Archeologia e Calcolatori
36.2, 2025, 103-118
doi 10.19282/ac.36.2.2025.09

THE CHURCH OF SAN LORENZO IN MIRANDA: POPULATING AN ECOSYSTEM

1. Introduction

The concept of cultural heritage has evolved beyond being a static entity confined to museums, archives, and libraries. Instead, it is now recognised as part of a dynamic and interconnected system, a perspective that has extended far beyond the academic community. The advent of digital technologies has revolutionised our relationship with cultural heritage, transforming it into a dynamic organism where assets and communities interact, significantly influencing its preservation, accessibility, and transmission as collective memory. In essence, we are witnessing the emergence of a true ecosystem (Bianchini *et al.* 2019), where technologies, platforms, tools, researchers, and citizen scientists collaborate within a shared environment that increasingly blends the physical and digital worlds into what is now termed a phygital reality. However, for this reaction to occur and be sustained, specific catalysts are required: primarily, the data available and the information that users process and reintegrate into the system. Collecting, archiving, sharing data and transforming them into information do constitute the essential fuel for the development and evolution of the cultural heritage ecosystem.

Within this framework, the layering of data and information is crucial not only for capturing the multifaceted nature of cultural heritage, but also for enhancing its accessibility by highlighting its inherently multidimensional character. This shift suggests that the challenge for both the academic community and the wider public is no longer merely the collection and digitisation of cultural assets but rather the creation of a digital environment where different levels of knowledge can be seamlessly integrated. It is important to distinguish between data and information, a distinction often overlooked in everyday language but essential within a scientific discussion. Data refer to quantitative records obtained from an object (typically through measurement) whereas information is the result of interpreting these data. This transformation process unfolds in three fundamental stages: collection, selection, and interpretation (Bianchini 2014).

The data collection phase has benefited enormously from the transition to digital methods. In fact, traditional approaches to architectural or archaeological survey, excavation documentation, archival research do not actually generate data but rather reflect the subjective readings of the scholars conducting these tasks. This inherent subjectivity introduces a significant methodological bias, conflicting with the scientific definition of data. Massive-acquisition tools such as 3D capturing, digital imaging, photogrammetry and diagnostic sensors have drastically reduced this subjectivity, enabling the application of rigorous scientific standards to cultural heritage studies. This paradigm shift allows multiple researchers to work on the same, reliable dataset (e.g., a point cloud) offering diverse hypotheses and interpretations based on equally consistent and verifiable data. At this stage, however, data remains 'raw' and requires further selection and interpretation before they can be transformed into meaningful information. The selection phase involves critically assessing the collected data to identify those most relevant, while interpretation consists of a comprehensive reading that aims at enhancing our understanding of the studied object and its characteristics.

A broader challenge is now emerging: how can this vast volume of data be systematically archived, searched, and retrieved? Beyond platform-related issues where efforts are underway to establish a standard, the key lies in defining a parameter that is as independent as possible from data type that, referring to cultural heritage, can encompass images, texts, 3D models, videos, sounds and much more. In this context, georeferencing is emerging as the most promising and universal method for cataloguing any cultural heritage-related data. Georeferencing is not merely about spatial localisation; it serves as the foundational infrastructure for interlinking diverse elements, including historical documentation, digital models, stratigraphic data, landscape constraints, restoration interventions and so on. This approach facilitates the construction of an integrated knowledge network where each heritage element is positioned within a unique spatial context, providing a common denominator for its different components.

The reliability of this infrastructure depends significantly on the tools employed. While open-source technologies can have margins of error up to 20 m, more precise techniques such as GNSS, laser scanning, and photogrammetry offer accuracies within just a few centimetres. The integration of these technologies enhances both localisation precision and the interoperability of data formats (e.g., GIS, BIM), promoting a more dynamic and effective management of cultural heritage. Furthermore, georeferencing enables not only the cataloguing of tangible elements, but also the diachronic documentation of their transformations, benefiting both scientific research and conservation efforts. This approach offers a viable path towards overcoming traditional divisions between archives, museums, and territorial information systems, fostering the development of a sustainable and inclusive phygital ecosystem where knowledge is continuously enriched and updated. To ensure the full effectiveness of this model, investment is needed in shared infrastructures, format standardisation, and open-access policies, as only through conscious integration can these processes be sustained.

Quite apart from these broader considerations, the digitisation of built artefacts has undergone an even more profound transformation, especially in the processes of data collection, selection, and interpretation. In this field, in fact, 3D capturing technologies have not only minimised methodological biases in data acquisition, but have also, for the first time, allowed the artefact itself to be regarded as a primary source of information for its own study. At first glance, the idea that a heritage artefact should be considered a source of information for its own analysis may seem self-evident. However, this perspective has only become truly viable due to the combined effects of two digital-age advancements. The first is the availability of scientifically reliable data, as previously discussed. The second, more procedural and design-related, concerns the comprehensiveness of acquired data relative to the physical extent of the artefact, a high-resolution model composed of billions of geometric points, maintaining consistent metric and geometric reliability.

This emergent property, combined with the prospect of widespread data sharing among scholars (as is already common practice in the hard sciences but still rare in heritage studies), means that hypotheses previously based on limited, inaccurate, and non-shared datasets can now be tested directly against the artefact itself. Producing such datasets naturally requires additional effort and cost at the acquisition stage. However, when viewed from the perspective of cultural heritage as an ecosystem, this investment becomes negligible compared to the long-term benefits in advancing knowledge, enriching data repositories, and ultimately preserving the collective memory upon which every society is built.

C.B.

2. The application of the methodology for the complex of San Lorenzo in Miranda

As part of the PNRR PE05 CHANGES-Spoke 8 project, the aforementioned challenges were tackled by testing various methodological and procedural solutions using the church of San Lorenzo in Miranda (Rome) as a case study. In this context, the traditional approach to the church's historical and architectural study was enriched with new inputs, driven by the need to build an ecosystem that ensures interoperability and interdisciplinarity in data collection and organization. With the ultimate goal of transforming data into meaningful information through a process of 'knowledge stratification', the first step involved establishing a shared coordinate system for data georeferencing, defining a standardized structure for data and metadata organization, and identifying an information system capable of storing and displaying the data.

Fig. 1 – On the left, the church of San Lorenzo in Miranda's 3D laser scanner point cloud vertical section; on the right, aerial views in the archaeological area of the Roman Forum (images acquired during the SAPR survey campaign in 2022).

Regarding data georeferencing, a two-phase 3D integrated survey was conducted in 2022 and 2024 to capture and document the monument's physical characteristics. These campaigns combined 3D laser scanning, photogrammetry, and a topographic survey to georeference the point cloud by linking it to the archaeological Park of the Colosseum's network (Fig. 1). The reference geographic system adopted was the RDN which materializes the 2000's realization of the European Terrestrial Reference System (ETRS) (Baroni *et al.* 2009). Consequently, the georeferenced 3D point cloud became a fundamental resource for analysing the church and providing precise 3D absolute coordinates for all its elements. While the georeferencing procedures were being carried out, another key aspect involved structuring the data and metadata organization. As in all fields of research concerning tangible cultural heritage (TCH), the domain of architectural documentation and analysis required identifying all potential data sources – such as cartography, existing survey drawings, historical images, point clouds, and 3D models – and classifying the relevant metadata within a standardized framework.

For the church of S. Lorenzo in Miranda, this shared database structure was adapted from the one developed within the LazioAntico project (https://lazioantico.datascape.dev/app.html), a GIS-based atlas documenting the archaeological remains of ancient Rome (Carafa 2017, 44-55). The database is designed to associate each archaeological unit of the ancient landscape with all available data, structured according to a specific taxonomy and semantic relationships. Its hierarchical framework is based on the concept of the Topographic Unit (TU), defined as 'the smallest trace that can be identified of human settlement or activity' (Ippoliti 2023, 3). Following this 'functional' distinction, the database is structured to host several phases and periods for each TU. Phases are meant as a timeframe from the starting to the end of a meaningful constructive transformation. Although the classification methods were largely compatible, the original structure – developed for archaeological data – required further adaptation to accommodate architectural documentation. In this context, the level of detail of information retrievable from written and graphic sources can be very high, varying significantly depending on the period of construction. For instance, in the case of the church of San Lorenzo in Miranda, bibliographic and archival sources make it possible to reconstruct the worksite stages, from the initial design to completion. This extensive documentation enabled us to trace the entire evolution of this initial phase, providing valuable insights into the building's historical and structural development.

Given this, while the original database structure's first TU phase would have identified a single period spanning from the beginning of construction in 1602 to the first modifications prompted by archaeological excavations in 1810, an additional criterion was introduced to distinguish the construction phase as a separate one going from 1602 until the completion of the church in 1720. Additionally, when dealing with architecture rather than archaeological remains, information related to the material consistency, the distribution of movable objects or furniture as well as the state of conservation documentation are crucial to describe in a more complete way an architectural object. To address this need, the database structure was enriched with additional TU parameters to provide more detailed descriptions.

As a result, the dataset classification of the church aimed to reproduce the constructive features of the building through a virtual dismantling. This virtual dismantling, allowed by the semantic structure, is the base for a digital reconstruction through 3D informative systems. In this direction Building Information Modelling (BIM) solutions can play a key role in stratifying the knowledge and interacting with multidisciplinary and heterogeneous data. In this perspective, the database structure was tested also to ensure a full compatibility with BIM parameters structure for future developments.

The following paragraphs will deal with the detailed description of the data collection and cataloguing phase for the case study and with the ultimate task of transforming data into information, unveiling through a combined study of point clouds, bibliographic sources and historical graphic documentation.

M.G.

3. The case study of San Lorenzo in Miranda, from knowledge to data cataloguing by topographic units

Having regard to the directives given by the Spoke 8, the study method is divided into two main stages. The first one consists of the collection of all available sources, both in analogue and digital form. The first stage starts from the selection of websites and databases related to the architectural heritage, not only able to provide digitised and freely accessible records, but also able to identify the location of analogue sources: archival documents, graphic and bibliographic sources. The second step is the digitisation of analogue materials, inventoried on the basis of scientific criteria. This operation is preparatory for their indexing, namely for association with historical, functional, typological and material information. All new documents – such as drawings, photographic documentation, test reports – are produced in digital form. This is also a precursor to a possible georeferencing of the data: in essence, the data are suitable to be inserted in a digital environment, possibly with more spatial references: not only the location of the architectural object, but also the place of the source itself (archives, libraries or other cultural institutes). Against this background, to better explain the study method, it is appropriate to provide brief descriptive notes on the monument under study, referring to the rich bibliography for more exhaustive details.

The church of San Lorenzo in Miranda, located in the Roman Forum, was built at the beginning of the 17th century on the ruins of the temple of

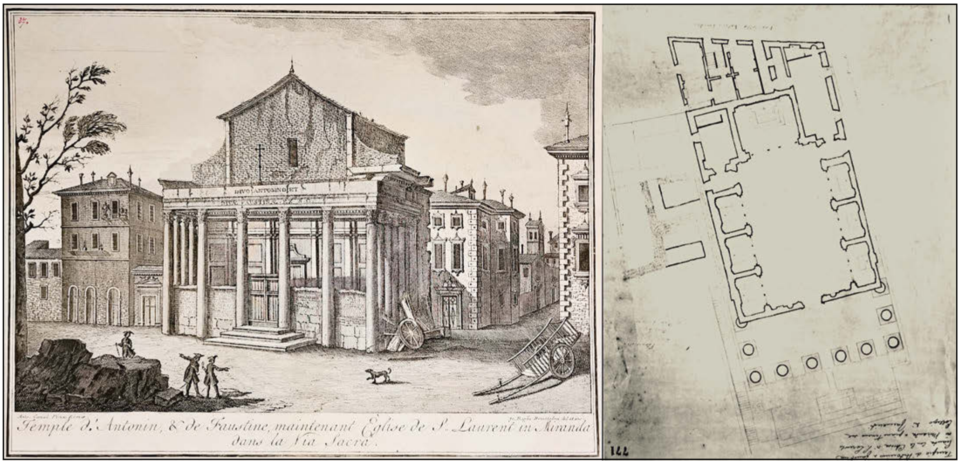

Fig. 2 – Left: J.B. Brustoloni, *Temple of Antoninus and Faustina, currently church of San Lorenzo in Miranda on the Via Sacra*, engraving, early 18th century (BIASA, Roma XI.3.VI.37); right: A. Migliorati, *Plan of the church and ground floor of the Nobile Collegio Chimico-Farmaceutico*, survey, 1903-1905 (A.S.A.RM, Archivio Disegni, Cart. Tempio di Antonino e Faustina).

Antoninus and Faustina 2nd century AD): the base, the side walls of the naos and the colonnade of the *pronaos* are closely connected to the early Baroque church, whose design is perfectly integrated with the ancient ruins. The building, therefore, is not simply rich in historical stratifications, but can be more appropriately defined as a binomial of two monuments, one within the other. Each of them retains its precise identity, but is now inseparable from the other. It is therefore a perfect subject for a study based on scientific data cataloguing criteria, as well as for the creation of an interactive product.

The ancient Roman temple – which according to reconstructions was of prostile type, preceded by a hexastyle U-shaped *pronaos*, and raised on a high base in tuff blocks preceded by a staircase (Pensabene 1996) – was transformed into a church already in 630, when pope Honorius II founded the collegiate of San Lorenzo the martyr in its ruins. This church was suppressed in 1429 by pope Martin V, who entrusted the complex to the *Universitas Aromatariorum Urbis*. Following this event, the *Speziali* (apothecaries) demolished the medieval building to make room for a small hospital and a chapel dedicated to St. Lawrence. These buildings were demolished in 1536 in the context of the redevelopment of the Roman Forum, ordered by pope Paul III on the occasion of the visit of emperor Charles V. Later, a phase of spoliation of the temple preparatory to the construction of the current church begun.

The construction of the current church, commissioned by the Nobile Collegio degli Speziali, began in 1602 under the direction of the architect Orazio Torriani (Bracciano 1578-Rome 1657, Dal Mas 2023) and ended in 1616, except for the facade, whose higher part was made only between 1721 and 1722, by the architect Matteo Sassi (Palmisano 2009). The religious building belongs to the most common type of church in the Counter-Reformation Age, consisting of a rectangular hall roofed with barrel vault, flanked by six chapels (three on each side) and concluded by a quadrangular presbytery (Fig. 2) (Benedetti 2011). The façade, in brick curtain and decorative elements in travertine, is structured with two overlapping orders of pilasters, with a curvilinear broken pediment. The sacred building was joined, on the back, by a four-storey building, designed by Torriani as a seat for the Speziali. This building was demolished in 1932, as part of the opening of Via dei Fori Imperiali. After the demolition it was necessary to redefine the rear façade of the church and rearrange the few remaining spaces as headquarter of the Order of Pharmacists, following a design provided by architect Virgilio Marchi (Dal Mas 1998).

The study of the building started from an analysis of the rich available bibliography primarily Dal Mas 1998 – which constitutes the main reference – but also subsequent articles by the same author (Dal Mas 2002, 2014, 2022, 2023) and other scholars (Pensabene 1996; Palmisano 2009), which provided a solid and reliable basis, thanks to their rich documentary appendices. Nevertheless, further research has been conducted, unfortunately unsuccessfully, at the State Archives of Rome and the Capitoline Historical Archive. On the contrary, the collection of iconographic sources – mainly carried out at the Library of the Institute of Archaeology and Art History of Rome – was satisfactory. This research has provided a great number of images (engravings, drawings, surveys, old photographs) which show the changes of the building over time and allow to reconstruct the history of the building, integrating information from documentary sources. In total, the data collected can be grouped into three categories: 1) reliable data, documented from archival sources; 2) hypothetical data, due to the assumptions and critical reasoning of the authors who have previously studied the monumental complex, now accepted by the scientific community; 3) graphic sources, such as ancient drawings, engravings, paintings, photographs and depictions of the building.

The study of the sources has allowed reconstruction of a very rich chronology and a rather precise dating for most of the building elements. Another important step was an accurate metrological analysis on plans and elevations, obtained by a laser scanner survey. This analysis has allowed to identify the 'module' used by Orazio Torriani in the design of the 17th century church inside the ruins of the temple, highlighting also the great skill of the masons, who erected a rather regular building within an ancient pre-existence and taking into account also the many structural instabilities that have occurred over time on the wall structure, largely as a result of the 19th century's excavations.

M.P

4. The database structure

All data collected (historical information, sources and images) were stored in a GIS database, ensuring that the entire process was conducted according to established archaeological methods. Considering the history of the building, six topographic units were identified in the architectural organism. Precisely, the temple of Antoninus Pius and Faustina (unit 137), the medieval church (unit 499), the hospital of the Speziali (unit 500), the current baroque church (unit 501), the arrangement of the archaeological area (unit 502), the seat of the Speziali (unit 503). Each topographical unit has been circumscribed by accurate descriptions of architectural and artistic character. It should be noted that not all topographic units identify still existing parts of the building: in fact, the medieval church and the first hospital have been demolished and replaced by the current building, but in order to create a BIM model that would follow the complete historical evolution of the monument, it is necessary to take into account also the lost phases.

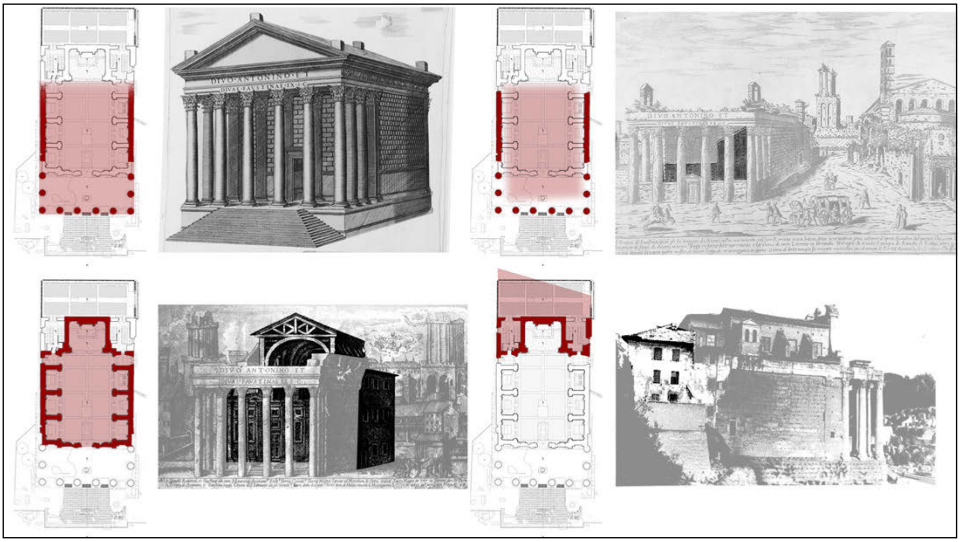

Fig. 3 – The topographic units and the corresponding graphic sources identifying them.

Moreover, the architectural history of each topographic unit has been synthesized into phases, of which chronological references and brief descriptions have been provided (Fig. 3). For topographic unit 137 (temple) a single phase has been identified: 1) stage 1 (141-present day): construction, after the death of Antoninus the temple was also dedicated to him, and the corresponding inscription was added. For topographic unit 499 (medieval church), considering the lack of information, a single phase has been identified: 1) stage 1 (630-1428): from the foundation of the church to its demolition. For topographic unit 500 (hospital of the Speziali), two phases have been identified: 1) stage 1 (1429-1535): construction and use of the hospital; 2) stage 2 (1536-1601): demolition of the hospital and partial spoliation of the temple ruins.

For topographic unit 501 (current baroque church of San Lorenzo in Miranda), five phases have been identified: 1) stage 1 (1602-1720): from the beginning of the construction of the current church, to the completion of the facade; 2) stage 2 (1721-1809): the church is regularly officiated, without significant architectural interventions; 3) stage 3 (1810-1834): first archaeological excavations in the portico of the temple, which prevented access to the church from its main door; 4) stage 4 (1835-1874): presence of a masonry bridge that connected the door of the church to the floor of the Campo Vaccino, bypassing the excavated *pronaos*; 5) stage 5 (1875-present day): demolition of the bridge and progressive continuation of excavations around the building.

For topographic unit 502 (arrangement of the archaeological area), three phases have been identified: 1) stage 1 (1810-1874): first stages of excavation. Initially only the bases of the columns and the floor of the *pronaos* were exposed, while the floor of the Roman Forum remained unaffected. The church door is accessible by a small masonry bridge built in 1835; 2) stage 2 (1875-1928): the site of the Roman Forum is progressively excavated to expose the entire base of the temple, while the bridge is demolished; 3) stage 3 (1929-present day): in 1929 the current brick staircase was built. Since that time there have been no further significant changes.

For topographic unit 503 (seat of the *Speziali*), three phases have been identified: 1) stage 1 (1613-1931): from the construction of the building up to the entire period in which the building exists; 2) stage 2 (1932-1957): from the demolition of the building and the arrangement of the rear façade of the church by Virgilio Marchi, until the period in which no major changes are recorded; 3) stage 3 (1958-present day): construction of the underground hall, behind the church choir, under the floor of the current courtyard.

The six topographic units and their phases are also referred to in the cataloguing of the graphic sources, which have been collected in a special database. Each source, in addition to parameters such as title, author, inventory number, type of representation and execution technique, has been placed in one or more historical periods of the topographic unit depicted, depending on the date of the source itself or the subject depicted. The same approach was followed for cataloguing bibliographic sources. In this way, all the materials useful for the study of the building are collected in a robust and flexible data structure, ready to support future research and analysis.

R.B.

5. Reconstructing the temple's plan: insights from survey data

The comparison between data obtained through laser scanner surveys and previously proposed reconstructions of the temple's original floor plan has revealed an important and unprecedented discovery. Current knowledge suggests a rectangular cella with a wall flush with the two external pilasters that turn onto the front, forming an L-shaped pillar (for the Roman phases of the temple: Bartoli 1914; Cassatella 1993; Pensabene 1996; Dal Mas 1998, 11-60; the modern reconstructions of the temple are based on those published in Bartoli 1914, tav. 1-2-3). For an effective graphic representation of the current state of knowledge regarding the temple's original appearance, refer to (Carandini 2012, tav. 103). However, the survey conducted during this study allowed for the precise localization of the remains of two pilaster capitals, now visible within the rooms of the current college (Fig. 4). These elements are positioned exactly in correspondence with the remains of the

Fig. 4 – Rome, temple of Antoninus and Faustina. Upper image: capital from the interior of the left wall of the cella; lower image: capital from the interior of the right wall of the cella. Today, both capitals are in the rooms of the College of Apothecaries.

external pilasters of the temple's cella wall, long known, thus creating a pillar free on three sides and anchored to the wall of the cella on the fourth side. The capital within the N-W wall logically continues into the peperino blocks corresponding to its base, which protrude from the wall line, despite erosion, indicating the presence of the pilaster itself. On the opposite side, later interventions have not preserved further traces.

These observations suggest that the temple's cella could not have had the floor plan currently attributed to it, where the naos wall is flush with the external pilaster. In this configuration, the wall would conflict with the presence of the internal pilaster. Consequently, this wall must be shifted inward by an indeterminate measure. The examination of historical representations of the temple helps to better understand this issue, which seemed to be recognized at least until the 18th century. A reconstruction of the temple's plan with the

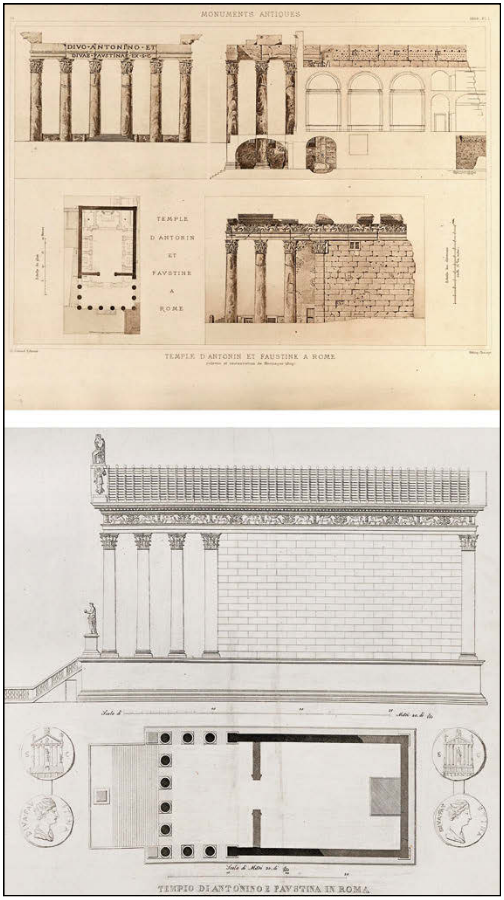

Fig. 5 – Upper image: sections and plan of the remains of the temple of Antoninus and Faustina (from D'Espouy 1905, II, 96, pl. 1); lower image: graphic reconstructions of the temple of Antoninus and Faustina (from Canina 1848, II, tav. XXIV).

cella wall flush with its front limit was already proposed by Palladio (1570, lib. IV, cap. IX, 33) and hinted at, with slight variations, in the drawings of Baldassarre Peruzzi (Bartoli 1914-1922, IV, fig. 506, tav. CCCVII) and Giovan Battista da Sangallo (Bartoli 1914-1922, IV, fig. 506, tav. CCCVII). The drawings by Giovanni Antonio Dosio (Bartoli 1914-1922, V, fig. 838, 839, tav. CDLVI) and Antonio da Sangallo the Elder (Bartoli 1914-1922, I, fig. 101, tav. LXVI), however, left the cella open, unable to identify the wall in question. Antonio da Sangallo the Younger presented an incomplete drawing suggesting the presence of the wall without fully depicting it (Bartoli 1914-1922, III, fig. 477, tav. CCXC). Renaissance graphic documentation thus reveals that even then, there was uncertainty about the cella wall's location. Architects hypothesized its alignment with the external pilasters, without significant protrusions of the longitudinal cella walls.

In the 18th century, studies on the temple led to new reconstructions of its appearance and floor plan. Investigations promoted by the French Academy identified the capitals within the cella wall, corresponding to the external pilasters. Their presence suggested that the cella wall was set back from the longitudinal walls'ends by the width of the pilaster itself (D'Espouy 1905, II, 96, pl. 1) (Fig. 5). Luigi Canina also recognized the issue posed by the internal capitals and hypothesized the wall was recessed by an intercolumniation (Canina 1848, II, tav. XXIV) (Fig. 5). Historical reconstructions thus formulated two hypotheses, those of Canina and Mesnager, both plausible given the surviving remains. However, Canina's hypothesis appears more credible, as there is no trace of the cella wall adhering to the internal pilaster, implying a more inward placement. A third possibility exists for the arrangement of the temple of Antoninus and Faustina's cella wall, proposing the absence of a wall and the presence of a colonnade composed of four columns between the antae. This solution would explain why the wall has not been traced since the Renaissance and could find a partial parallel in the Templum Pacis in the Forum of Vespasian, where the cella wall was replaced by a colonnade. However, the extreme rarity of such an arrangement makes this hypothesis unlikely. It is more probable that the cella wall was dismantled earlier than other structures, as it did not support the roof, which rested on the lateral walls. This hypothesis also explains the complete absence of traces of the temple's rear wall, likely dismantled before the Renaissance, possibly alongside the front wall.

The structure, consisting of a pillar free on three sides at the ends of the cella's longitudinal walls, finds precedents in temples where the cella's side walls extend towards the front columns, as seen in the later phases of the *Aedes Iani* and *Aedes Iunoni Sospitae* at the current church of San Nicola in Carcere. Additional comparison comes from the temple of Juno Regina at the Portico of Octavia (Viscogliosi 1996), which features a similar floor plan, particularly regarding the cella wall and the arrangement of front columns extending along the side for three intercolumniations. The layout under examination also finds a strong parallel in the *Hadrianeum* (Presicce, Baldi 2024), whose cella presented a similar solution with pillars at the ends of the longitudinal walls. Notably, while the *Hadrianeum* was a peripteral temple, the core structure of the cella and its pronaos resemble that of the temple of Antoninus and Faustina, a significant detail considering the same patronage and their use as temples commemorating relatives of Antoninus Pius.

R.D.A.

6. Conclusion

In conclusion, the presented work highlights how the integration of digital technologies in the field of cultural heritage studies is radically transforming research, documentation, and conservation methods. The use of advanced tools such as GIS and BIM allows for a deeper and more accurate understanding of artefacts, overcoming the limitations of traditional practices. The ability to archive and share data in digital format also fosters the creation of a collaborative and shared working environment among researchers, professionals, and citizens, paving the way for a phygital ecosystem in which cultural heritage becomes a dynamic and constantly evolving resource. Digitization is not limited to mere data preservation but rather opens up new opportunities for the interpretation and enjoyment of heritage. Emerging technologies allow for overcoming the divisions between archives, museums, and territorial information systems, integrating different types of data into a single knowledge network. This multidisciplinary and interoperable approach enables a more comprehensive analysis of artefact characteristics, improving the quality and accuracy of the available information.

The case study of the Church of S. Lorenzo in Miranda demonstrates how the combination of historical analysis, digital data, and comparisons with similar examples allows for rethinking and reinterpreting the monument's structure in a more informed and scientifically grounded way. The differences in the diachronic stratification of the elements that make up the artefact and the details examined (such as the capital) highlight the need for a revision of traditional hypotheses, based on a more careful and precise reading of the available data. The aim is to build an active memory that crystallizes a diverse range of perspectives focused on the same cultural asset, defining the cross-cutting role of digitization as central to the study and conservation of Cultural Heritage.

In summary, advancements in digital technologies offer new fundamental tools for the conservation and enhancement of cultural heritage, transforming our ability to understand, manage, and preserve the material witnesses of our past civilizations. However, for these tools to be effective in the long term, continuous investment in shared infrastructures, the standardization of formats, and the adoption of open-access policies are necessary, ensuring that cultural heritage becomes an open and globally accessible resource.

F.P.

Carlo Bianchini, Roberto Barni, Rinaldo D'Alessandro, Marika Griffo
Francesca Porfiri
Sapienza Università di Roma
carlo.bianchini@uniroma1.it, roberto.barni@uniroma1.it, rinaldo.dalessandro@uniroma1.it
marika.griffo@uniroma1.it, francesca.porfiri@uniroma1.it

Marco Pistolesi
Ministero della Cultura, VIVE - Vittoriano e Palazzo Venezia
marco.pistolesi@cultura.gov.it

REFERENCES

Baroni L., Cauli F., Farolfi G., Maseroli R. 2009, *Final results of the Italian "Rete Dinamica Nazionale" (RDN) of Istituto Geografico Militare Italiano (IGMI) and Its Alignment to ETRF2000* (https://www.igmi.org/++theme++igm/pdf/rdn_download/Final_Results_RDN.pdf).

Bartoli A. 1914, *Il tempio di Antonino e Faustina*, «Monumenti Antichi dei Lincei», 951-974.

Bartoli A. 1914-1922, *Monumenti antichi di Roma nei disegni degli Uffizi di Firenze*, I-V, Roma, Bontempelli Editore.

Benedetti S. 2011, *Sintetismo e magnificenza nella Roma post-tridentina*, in L. Marcucci (ed.), *Architettura del Cinquecento romano*, Roma, Istituto Poligrafico e Zecca dello Stato, 27-56.

Bianchini C. 2014, *Survey, modeling, interpretation as multidisciplinary components of a Knowledge System*, «SCIRES-IT-SCIentific RESearch and Information Technology», 4, 1, 15-24.

Bianchini C., Casale A., Empler T., Esposito D., Inglese C., Ippoliti E., Viscogliosi A. 2019, *Ecosistemi digitali e risorse culturali. Digital ecosystems and cultural resources*, «Paesaggio Urbano», 1, 41-51.

Canina L. 1848, *Gli edifizi di Roma antica*, II, Roma, Tipi Canina.

Carafa P. 2017, *The Information System of Ancient Rome*, in A. Carandini, P. Carafa (eds.), *The Atlas of Ancient Rome: Biography and Portraits of the City*, Princeton-Oxford, Princeton University Press, 44-55.

Carandini A. 2012, *Atlante di Roma Antica*, II, Milano, Electa.

Cassatella A. 1993, *Antoninus, Divus et Faustina, Diva, Aedes, Templum*, in E.M. Steinby (ed.), *Lexicon Topographicum Urbis Romae*, I, Roma, Edizioni Quasar, 46-47.

D'Espouy H. 1905, *Monuments antiques relevés et restaurés par les architectes pensionnaires de l'Accadémie de France à Rome*, II, Paris, Massin.

Dal Mas R.M. 1998, S. *Lorenzo de' Speziali in Miranda: Universitas Aromatariorum Urbis*, Roma, Tipografia Cardoni.

Dal Mas R.M. 2002, *I restauri di Orazio Torriani: il rapporto tra processo creativo e preesistenza nell'area del Foro Romano*, «Quaderni dell'Istituto di Storia dell'Architettura», 34/39, 447-454.

Dal Mas R.M. 2014, *Interventi progettuali per la fruizione di chiese romane su preesistenze classiche: Sant'Angelo in Pescheria e San Lorenzo de'Speziali in Miranda*, in S. Bertocci, S. Van Riel (eds.), 2° *Convegno Internazionale sulla documentazione, conservazione e recupero del patrimonio architettonico e sulla tutela paesaggistica*, Firenze, Alinea Editrice, 673-680.

Dal Mas R.M. 2022, *I materiali delle finiture nella chiesa di San Lorenzo de' Speziali in Miranda di Orazio Torriani, nella prima metà del Seicento*, in D. Esposito, F. Lembo, F. Fazio, B. Tetti (eds.), *Studi superficiali: ricerche sulle malte tradizionali e sui sistemi di finitura medievali e moderni*, Firenze, Nardini Editore, 227-236.

Dal Mas R.M. 2023, *Contributi sull'attività architettonica di Orazio Torriani tra Roma e Bracciano nella prima metà del Seicento*, Roma, Edizioni Quasar.

Ippoliti M. 2023, *Lazio antico: From the information system for the archaeological heritage of ancient Latium to the virtual museum*, «Journal of Physics: Conference Series», 2579 012003, 1-12.

Palladio A. 1570, *I quattro libri dell'architettura*, Venezia, Dominico de Franceschi.

Palmisano L. 2009, *L'attività dell'architetto Matteo Sassi (1647-1723), con alcune note inedite relative al progetto per il secondo ordine della facciata di San Lorenzo in Miranda o degli Speziali*, «Römische historische Mitteilungen», 51, 257-291.

PENSABENE P. 1996, *Programmi decorativi e architettura del tempio di Antonino e Faustina nel Foro Romano*, in L. BACCHIELLI, M. BONANNO ARAVANTINOS (eds.), *Scritti di antichità in memoria di Sandro Stucchi*, Studi Miscellanei, 29, II, Roma, L'Erma di Bretschneider, 239-269.

PRESICCE C.P., BALDI M. 2024, *Hadrianeum. Il progetto architettonico e le fasi costruttive*, Roma, L'Erma di Bretschneider.

VISCOGLIOSI A. 1996, *Iuno Regina, aedes in Campo, ad Circum Flaminium*, in E.M. STEINBY (ed.), *Lexicon Topographicum Urbis Romae*, I, Roma, Edizioni Quasar, 126-128.

ABSTRACT

This paper explores the impact of digital technologies on the study, conservation, and enhancement of cultural heritage, highlighting how tools such as integrated large-scale surveys, georeferencing, GIS, and BIM are transforming the research and management landscape of cultural assets, particularly in the integration of heterogeneous data. The paper emphasizes how the collection, selection, and interpretation of such data can be integrated into an interoperable system that connects various types of sources (historical, architectural, graphic) within a shared and phygital environment. The case study of the Church of San Lorenzo in Miranda (Rome) is presented to demonstrate how the collected data enable a more accurate understanding of ancient structures and their transformations. The proposed approach allows overcoming the limitations of traditional methods, offering new opportunities for documentation, research, and conservation. The paper concludes by highlighting the need to invest in shared digital infrastructures and open-access policies to ensure that cultural heritage becomes a global and sustainable resource for future generations.