

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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Digitizing Cultural Heritage. Methodology, Potential,
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keywords – Norman Palermo, Royal Palace,
Cappella Palatina, 3D survey, Digital surrogate



The Royal Palace in Palermo, with its famous Cappella Palatina and the so-called Norman Stanza, is an outstanding, intricate architectural palimpsest. The three-dimensional model of the Palace represents an effective, useful tool, thanks to which a deeper knowledge of the monument arises. Besides a short description of the Royal Palace Project, which includes the trans-disciplinary approach applied to the monument in its complicated architectural history and archaeological stratigraphy, part of this contribution is dedicated to the epistemic rationale of the digital humanities, 3D models and digital tools, exploring potentials, questions and limits deriving from vast amounts of data, with the consequent need for an appropriate, dedicated and permanent management system. Compared to the traditional scientific outcomes represented by definitive publications and books, a never-definitive digital model would represent a dynamic tool, potentially open to an unlimited incrementation of data, and fostering a hermeneutic update and the heuristic upgrade of knowledge of a given cultural heritage monument. This increase of knowledge balances the degree of uncertainty of our working hypotheses and reconstructions, fundamental tools to retrace the diachronic history of a given monument and to recreate a reliable configuration of synchronic spaces and functions.

Dor: 10.48431/hsah.0209

Digitizing Cultural Heritage. Methodology, Potential, and Limits of the Palermo Royal Palace Project

Ruggero Longo

Digital Humanities, as the combined terms indicate, explicitly merges scientific and humanistic disciplines, logical and intuitive approaches, and mathematics and aesthetics, and takes for granted that science is not just an ensemble of specific disciplines, such as physics or chemistry, but a method.¹ In this sense, a digital humanist today is not simply an archaeologist, an architect or an architectural historian, or a computer scientist. My point of view in this essay is that of an art historian, armed with archaeological and archaeometric approaches, accustomed to interdisciplinarity, but who deals primarily with visual languages. Thus, I will focus my methodological analyses and criticisms on what we can rightly describe as visual languages, be they 2D, 3D, 4D, etc.

As an introduction to my argument, I would like to share a statement by Erwin Panofsky, which sheds some light on the limits of the aesthetic approach in the humanities, and in particular in art history:

[An Art Historian] constitutes his “material” by means of an intuitive aesthetic re-creation [...] How, then, is it possible to build up art history as a respectable scholarly discipline, if its very objects come into being an irrational and subjective process?²

Referring explicitly to Immanuel Kant's *Critique of Judgment*,³ Panofsky acknowledges that the aesthetic process, constituted by a relationship between the subject and the object, is a subjective one. The solution that he proposes consists in combining an aesthetic approach with an archaeological one, ensuring that the two processes interpenetrate one another:

Intuitive aesthetic recreation and archaeological research are interconnected so as to form, again, what we have called an “organic situation.”⁴

In other words, to mitigate the subjectivity of hermeneutic processes dealing with visual languages, Panofsky proposes to adopt an archaeological approach, thus introducing interdisciplinary studies and anticipating the need to start from objective bases, recently postulated for the field of 2D and 3D reconstructions by theorists such as Kevin Garstki.⁵ Panofsky's words also indicate the necessity of adopting transparent methodological paths that preclude the axiomatic assumption of objectivity of the visual data, a necessity recently theorized by many scholars, including Garstki himself as well as Susan Schreibman and Costas Papadopoulos.⁶

The comparison, in this regard, between photography and digital three-dimensional models has been often highlighted in a manner that goes beyond the similarities with Walter Benjamin's reproducibility and the ‘aura’ of the work of art⁷ – which Adam Rabinowitz redefined as “the Age of Digital Surrogacy”.⁸ Photography has long been employed as an indispensable, objective methodological tool in archaeological excavations, yet as Benjamin and Rabinowitz remind us, it acquires its authenticity, its aura, its purely subjective dimension, as a medium capable not (only) of translating and conveying reality, but rather of interpreting it. Similarly, the act of digital re-constructions is not an objective process, but a creative one, a form of rendering that performatively cites the original starting point.⁹ As with photography, is digital recreation thus a scientific method of

1 Russell 1914.

2 Panofsky 1938, pp. 103–104.

3 Kant 1790.

4 Panofsky 1938, p. 105.

5 Garstki 2017.

6 Schreibman/Papadopoulos 2019.

7 Benjamin 1968.

8 Rabinowitz 2015.

9 Garstki 2017.

Figure 1
View of the three-dimensional model of the
Royal Palace in Palermo.
Graphic: TecnoArt; © A.R.S. 2015.



replicating and translating reality, or a creative way of interpreting it? And subsequently: where is the boundary between art and science, subjectivity and objectivity, or to use Bertrand Russell's words, mysticism and logic?¹⁰

Be that as it may, like photographs, the three-dimensional renderings do not represent the objects themselves in their totality, but a single phase of their lives: a snapshot. In this paper, I will employ as my example a snapshot created in 2014–2015 of the Royal Palace in Palermo (fig. 1). The circumstance for this performance was the project “Knowledge, Cultural Promotion and Public Enjoyment of the Royal Palace in Palermo, 2014–2015.”¹¹

The Royal Palace is a significant architectural palimpsest, encompassing remains from across the entire history of Palermo, from the Punic-Hellenistic and Roman eras to the Norman period, and from early modernity to today. The importance of this site was made clear between 1984 and 1986, when some sections of the Punic and Hellenistic city walls were discovered below the Palace, together with one of the most ancient city gates of Pànormos, as Palermo was then known. More than 2500 years of history have produced a site of incredible archaeological complexity, the constructional stratigraphy of which is extremely difficult to investigate.¹² According to late 11th-century Latin sources, the Normans founded a fortress soon after they conquered Palermo in 1072.

The reconfiguration of the building undertaken in the 16th and 17th centuries by the Spanish court and the addition of early modern structures reshaped the medieval castle into a modern palace (fig. 2). A number of medieval Latin and Arab texts and documents permit us to arrive at a hypothetical reconstruction of the Norman Palace as it appeared in the late 12th century (fig. 3, fig. 4).¹³ The place where the Normans built the palace did not consist of a natural hill. The whole palace lies at an altitude eight meters higher than the Punic levels (fig. 5), a gap filled with stratifications belonging to pre-Norman phases of construction that were in need of better understanding.¹⁴ Importantly, the physical context that surrounds the famous Cappella Palatina – a wonderfully preserved cornerstone of medieval Mediterranean art – had never been properly investigated.¹⁵ The idea for a comprehensive project focused on the study of the Royal Palace was prompted by Maria Andaloro in 2009.¹⁶ The pioneering holistic approach¹⁷ aims to re-contextualize works of art within their original – and often lost – medieval spaces, a project that requires combining different disciplines in order to produce and convey knowledge. A multidisciplinary team from Tuscia University was in charge of the project, which I had the responsibility to coordinate. This challenging endeavor was performed in collaboration with Tecnoart, a company that specialized in innovative information technologies for the presentation and study of cultural heritage.

¹⁰ Russell 1914.

¹¹ PO-FESR 2007–13, CIG: 4397878889. Concept by Maria Andaloro; Sponsored by European Community – Regione Sicilia Assemblée Regionale Siciliana. Scientific Director: William Tronzo; Executive

Coordinator: Ruggero Longo; Executive Director: Pasquale Riggio; Executive teams: Università della Tuscia, Tecno Art s.r.l.

¹² P. Longo 2011.

¹³ R. Longo 2011; R. Longo 2016.

¹⁴ Giarrusso/R. Longo 2018.

¹⁵ Longo/Romagnoli 2018; Brunazzi/De Santis 2020.

¹⁶ Andaloro 2011a.

¹⁷ See, for instance, Andaloro 2006.

Figure 2

Carlo Castiglia, *Teatro Geografico Antiquo y Moderno del Reyno de Sicilia*, 1686: Palermo, view of the Royal Palace of Palermo (Madrid, Ministerio de Asuntos Exteriores y de Cooperación, Archivo General y Biblioteca, Ms. 3). Consolo/De Seta 1990, p. 264, fig. 51.

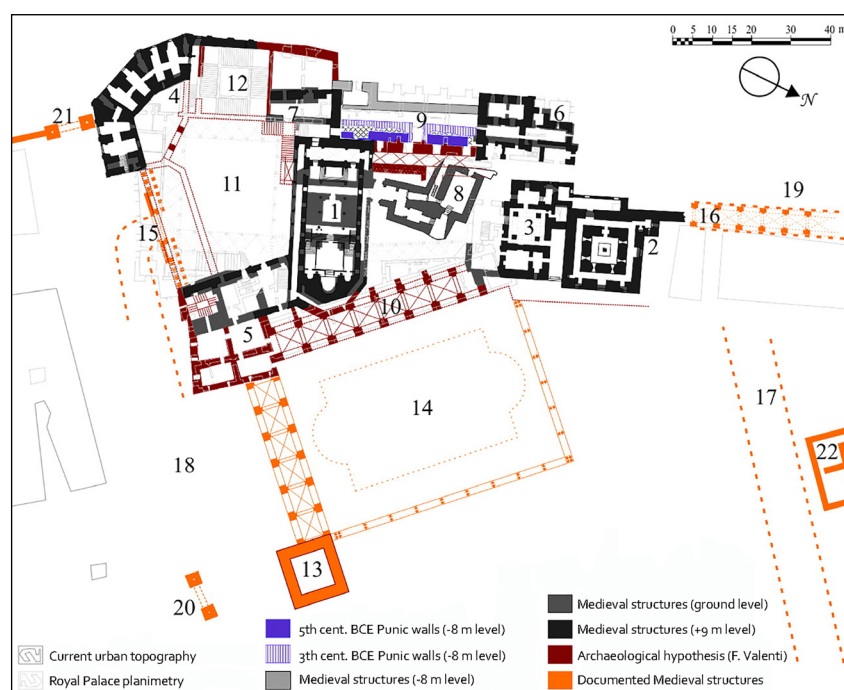


Figure 3

Map of the Royal Palace in Palermo, with surviving Medieval structures (grey) and structures hypothesized by F. Valenti or documented by historical sources (orange and red):

1. Cappella Palatina; 2. "Pisana" tower;
3. "Joharia"; 4. South-West Bulwark;
5. "Greek" tower; 6. Royal apartments;
7. Cappella Palatina treasury; 8. Dungeons (beneath "Cortile della Fontana");
9. Punic walls (beneath Sala Montalto);
10. Maqueda wing and modern façade;
11. Maqueda courtyard; 12. Monumental stairs; 13. "Red" tower; 14. "Aula regia" room; 15. Medieval entrance gate; 16. "Via cooperta" passageway; 17. "Simat" or "vicus Marmoreus" main street; 18. "Vicub ab aula regia" secondary street; 19. City walls;
20. "Galka" city gate; 21. "Bāb al-abnā" o "Porta Palatii" city gate; 22. Santa Maria della Pinta church.

Graphic: Ruggero Longo.



I wish here to highlight two aspects of the project. The first is related to the concept of epistemological objectivity and transparency. In 1933 Alfred Korzybski stated, "A map is not the territory it represents, but, if correct, it has a similar structure to the territory, which accounts for its usefulness."¹⁸ Well aware that a model is only a way to simplify reality, and that objectivity is only a chimera – something to aim for, but impossible to achieve or encompass,¹⁹ as relativity, quantic physics, and Heisenberg's uncertainty principle have

demonstrated²⁰ – and cognizant of Panofsky's assumption, our archaeological approach sought to integrate historical data, materials, and knowledge deriving from scientific analyses – physical, chemical, geological, mineralogical, hyperspectral – with visual-aesthetical data. The digital surrogates produced through this process, although missing aura, physical substance, scale, life, context, and experience,²¹ are capable of incorporating material data and evidence into the visual model. More than a simple virtual replica or a digital twin, the

¹⁸ Korzybski 1933, p. 58.

¹⁹ Russell 1914.

²⁰ Rovelli 2020.

²¹ Jeffrey 2015.

Figure 4

Drawing with the hypothetical reconstruction of the Norman Palace with indications of the medieval structures and buildings (Ruggero Longo). Based on a drawing by Paolo Loiacono under the direction of Francesco Valenti, published in Valenti 1925, pp. 512–528, fig. 13.

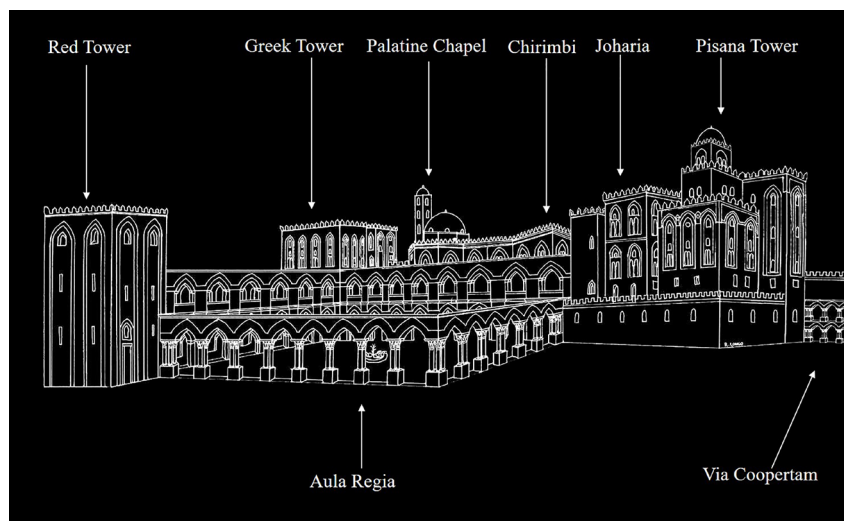
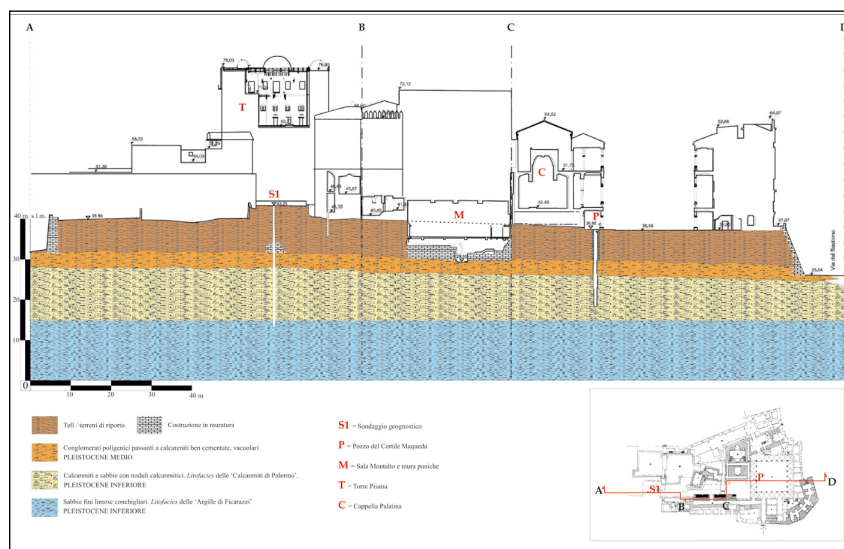


Figure 5

North-South cross-section of the Royal Palace in Palermo, including the geological section underground. Graphic: Ruggero Longo (Giarrusso/R. Longo 2018, fig. 17).



surrogate thus becomes something else in comparison to the original starting point: it is identifiable as a new creation. The power of this sort of digital copy lies precisely in its ability to supersede the original object to convey more pieces of information and to do so as they are perceived, recorded, and interpreted. It thus opens avenues to scientific approaches, while also making processes, and uncertainties, trackable and transparent.

The second aspect to be considered is that by analyzing the workflows of different processes during the creation of the digital reconstructions, we could individuate two opposite vectors: one is progressive, as it starts from surviving archaeological evidence and other more readily available data, and reconstructs the lost, disappeared past; the other is regressive, as it starts from the current configuration of the space and

architecture – i.e., the product of alterations, transformations, and stratifications – and excavates backward through it until a previous configuration comes to light. In both cases, it is essential to start from objective evidence. However, in the first case, our ‘time machine’, although returning back into the past (in a time before a given destruction occurred), will mainly move forward, in a constructive direction. In the second case, instead, the process starts from the present, returning back to the past through a destructuring process (in a time before a given new phase of construction and stratification happened). The Royal Palace case study began with a regressive approach: before modeling reconstructions, we performed a laser scan three-dimensional survey of the current configuration of the monumental complex. The utility of such a survey is obvious, for it

Figure 6
Creation of the three-dimensional model of the Royal Palace in Palermo. Above: workflow with buildings layers; below: point cloud and horizontal cross-section.
Graphic: TecnoArt.

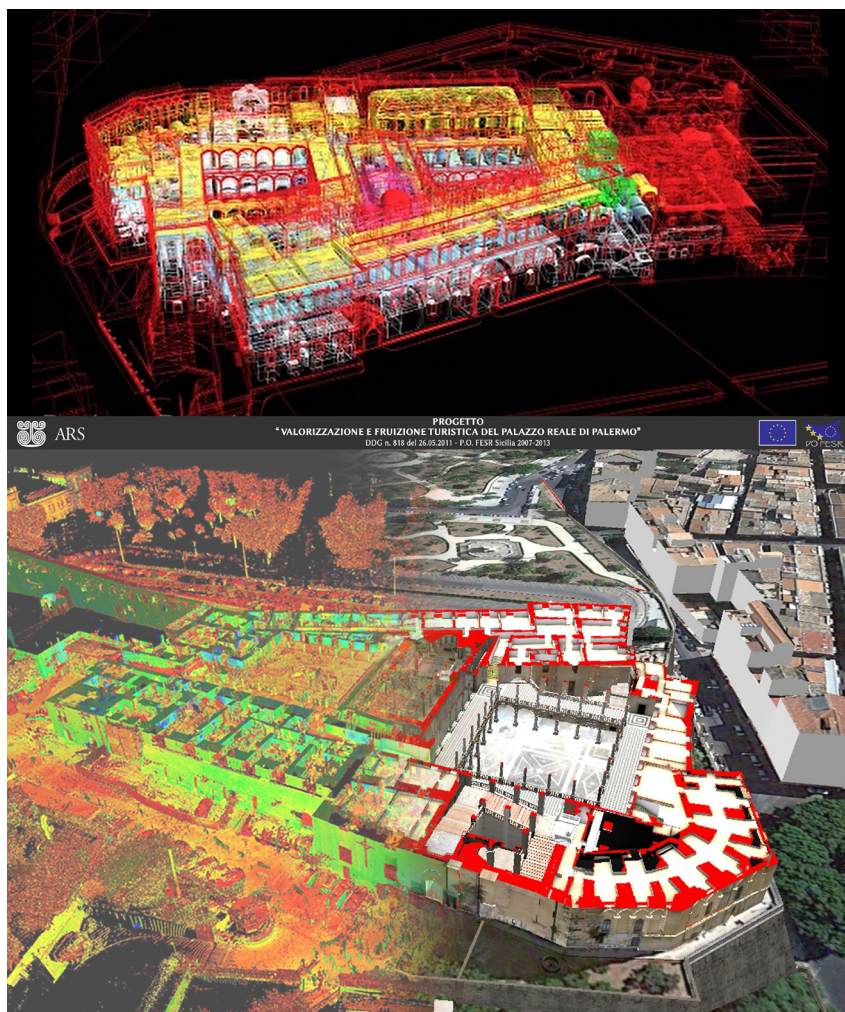


Figure 7
Cross-sections of the Royal Palace in Palermo, with the Cappella Palatina; above: three-dimensional model; below: AutoCAD output.
Graphic: TecnoArt; © A.R.S. 2015.

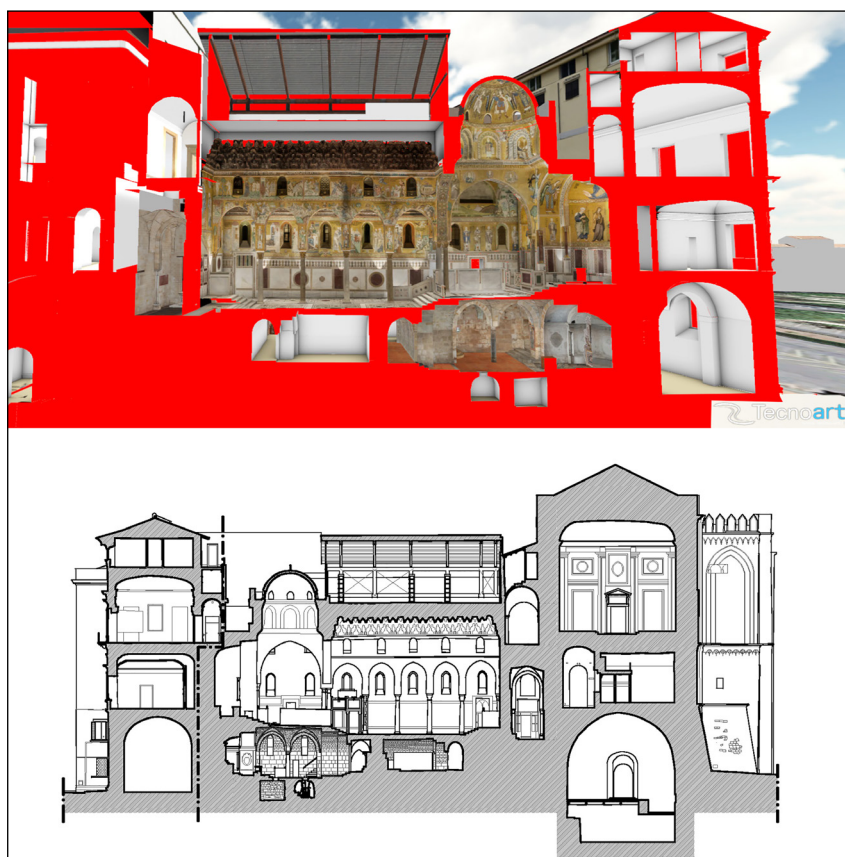
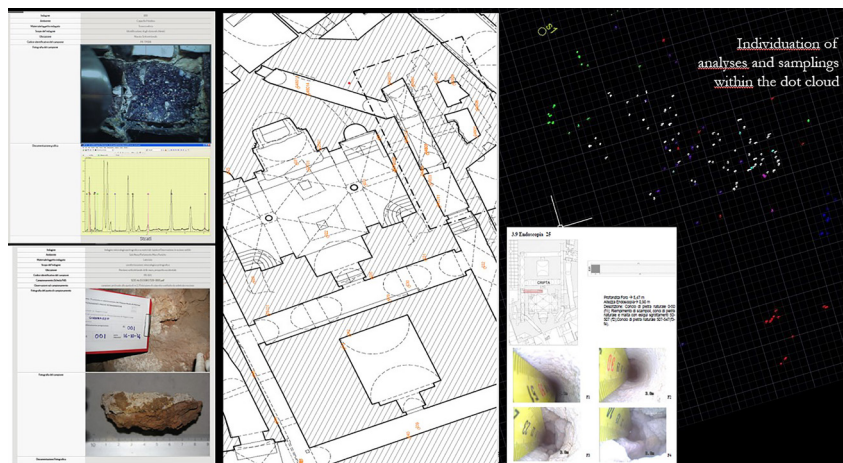


Figure 8
Georeferenced mapping of scientific investigations and analyses performed within the Royal Palace in Palermo.
Graphic: TecnoArt.



permits us to extract any plan or cross-section (fig. 6, fig. 7).

But the 3D model alone does not represent the real strength of the project. As part of our collective research, we carried out numerous types of scientific analyses, including identification of mortars and building stones, chemical analyses of mosaic glass tesserae, georadar and thermographic imaging, hyperspectral photography, and mapping of the mosaic surfaces. Focused databases preserve all the outcomes, files, documents, and information derived from these analyses, as well as from bibliographic and archival research. The innovative aspect arises from the manner in which the 3D model serves as a virtual platform or container, making it possible to present the data in their precise spatial and topographic context (fig. 8).

Such innovative methodology offers the chance to study the Royal Palace in a new way. Applications of this advanced tool can help to clarify the intricate relationships among the construction phases of the building, the still uncertain relative chronologies, and the original configuration of the medieval space. The most important findings of this project were presented in June 2018 at an international conference which I organized together with Maria Andoloro, William Tronzo, and Jeremy Johns.²² One example will suffice: the resolution of a crucial issue related to the medieval configuration and function of

the Cappella Palatina. Many scholars, starting from Ernst Kitzinger,²³ based their interpretations of the arrangements of mosaics, internal distribution of spaces, and multiple functions of the Cappella Palatina upon the existence of a *royal loggia*, located on the north wall of the sanctuary, from which King Roger II would have followed ceremonies from a privileged point of view (fig. 9).²⁴ The loggia that we see today is the result of mid-19th-century alterations, but in 1992 Kitzinger published a precious drawing executed in 1790 by Leon Dufourny, which attests to the existence of the loggia before the 19th century.²⁵ Other scholars had questioned the existence of the balcony in the Middle Ages, on the basis of interpretations of some late 16th and 17th-century documents.²⁶ Thanks to a deep analysis of the historical sources and the investigations performed on the architectural context around the chapel, it has been possible to verify that the first transformation of the openings occurred in 1585 when a new portico was built, the vaults of which obliterated the original windows on the north side of the chapel, thus modifying the loggia (fig. 10). The use of infrared imaging on this element has enabled the detection of the medieval openings (fig. 11), leaving room for interpretations (fig. 12) that may bring new life to Kitzinger's compelling hypotheses.

Before concluding, I wish to present some drawbacks to the approach used in this project.

22 Andoloro/Longo forthcoming.

23 Kitzinger 1949. 24 Ćurčić 1987.

25 Kitzinger 1992, pl. E.

26 Brenk 2010; Aurigemma 2010; Brenk 2014.

Figure 9
Drawing of the longitudinal cross-section of the Cappella Palatina in Palermo, with the royal balcony.
From Ćurčić 1987, fig. 6b.

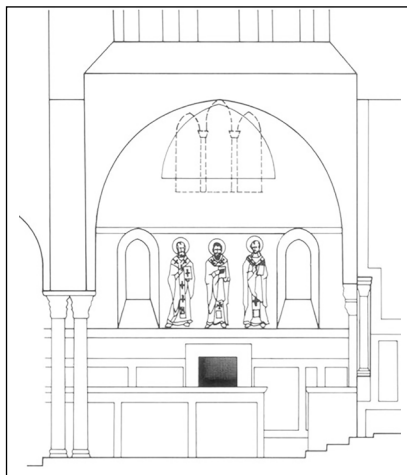


Figure 10
Cross-sections of the Royal Palace and the Cappella Palatina in Palermo; left: three-dimensional model; right: AutoCAD output. The black dashed boxes indicate the 1585 slabs of the modern courtyard (Cortile della Fontana), formerly supported by vaults, which obliterated the original openings on the North side of the Cappella Palatina sanctuary.
Graphic: TecnoArt; © A.R.S. 2015.

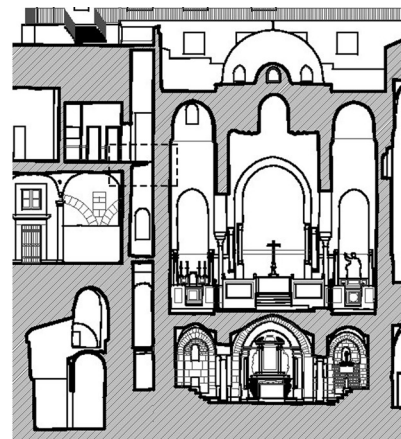


Figure 11
Infrared observation performed on the North wall of the North transept of the Cappella Palatina in Palermo, showing the presence of a walled-up portion of the window.
Graphic: TecnoArt.

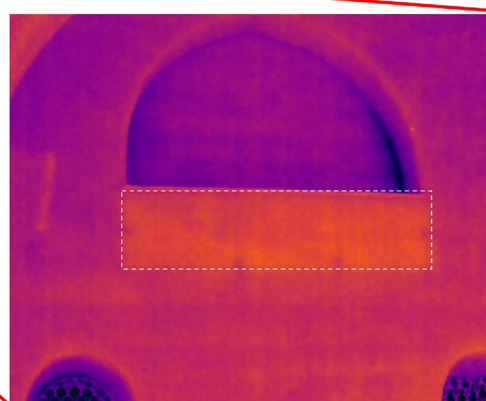
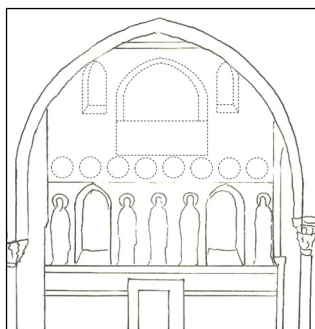


Figure 12
Drawing with the hypothetical reconstruction of the North transept of the Cappella Palatina in Palermo, with the possible original configuration of the royal balcony.
Graphic: Ruggero Longo.



First: the amount of data produced is really high. The dot cloud alone comprises more than two billion points. The datasets are constituted by more than 400 entries, the photographer Gaetano Alfano took more than 2000 pictures, and the total amount of gigabytes produced is extraordinary. This forces us to confront issues of High versus Low resolution. A good compromise would consist in managing multi-resolutions, but the real issue is: to whom do we plan to address our digital model? While addressing these projects to the general public would be democratically important and efficient in promoting culture – and would allow us to opt for lower data resolution in the interest of broader divulgation – I am quite skeptical of the idea that this kind of endeavor could ever be designed for general public only, for our responsibility to convey knowledge would risk to be compromised by a lack of knowledge. In other words, the lower level of detail (resolution) appropriate for a general audience reduces the utility of the model as a tool for advanced interpretation. In order to visualize complexity, we need first of all to understand it; only once we understand it can we have the chance to transform it into ‘simplicity’.²⁷ Therefore, the first aim should be that of creating a powerful tool to investigate and interpret reality, whether current, past or future. But another critical point emerges, concerning resources, funding, and clients. It is clear that to produce an accurate model, we need more resources and time. According to our experience, the government can be an appropriate sponsor for these kinds of investments in cultural heritage, but projects work better if they are not constrained by political agendas, and, of course, if a research center, being it public or private, is the one responsible for project administration, management, and coordination. In 2016, the contents and technologies of the Royal Palace project were

delivered to the Sicilian Regional Assembly, which is responsible for maintenance and public dissemination. Today the model is not available online, for the municipality does not have the capability (and the will?) to manage the firmware updates, software migrations, and other steps necessary to maintain the model and the databases online, and it is even difficult for we, the project’s creators, to use the model. So, the risk is that, in the near future, all of this new digital cultural heritage concerning Sicilian patrimony will be lost.

For my conclusion, I kept some positive points.

First, the importance of designing at a high-definition level is also an answer to another fundamental issue, that of documentation and preservation of cultural heritage in advance of damage or loss. For instance, thanks to the CyArk foundation²⁸ the temple of Bel in Palmyra, Syria, unfortunately lost in recent years, has been virtually reconstructed from tourists’ pictures.²⁹ Unfortunately, once we zoom into the 3D model, the image reminds us that we have lost the primary source of knowledge and every detail of it (fig. 13). Imagine if we had had the chance not only to take pictures but also to perform a HD digital model of this UNESCO world heritage site. Second, we assumed that a 3D model can be considered as a photographic documentation. Unlike, however, an analog snapshot or a printed book, a digital model should be considered not as frozen and static but as alive and dynamic, capable not only to take us traveling into the past but also to follow and document ongoing events, being something incrementable and updateable over the years. In this perspective, digital surrogates should be embraced as one of the most powerful tools for transmitting to the future the present knowledge of the past.

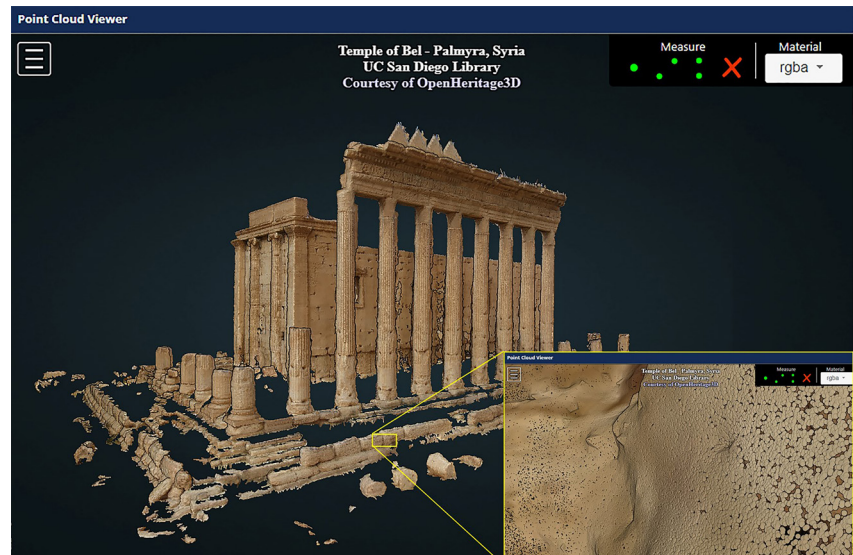
²⁷ Berthoz 2019.

²⁸ <https://www.cyark.org/>.

²⁹ <https://openheritage3d.org/project.php?id=zjnn-wx58>.

Figure 13

Digital surrogate of the temple of Bel, Palmyra, Syria, recreated starting from tourists' pictures. The yellow box shows the low-resolution detail of the surface.
<https://collections.arck-project.org/view/ARCK3D0000000253>; (©) The Arck Project.



References

- Andaloro 2006
La pittura medievale a Roma 312-1431. Atlante, percorsi visivi: I. Suburbio, Vaticano, Rione Monti, ed. Maria Andaloro, Milan, 2006.
- Andaloro 2011a
 Maria Andaloro "Restituire l'insieme e le sue parti: A proposito di un'idea progettuale sulla Cappella Palatina", in *Die Cappella Palatina in Palermo: Geschichte, Kunst, Funktionen*, ed. Thomas Dittelbach, Künzelsau, 2011, pp. 440-445.
- Andaloro/R. Longo forthcoming
 Maria Andaloro and Ruggero Longo, *Il Palazzo Disvelato: Il Palazzo Reale di Palermo e altri centri del potere nel Mediterraneo medievale*, forthcoming.
- Aurigemma 2010
 Maria Giulia Aurigemma, "Palinsesto Palatina: le arti, le trasformazioni, gli usi e i restauri da Federico II ai Savoia", in *La Cappella Palatina a Palermo = The Cappella Palatina in Palermo*, ed. Beat Brenk, F.C. Panini, Modena, 2010, pp. 203-272.
- Benjamin 1968
 Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction", in *Illuminations: Essays and reflections*, ed. Hannah Arendt, Harcourt and Brace & World, New York, 1968, pp. 217-252.
- Berthoz 2019
 Alain Berthoz, *Simplexity: Simplifying principles for a complex world*, Odile Jacob, Paris, 2019.
- Brenk 2010
 Beat Brenk, "L'importanza e la funzione della Cappella Palatina di Palermo nella storia dell'arte", in *La Cappella Palatina a Palermo = The Cappella Palatina in Palermo*, ed. Beat Brenk, F.C. Panini, Modena, 2010, pp. 27-78.
- Brenk 2014
 Beat Brenk, "Per la ricostruzione della parete settentrionale del presbiterio della Cappella Palatina a Palermo", in *Il potere dell'arte nel medioevo: Studi in onore di Mario D'Onofrio*, ed. Manuela Gianandrea, Francesco Gangemi, Carlo Costantini, Campisano editore and Campisano, Roma, 2014, pp. 181-192.
- Brunazzi/De Santis 2020
 Valeria Brunazzi and Tommaso De Santis, *Le segrete del Palazzo Reale di Palermo*, 40due, Palermo, 2020.
- Consolo/De Seta 1990
 Vincenzo Consolo and Cesare De Seta, *Sicilia teatro del mondo*, Nuova ERI, Roma, 1990.
- Ćurčić 1987
 Slobodan Ćurčić "Some Palatine Aspects of the Cappella Palatina in Palermo", in *Studies on Art and Archeology in Honor of Ernst Kitzinger on his Seventy-fifth Birthday*, ed. William Tronzo, Irving Lavin, Ernst Kitzinger, *Dumbarton Oaks Research Library and Collection*, Washington, D.C., 1987, pp. 125-144.
- Garstki 2017
 Kevin Garstki "Virtual Representation: the Production of 3D Digital Artifacts", *Journal of Archaeological Method and Theory*, vol. 24, (2017), pp. 726-750.
- Giarrusso/R. Longo 2018
 Renato Giarrusso and Ruggero Longo "Note sulla stratigrafia del sottosuolo del Palazzo Reale di Palermo", *Notiziario Archeologico Soprintendenza Palermo*, n. 36 (2018), URL: https://www2.regione.sicilia.it/beniculturali/dirbenicult/notiziarioarcheologicopalermo/36_Longo_Pal_Realebis.pdf.
- Jeffrey 2015
 Stuart Jeffrey "Challenging Heritage Visualisation: Beauty, Aura and Democratisation", *Open Archaeology*, vol. 1, (2015), pp. 144-152.
- Kant 1790
 Immanuel Kant, *Kritik der Urteilskraft*, Berlin/Libau, 1790.
- Kitzinger 1949
 Ernst Kitzinger, "The Mosaics of the Cappella Palatina in Palermo: An Essay on the Choice and Arrangement of Subjects", *Art Bulletin*, vol. 31/49, 4, (1949), pp. 269-292.
- Kitzinger 1992
 Ernst Kitzinger, *I mosaici del periodo normanno in Sicilia: 1: La Cappella Palatina di Palermo. I mosaici del presbiterio*, Accademia Nazionale di Scienze Lettere e Arti, Palermo, 1992.
- Knipp 2017
 David Knipp, *The Mosaics of the Norman Stanza in Palermo: A Study of Byzantine and Medieval Islamic Palace Decoration*, Peeters, Leuven, 2017.
- Korzybski 1933
 Alfred Korzybski, *Science and Sanity: An Introduction to non-Aristotelian Systems and General Semantics*, Science Press Printing Co/Science Press Printing Company, Lancaster, Pa., 1933.
- P. Longo 2011
 Piero Longo "The Royal Palace of Palermo: From the Phoenician-Punic Emporium to the Seat of the Sicilian Regional Assembly", in *Il Palazzo reale di Palermo*, ed. Maria Andaloro, ARS and Panini, Palermo and Modena, 2011, pp. 119-171.
- R. Longo 2011
 Ruggero Longo, "The Royal Palace of Palermo: The Medieval Palace", in *Il Palazzo reale di Palermo*, ed. Maria Andaloro, ARS and Panini, Palermo and Modena, 2011, pp. 51-117.
- R. Longo 2016
 Ruggero Longo, "In loco qui dicitur Galca': New Observations and Hypotheses on the Norman Palace in Palermo", *Journal of Transcultural Medieval Studies*, vol. 13, (2016), pp. 225-318.
- R. Longo/Giarrusso 2011
 Ruggero Longo and Renato Giarrusso, "L'impiego del palombino e del litotipo artificiale stracotto nell'opus sectile del Meridione normanno", in *Atti del XVI Colloquio dell'Associazione Italiana per lo Studio e la Conservazione del Mosaico*, ed. Claudia Angelelli, Ed. Scripta Manent 2011, pp. 315-328.
- R. Longo/Romagnoli 2018
 Ruggero Longo and Giuseppe Romagnoli, "Le 'Segrete' e la Chiesa Inferiore del Palazzo Reale di Palermo. Nuove osservazioni sulla stratigrafia degli alzati", in *Studi in memoria di Fabiola Ardizzone*, ed. Rosa Maria Bonacasa Carra, Emma Vitale, Fabiola Ardizzone Lo Bue, Antipodes, Palermo, 2018, pp. 207-228.
- Panofsky 1938
 Erwin Panofsky, "The History of Art as a Humanistic Discipline", in *The Meaning of the Humanities*, ed. Theodore Meyer Greene, Princeton, N.J. & London, 1938, pp. 89-118.
- Rabinowitz 2015
 Adam Rabinowitz "The Work of Archaeology in the Age of Digital Surrogacy", in *Visions of Substance: 3D Imaging in Mediterranean Archaeology*, ed. Brandon Richard Olson, William Rodney Caraher, Sebastian Heath, The Digital Press @ The University of North Dakota, [Grand Forks, N.D.], 2015, pp. 27-42.
- Rovelli 2020
 Carlo Rovelli, *Helgoland*, Mondolibri, Milano, 2020.
- Russell 1914
 Bertrand Russell, "Mysticism and

Logic", *Hibbert Journal*, vol. 12, (1914), pp. 780–803.

Schreibman/Papadopoulos 2019
Susan Schreibman and Costas
Papadopoulos "Textuality in 3D:
three-dimensional (re)constructions
as digital scholarly editions",
*International Journal of Digital
Humanities*, vol. 1, (2019), pp. 221–
233. Doi: [https://doi.org/10.1007/
s42803-019-00024-6](https://doi.org/10.1007/s42803-019-00024-6).

Valenti 1925
Francesco Valenti, "Il Palazzo Reale
di Palermo", *Bollettino d'arte del
Ministero della Pubblica Istruzione*,
vol. 11, (1925), pp. 512–528.
URL: [http://www.bollettinodarte.
beniculturali.it/opencms/export/
BollettinoArtelt/sito-BollettinoArtelt/
Contributi/Editoria/BollettinoArte/
Fascicoli/Fascicoli-Serie-II/
visualizza_asset.html_2085265731.
html](http://www.bollettinodarte.beniculturali.it/opencms/export/BollettinoArtelt/sito-BollettinoArtelt/Contributi/Editoria/BollettinoArte/Fascicoli/Fascicoli-Serie-II/visualizza_asset.html_2085265731.html).