconstructing and communicating (Moscati 2007, 2009). In fact, attempting the reconstruction of Phase II of the Castellito villa imposed a considerable interpretive effort that was facilitated by the GIS analysis of heterogeneous data. Indeed, in cases like this where the archaeological evidence is highly compromised, any reconstructive hypothesis is the result of choices and additions (Barceló 2001; Lock 2003).

However, in the case of Castellito, the 3D modelling of the building, in conjunction with the historical reconstruction process, was an opportunity to reflect on the residual architectural evidence and to address the communication problems posed by a 'marginal' archaeological site. From this perspective, the process of creating the 3D digital reconstruction model can be considered a metaphor for the entire process of knowledge creation in archaeology (De Felice, Sibilano 2010; Limoncelli 2012).

This study sheds light on the great potential in applying digital technologies to gain a new understanding of the Roman villa remains: indeed, the applied workflow – from analysis to synthesis, in the light of the site's history and through different stages of interpretation – and the digital analysis of seemingly meaningless clues have allowed us to propose an organic historical hypothesis for the site until the fourth century at least, which will form the basis of future investigations.

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ABSTRACT

This paper presents the results of the research undertaken through a series of on-site surveys and studies (2019-2022) of the site of Castellito di Ramacca (Catania, Sicily). The site, located on the top of a low hill (106 msl), was partly excavated in the late 20th century and interpreted as a Roman rural building, possibly with a special function (road station). Its name is also attested in ancient sources (Capitoniana). The site was re-evaluated using various

non-destructive prospecting methods (aerial photogrammetry, fieldwalking survey, architectural recording), precise location with RTK GNSS and integration of the legacy data in GIS. This approach confirmed a new addition to the already known villa complex and contextualized it as a focal point of the rural settlement system. Based on the topographical data obtained from the survey campaign, conducted by integrating of different techniques, we propose a reconstruction of the villa's elevation at its peak in Late Antiquity. This study illustrates the great potential of applying digital technologies for a new understanding of Roman villa remains.