

Hertziana Studies
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Visualizing Complexities

Practices and Heuristics of Digital Models in Art History

Edited by Nicola Camerlenghi, Tanja Michalsky & Elisabetta Scirocco



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Tanja Michalsky & Tristan Weddigen

Managing Editor

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Abstract

Angelica Federici

Visualizing Medieval Rome. The Basilica of
Sant'Agnese fuori le mura

keywords – *Digital Humanities, Middle Ages, Rome,
Virtual Reality, 3D modeling*



Digital visualization technologies, including laser printers, 3D modeling and virtual/augmented reality, have revolutionized our critical engagement with the visual arts. By contrast, building information and CAD modeling can extend our understanding of art and architecture by augmenting the three primary spatial dimensions (width, height, and depth) with time. The settlement of female communities in pre-existing structures, the loss of a significant number of convents and the perishable nature of the construction materials used, has too often impaired the study of female monastic architecture. VR Sant'Agnese combines established tools of scholarly enquiry, including but not limited to archival research, empirical display of extant objects, and meticulous study of building structures with photogrammetry/point cloud, CAD modeling and ultimately virtual reality. These 3D models set in motion a series of methodological and ontological issues which question all aspects of art history and force us to engage with new agendas for research. While the sustainability of Digital Humanities research is at the forefront of current debates, we should take a step back and ask ourselves what is the use of these models? How can we guarantee a best practice standard which balances out the need for accuracy with the aesthetic quality of the object itself? These models need to be live, open and discoverable and ultimately understood not as research products but as a research tool.

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Visualizing Medieval Rome. The Basilica of Sant'Agnese fuori le mura

Angelica Federici

Introduction

Digital visualization technologies, including laser printers, 3D modeling and virtual/augmented reality, have revolutionized our critical engagement with the visual arts.¹ For example, the transformation of physical spaces over time was originally approached through traditional building design, largely reliant upon 2D technical drawings (plans, elevation, sections). By contrast, building information and CAD modeling can extend our understanding of art and architecture by augmenting the three primary spatial dimensions (width, height, and depth) with time. The settlement of female communities in pre-existing structures, the loss of a significant number of convents and the perishable nature of the construction materials used, has too often impaired the study of female monastic architecture. For these reasons when it comes to women religious, fixed architectural schemes cannot be traced on the basis of surviving elements. *VR Sant'Agnese*, conducted under the supervision of Professor Giulia Bordi, combines established tools of scholarly enquiry, including but not limited to archival research, empirical display of extant objects, and meticulous study of building structures with photogrammetry/point cloud, CAD modeling and ultimately virtual reality.² This project aims to reconstruct the medieval guise of the monastery of Sant'Agnese fuori le mura in Rome, in an integrated study of architecture, liturgical furnishing and painting. It wishes to produce a precise spatial analysis that goes beyond the descriptive limit of photographic reproductions. By creating a 3D virtual model of the monastery in its late medieval appearance,

this application ultimately aims to be both a research tool and an interactive instrument to visit the monument.³

The monumental complex of Sant'Agnese fuori le mura rises over a small hilltop off the Via Nomentana on the outskirts of central Rome (fig. 1).⁴ Originally the site of an early Christian cemetery and of the burial of Saint Agnes herself, the area underwent a period of extensive development, promoted both by Constantine and his daughter Constantia, during the transition of the Roman Empire from paganism to Christianity. In 1112, Paschal II (1099–1118) installed a group of Benedictine nuns who occupied the complex for over three and a half centuries until they were eventually replaced by a community of monks in 1480. The current state and impression of the church is due to the restoration works carried out in the 19th century by Pope Pius IX ca. 1855–1856 (fig. 2).

Historical Data

As testified by a monumental inscription originally found in the choir and today sited in the stairway that connects the church to the convent, the church underwent a radical refurbishment in 1256. The inscription declares that in 1256 – on the feast of St. Vitalis – three altars dedicated to St. John the Baptist, St. John the Evangelist and St. Emerenziana were consecrated in the presence of Pope Alexander IV (1254–1261) and a large group of senior ecclesiastics. The inscription goes on to state that the entire female monastic community was present and mentions three members by name: Lucia *abbatissa*, Theodora *priorissa* and Jacoba *devota*

1 Bonacini 2011; Luigini/Panciroli 2018.

2 This investigation is currently being conducted for my postdoctoral research at the Department of Humanities of the Università degli Studi di Roma Tre.

3 This methodological approach is indebted to the pioneering work of the art historian Maria Andaloro together with her research team. See Andaloro 2006.

4 Ballardini 2018; Brandenburg 2004;

Covello 2018; Frutaz 1960; Krautheimer/Frankl/Corbett 1937; Gambuti 2014–2015; Saini/Ravignani 2004.



Figure 1
Rome, Sant'Agnese fuori le mura, exterior of the Basilica.
Photo by the Author.



Figure 2
Rome, Sant'Agnese fuori le mura, interior of the Basilica.
Photo by the Author.

moniali sacrista. These renovations included the construction of a Cosmatesque *schola cantorum*, fragments of which survive: i) in the stairway connecting the Basilica to the monastery (fig. 3); ii) in the convent's present day refectory (fig. 4); and iii) incorporated in the altar *paliotto* of one of the 16th century side chapels dedicated to St. Lawrence and St. Stephen (fig. 5).

Several authors account for the appearance of the late medieval church in great detail during the 16th century. These chronicles were particularly useful to retrace the appearance of the church and especially its choir enclosure between 1200–1400.⁵ The erudite Augustinian Onofrio Panvinio (1530–1568), an Italian historian and antiquary, librarian to Cardinal Alessandro Farnese (1520–1589), provides a detailed description of the church in the second

half of the sixteenth century. He describes a series of crucial elements, namely an *architrabe tesselatis* dividing the central nave from the presbytery, the two altars mentioned in the monumental inscription – the one on the right dedicated to St. John the Evangelist while the one to the left to St. John the Baptist – and the presence of “*picturis*” in the galleries.⁶

The Italian ecclesiastic Pompeo Ugonio (ca. 1545/1550–1614), who visited the church around the same time, describes two pulpits, the *pro evangelio* and *pro epistole*, respectively on the right and on the left of the *schola cantorum*, along with the third altar dedicated to St. Emerenziana mentioned in the 1256 inscription.⁷ He claims that this was found on the counter façade and apparently housed the celebrated 1256 dedicatory inscription. Ugonio also

5 Claussen 2002, pp. 64–65; Giesser 2017, 108–13; Romano 2017.

6 Onofrio Panvinio, *Schedae De Ecclesiis Urbis Romae*, BAV, Vat. lat. 6780, fol. 278r (transcription Santi Pesarini, Appunti copie, estratti e schede riguardanti in massima parte le chiese di Roma, BAV, Vat. lat. 13127,

fol. 454r); Claussen 2002, p. 64.

7 Pompeo Ugonio, *Compendio del Theatro della città di Roma*, BAV, Barb. lat. 2160, fol. 129v, 130r (transcription Santi Pesarini, Appunti copie, estratti e schede riguardanti in massima parte le chiese di Roma, BAV, Vat. lat. 13127, fol. 456r, 456v); Claussen

2002, p. 64; Pompeo Ugonio, *Theatrum Urbis Romae*, 1594, Biblioteca Comunale Ariostea di Ferrara, Classe I. 161, fol. 966 (transcription Santi Pesarini, Appunti copie, estratti e schede riguardanti in massima parte le chiese di Roma, BAV, Vat. lat. 13127, fol. 458r); Claussen 2002, p. 65.



Figure 3 (above)
Rome, Sant'Agnese fuori le mura, interior of the Basilica, monumental stairway, fragments of the *schola cantorum*. Photo by the Author.



Figure 4 (above)
Rome, Sant'Agnese fuori le mura, interior of the Basilica, refectory, fragments of the *schola cantorum*. Photo by the Author.



Figure 5 (right)
Rome, Sant'Agnese fuori le mura, interior of the Basilica, chapel of St. Lawrence and St. Stephen, fragments of the *schola cantorum*. Photo by the Author.

reports that the partition wall between the nave and the presbytery was raised by a step and consisted of panels decorated with mosaic.⁸ Three pillars each to the left and right of the central entrance to the presbytery area carried the final stone beam. These pillars were turned in their middle and set with colored mosaic stones. The archway was continued with two further columns in each of the two side aisles. In total there were ten columns that carried the temple beam in the full width of the church. This stone beam which separated the long house from the altar area was often part of the standard furnishings of Roman churches between the 12th and 13th centuries.⁹ The 1256 renovations of Sant'Agnese, however, also marked a larger refurbishment of the Basilica and the convent that probably extended over a considerable period of time and included fresco cycles both in the church and in the nuns' conventual spaces. Two fresco cycles originally depicting scenes from the lives of Saint Catherine and Saint

Benedict were originally located in the upper galleries of the Basilica and were detached into 22 panels in 1856 during the restoration works carried out by Pope Pius IX (1846–1878). The Saint Catherine cycle was found in the northern gallery extending on the area above the narthex while the Saint Benedict stories on the southern side of the matroneum. At present, they are preserved in the deposits of the Pinacoteca Vaticana and inside the Pope's personal apartments at the Vatican and are not visible to the public. By studying 16th century chronicles of the Basilica, measuring surviving medieval fragments of the original *schola cantorum* and combining these to the information provided by 13th century inscription we started tracing the medieval layout of Sant'Agnese during the 1250s.

3D Model and Technological Pipeline

The project pipeline was defined by Professor Marco Canciani, director of the Rilttec Laboratory

⁸ Pompeo Ugonio, *Theatrum Urbis Romae*, 1594, Biblioteca Comunale Ariostea di Ferrara, Classe I. 161, fol. 966 (transcription Santi Pesarini, *Appunti copie, estratti e schede riguardanti in massima parte le*

chiese di Roma, BAV, Vat. lat. 13127, fol. 458r); Claussen 2002, p. 65.

⁹ No surviving example exists in Rome dating to this period, but we know of several examples through sixteenth-century

chronicles, namely those of S. Bartolomeo all'Isola, S. Maria in Trastevere, and S. Saba; Claussen 2002, p. 58.



Figure 6
Sant'Agnese fuori le mura, 3D model of the interior.



Figure 7
Sant'Agnese fuori le mura, 3D model, longitudinal section.

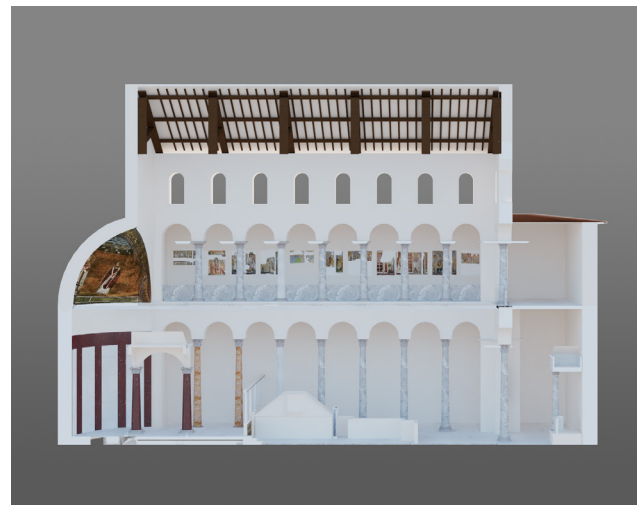


Figure 8
Sant'Agnese fuori le mura, 3D model, longitudinal section.

at the Department of Architecture of the Università degli Studi di Roma Tre. This laboratory aims to study and experiment methods relating to three areas in particular, which range from surveys of archaeological, architectural, urban and environmental heritage through 3D systems to multimedia communication through innovative methodologies (such as virtual anastylosis, augmented reality, etc.). While our aim is to create a three-dimensional model of the entire complex, we decided to start the process of reconstruction from the Basilica and work our way towards the other parts of the convent. The historical-documentary information was integrated with the planimetric surveys of the complex conducted by Dr. Emanuele Gambuti, who scanned the convent and outlined the architectural plans of the monastery for his PhD dissertation at the Department of History,

Representation and Restoration of Architecture at La Sapienza Università di Roma.¹⁰ The technological pipeline envisaged as a first step the creation of an orthophoto superimposed on the floor plans together with the cadastral classification drawn by the City Municipality (ca. 2010). Prior to the laser campaign inside the Basilica we took a series of measurements of the monastic complex to test the accuracy of Dr. Gambuti's plans. In December 2019 the laser survey was carried out by Professor Marco Canciani and Giuseppe Fioravanti with a Faro Focus instrument both in the church, in the monumental staircase, and in front of the façade. The point cloud was cleaned, and its alignment optimized with the program ReCap. In parallel we simplified Dr. Gambuti's DWG files in AutoCAD to obtain a rendering that was as close as possible to the original aspect of the

¹⁰ Gambuti 2019.

Figure 9
Sant'Agnese fuori le mura, 3D model,
screenshot from video <https://doi.org/10.17617/3.UCZKF4>



medieval church.¹¹ We used a 16th century plan of the complex (ca. 1550s) drawn by Alberto Alberti (1525–1598) as a visual map for the CAD drawings which were naturally integrated with the studies on liturgical furnishings conducted by Peter Cornelius Claussen in the *Corpus Cosmatorum*, and primary documentary sources mentioned above. Precise measurements of the surviving sculptural fragments were taken at Sant'Agnese to delimit the length and width of the choir enclosure. I then proceeded to measure Cosmati pulpits which shared a similar chronology to the one present at Sant'Agnese fuori le mura. This was executed at San Clemente, San Lorenzo fuori le mura, and Santa Maria in Cosmedin to create model prototypes for the virtual reconstruction of the *schola cantorum* at Sant'Agnese. We then proceeded to the 3D modeling *in vivo*, taking the point cloud as a reference point. The plans and elevations were modeled in 3D with SketchUp and Rhino and once the modeling was finished we worked with V-ray and Photoshop for the light and final touches in the rendering (fig. 6, fig. 7, fig. 8).

All measurements in the model are exact and account both for the sculptural fragments

present in nunnery, the point cloud, Gambuti's DWG file and Alberti's map. As far as the mosaic pavement is considered, for the video (fig. 9) we drew the one present in the model using the mosaic pattern at San Clemente as a benchmark. On a final technical note, the pictorial fragments were opened in photoshop – cut and reapplied as materials; while the PNG files did not work due to their transparency, we used them as standard JPEGS. Following Giulia Bordi's research on early medieval frescoes in Domenico Bartolini's writings, a provisional location to the fresco of the *Holy Princesses*, was allocated in the pillars of the narthex.¹² Finally, the detached frescoes at the Vatican were positioned inside the upper galleries of the Basilica following the narrative cycles of the *Saint Catherine* – *Saint Benedict* legends. The paintings have been temporarily positioned in the galleries in their fragmented nature, the next step will be to try and integrate the missing parts in a process of virtual integration. The video inside the 3D model was made using Premier Pro 30 which generated 30 frames per second creating a series of renders from the 3D model and file folders which were subsequently joined to create the video.

¹¹ Gambuti 2020, p. 125; Forni 1991.

¹² Bordi 2006, pp. 63–64; Frutaz 1960, pp. 164–165.

Conclusions

While the material presented in this article is still a work in progress, it bears witness to a methodological approach which combines architectural, archival, art historical research integrated with technical tools to aid visualization of research results. It is now apparent how the use of CAD technologies has revolutionized our critical engagement with the visual arts. IT-assisted research has dramatically changed the way we communicate the history of art and architecture. It is by recording the passage of time that these models acquire their significance, practically making them time machines, useful tools for researchers and the public at large. These 3D models set in motion a series of methodological and ontological issues which question all aspects of art history and force us to engage with new agendas for research. While the sustainability of Digital Humanities research is at the forefront of current debates, we should take a step back and ask ourselves what is the use of these models? How can we certify a best practice standard which balances out the need for accuracy with the aesthetic

quality of the object itself? It is through sound research of primary sources and transparent integration of technology that this may be guaranteed. While the peer review process in place in many academic journals has been heavily criticized, this could verify that these models have a certain level of accuracy which would ultimately foster a longer shelf life. Along with the actual feasibility of direct access we should also imagine new forms of publication, while ensuring copyright these should take into account the possibility of updating both software and content. Additionally, the fact that models are seldom successfully deployed in the classroom speaks to a limitation which is not only caused by an intrinsic design obsolescence characteristic of all technology, but also to a certain reticence on the part of the teaching body. In order to safeguard its survival through time, any digital [re]construction should take into consideration a pedagogical element, ultimately guaranteed through a thorough methodological research question. These models need to be live, open and discoverable and understood not as research products but as a research tool.

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