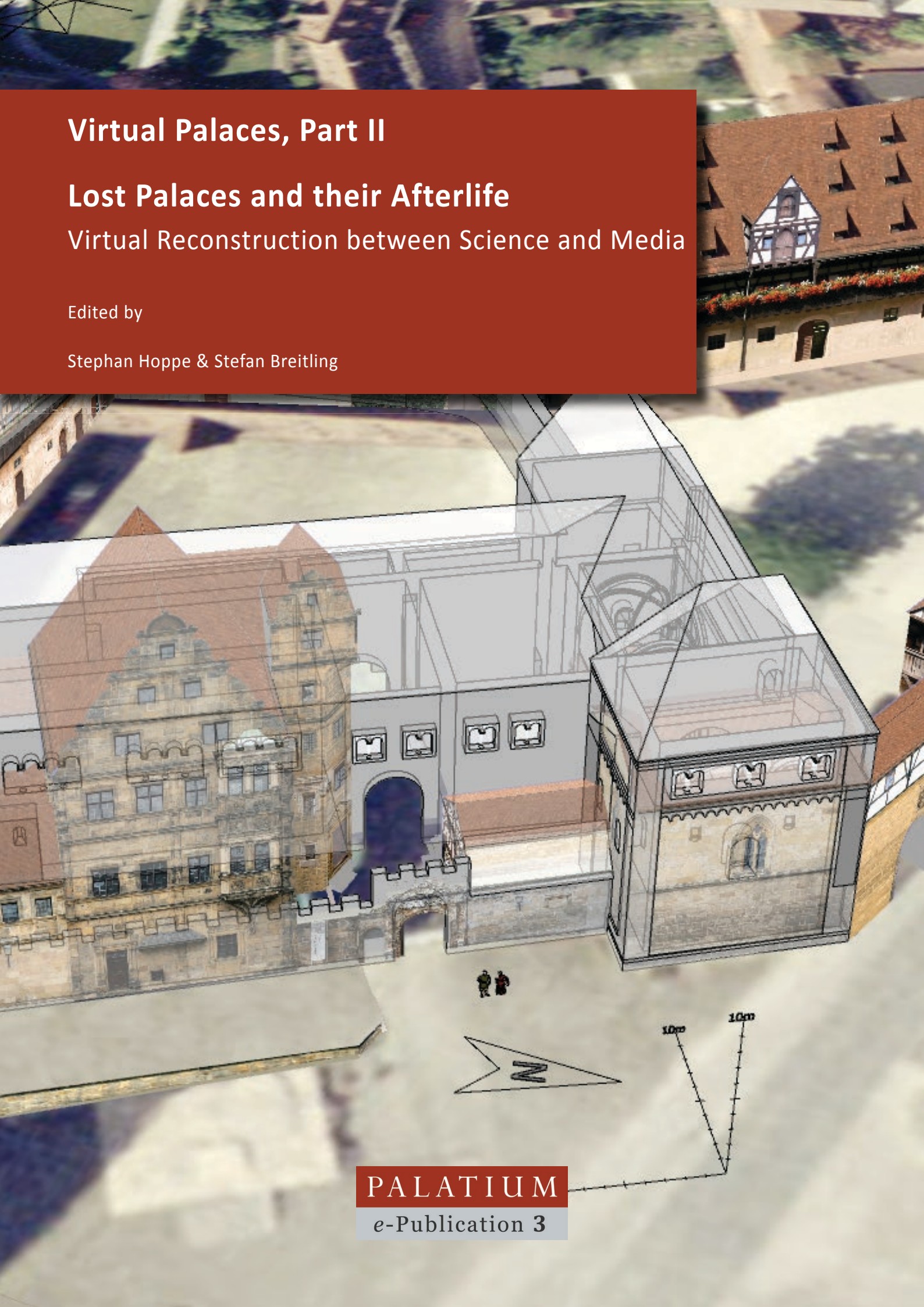
Virtual Palaces, Part II

Lost Palaces and their Afterlife

Virtual Reconstruction between Science and Media

Edited by

Stephan Hoppe & Stefan Breitling



PALATIUM

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With the assistance of
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Cover image: Bamberg, Alte Hofhaltung at around 1300. Overlay of the medieval palace with the photorealistic model of the surrounding area, as it is today. Breitling/Buba/Fuhrmann/Uni Bamberg 2012, building research by Burandt 1998, nowadays city model by Carlo Schramm, Stadtplanungsamt Bamberg 2012.

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Virtually Rebuilding the Palace of Vila Viçosa in Portugal

From the Present to the Time of D. Teodósio I (16th Century)

Ana Catarina G. Lopes (EAUM – Escola de Arquitectura da Universidade do Minho / CHAM – Centro de História de Além-Mar, Portugal)

Studying the Palace of Vila Viçosa (fig.1) as an element of Portuguese architectural history became essential to the FCT research project *De Todas as Partes do Mundo. O Património do 5.º Duque de Bragança, D. Teodósio I / All his Wordly Possessions. The Inventory of the 5th Duque of Bragança, D. Teodósio I*.[1] Since the beginning of the project, the research team has been working on an inventory of extraordinary value, revealing the goods, the cultural and intellectual interests of an important aristocrat of the 16th century, D. Teodósio, describing in detail and giving us a rare and amazing view of the material world of a prince of the Portuguese Renaissance. The *Duque* was from one of the most powerful families of his time. His father, D. Jaime (who was nephew of the king D. Manuel), ordered the construction of a palace in 1501 in southern Portugal to mark the land that the king had offered him. I began collaborating with the research team in order to virtually reconstruct the Palace of Vila Viçosa and its surroundings, in the time of D. Teodósio I (the first half of the 16th century).

Fig. 1 Palace of Vila Viçosa, Évora, Portugal (2012).

The Major Aims of the Ongoing Work Framed in the Workshop *Virtual Palaces II*

As an architect and a teacher in the field of the history of Portuguese architecture, the interest for the study of architectural heritage has aroused in me a special interest in virtually designing and reconstructing architectural structures as material to be deeply analysed, thus producing know-ledge, especially in its interaction with the territory and the cultural contexts that produced historical monuments. The idea of participating in an interdisciplinary forum to discuss the contribution of virtual reconstructions and its various methods was something I found of extreme interest. It allowed for obtaining a greater insight into architectonic structures and their physical space, rhetoric representations and how to better inform the scientific community on the investigations' results.

D. Teodósio was responsible for the renewal and extension of his family's residence, turning it into a palace that followed the most erudite Italian models – a clear demonstration of his adherence to what was most advanced in European architecture of that time. Several changes have been made to the palatial spaces until the present day, but with the documentation under study and through an interpretation of the existing building, we believe one can virtually rebuild its architecture in a unique approach to the history of this ducal house.

The short communication I was able to do[2] wished to report on how we were developing this work, sharing the possible methods I have been using and comparing them with some case studies that I have been analysing, framing the study of the Palace of Vila Viçosa (from the present to the first half of 16th century). The work aimed to include the registration of all the metric and geometric information – architectural and topographical surveys, counting with photogrammetry. We have always considered the architectural survey a fundamental tool to proceed with rigorous studies of the historical structure. It is fundamental to acquire it, as it allows to test, clarify the types, forms, functions and geometries of this complex, allowing to launch interpretations related to the artistic domain and functional programme, as well as the evaluation of the possible impact of different construction phases.

At the time of the meeting in Munich, the research project was already underway for some time, but the architectural work of virtual reconstitution was really just starting and already had several process changes. The short presentation became an opportunity to report how we intended to develop the work. And for that it was important to reflect briefly about one or two examples of other case studies we have carried out. Its results have been quite satisfying and, therefore, we wanted to apply the same methodology to study the Palace of Vila Viçosa.

Other Case Studies

Working as a research assistant at the *Centro de História de Além-Mar (CHAM)* has allowed me to be part of some research projects about castles and military settlements built in the first half of the 16th century by the Portuguese overseas, particularly in Morocco (figs. 2-4). The drawings and three-dimensional representations reproduced results of architectural and topographical surveys, including photogrammetry. The works always begin with the registration of all the metric and geometric information of the architectural remains. Sometimes we resort to the use of technology, on other occasions we work with the support of more traditional methods, usually adapting the best tool to each situation. At each time of the fieldwork it is necessary to decide what information is essential and what is detrimental to capture the formal features of the architectonic object we wish to comprehend. The architectural survey is fundamental to proceed with rigorous studies of the historical structure, but sometimes it is hard to decide where to exactly point out the laser to accurately locate and measure damaged structures. At other times, it is impossible to reach the entire spaces with the topography equipment or it simply becomes easier to do some manual measurements, using a triangulation method overlapping some points topographically calculated as a common axis vector. AutoCAD is the software I use to work out the metric and rigorous data as vector information of the current state of the building, with all its formal characteristics. The collected material is then processed and produced in 2D and 3D reconstructions in terms of seeking interpretations and studies produced on the architectural work. It is always possible to go back and remake these drawings and handle their representativeness. After this, I export the data to another program – SkechUP, that greatly simplifies choosing views, imposing shadows caused by simulated sunlight and deciding the graphical representation. As a final treatment of the images produced, we use Photoshop and Illustrator. We never seek realistic representations, but we prefer to create virtual models that can be updated at any moment.

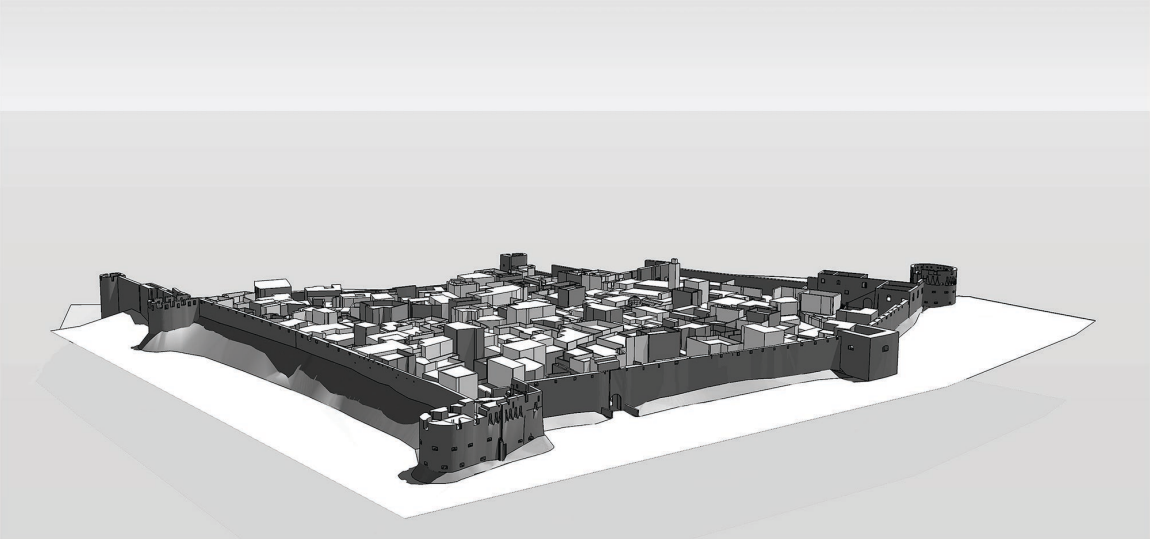

Fig. 2 Three-dimensional reconstruction of the Portuguese military settlement and urban occupation in Azemmour, Morocco, 2009.

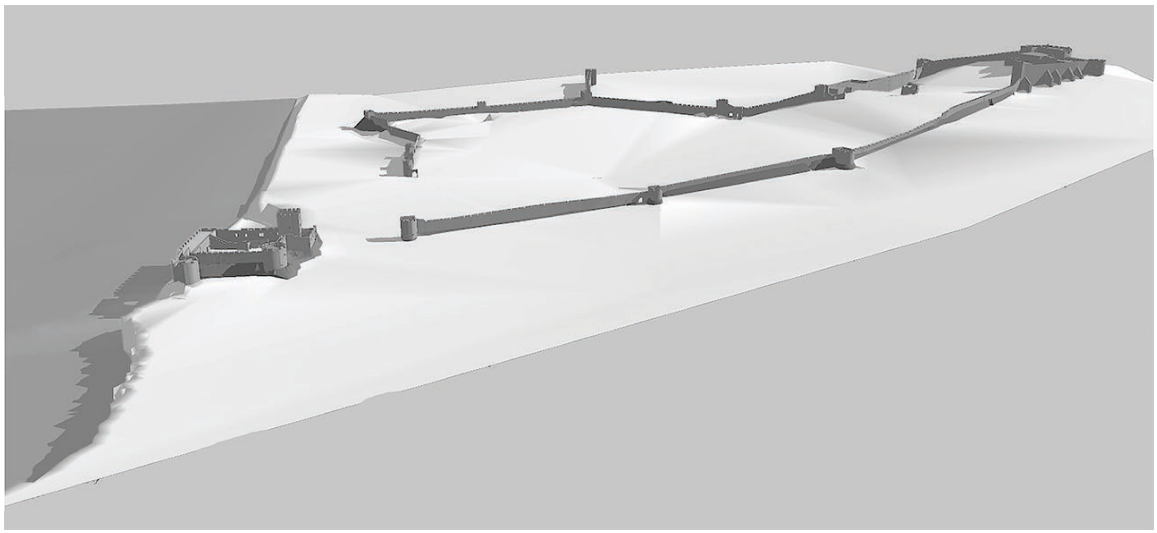

Fig. 3 Three-dimensional reconstruction of the Portuguese military settlement in Safi, Morocco, 2010.

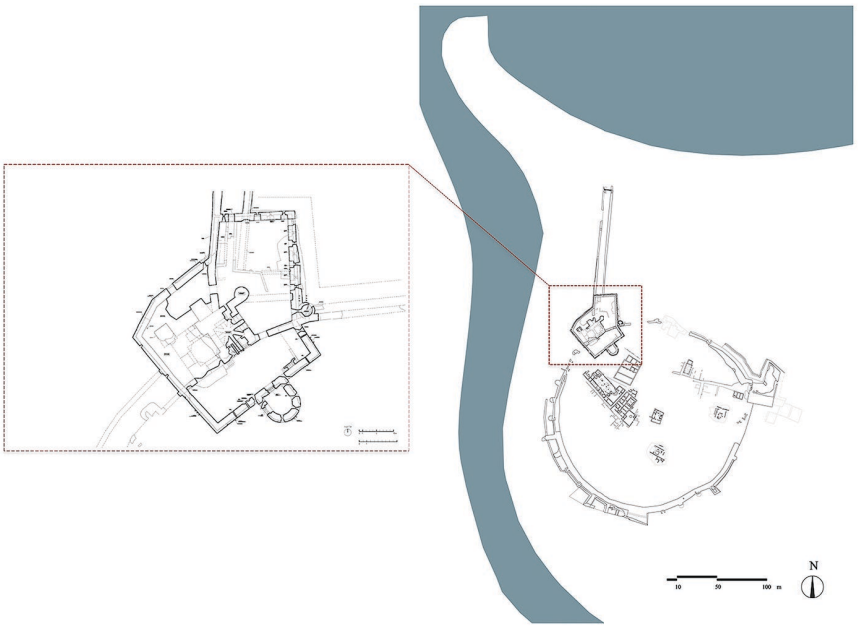

Fig. 4 Plan of the Portuguese military settlement in Ksar – Seghir, Morocco (survey of the remaining ruins) and close up of the citadel's plan, 2011.

These are the fundamental tools that permit us to test and clarify the geometries of the elements under study, allowing launching interpretations related to the artistic domain and functional programme, as well as the evaluation of the possible impact of different construction phases.

Some of this work is also important as testimony of built heritage, which sometimes is on the brink of disappearing. This is the case of the *Château de Mer* in Safi, which is about to be destroyed by the sea. In Azemmour, the urban and architectonic studies have defined the best sites for archaeologists to carry out their excavations. With their findings, we made some virtual reconstructions of structures that disappeared with time (fig. 5). As an architect, my vision will always be more focused on issues like metrics, ratios, geometry, materials and construction systems. Collaborating with other professionals, particularly with surveyors, archaeologists and art historians has shown me that the crossing of several disciplines can produce the real (re)creation of knowledge for the reconstruction of architectural spaces and life styles of the cultural heritage.

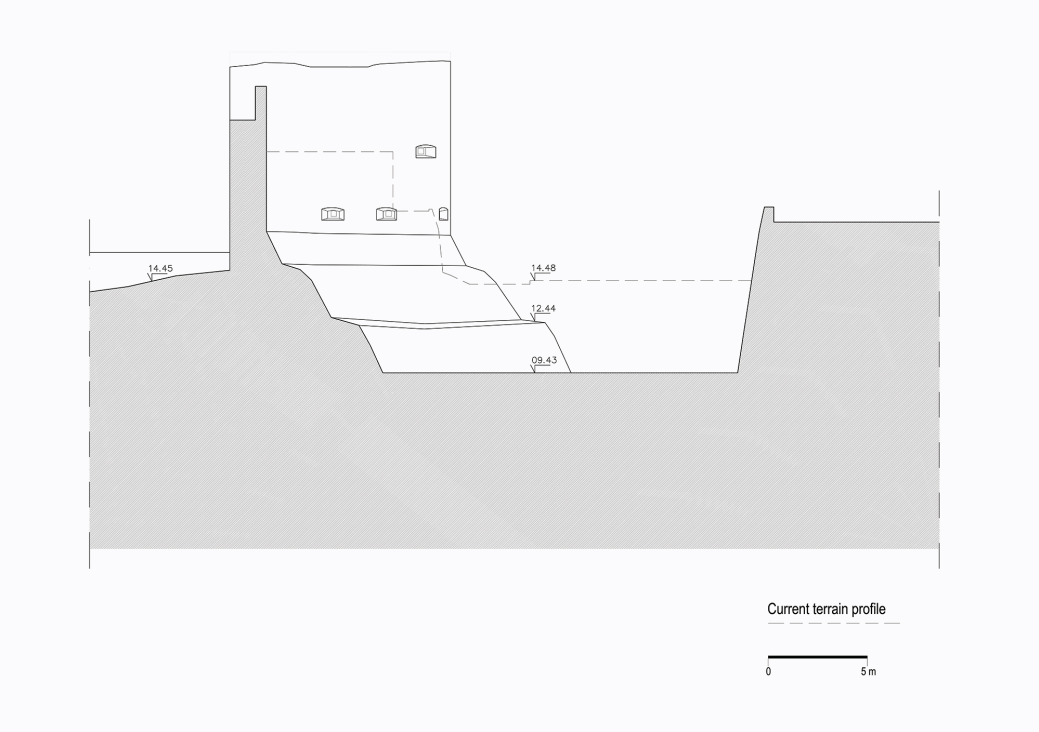

Fig. 5 Reconstitution of the bulwark excavated by the archaeologists recovering the moat section, Azemmour, Morocco, 2009.

I studied proportions, ways of building, tested the knowledge of the Portuguese builders concerning the treatises of their time and verified if the workmen complied with the orders of the King that have been interpreted by historians. The analysis of the data obtained allowed us to identify some interesting mathematic rules and geometries used by the constructors, understanding their architectural solutions to the challenges they had. It was also possible to overlay the three-dimensional reconstructions with coeval iconography to check the accuracy between representation and reality. This joint work enabled an improved understanding of its continuous overlaps and multiplied conceptual elements that were introduced over time, so we could better read its architecture and virtually rebuild it in its original form.

Studying the Palace of Vila Viçosa

We planned to do the same kind of work and subsequent research on the Palace in question. Today, the palace serves as a museum and belongs to a foundation established in the early 20th century: the *Fundação Casa de Bragança,* with which we had to establish some protocols. Our study focuses on the structures that constitute the ground floor and the noble floor, as it is known that the third level is the result of a more recent construction campaign. But these are the main floors of the museum, which is open almost every day of the week and weekend and receives a huge number of visitors. This could hinder the progress of measurement, drawing and observation fieldworks, and all this made it necessary to coordinate things between us and the staff and officials of the palace.

We started studying the palace as it is nowadays, starting from a few architectural drawings that report its physical status over time, going back to 1845. Together with the meager historical information, we were just learning a little more about the building history, crossing information with the rest of the research team, recognizing the physical changes that its architecture suffered with the continuous periods of construction.

We already had a strategy and a timetable for the survey work, when we were informed that there was no authorization to develop this kind of effort, because it could jeopardize the safety of the museum and its exhibits. Thus, we decided to develop an alternative approach – we would have to use the existing drawings to compare different stages of the building's existence. But we soon realized that those plans were not truly realistic and perhaps, we could be compromised to achieve accurate results of architectural historiography. We wanted to recognize and draw the functional distribution of the Palace and for that it will be very important to cross the possible analysis of those drawings with the documents that the inventory of D. Teodósio includes (such as letters, account books, descriptions of preparations for family weddings and their festivities taking place in the residence and even records of building work and its payments, including measurements of what was executed).

Moreover, there was still no graphical database for us for working on the virtual models. We decided to draw over the most recent plans, line by line, to have a basis to work on (figs. 6-7). Having done this, we asked for permission to walk through the Palace, only to make notes on our drawings about some of the interior walls and even some ceilings and doors that have been changing until the last few years. We also requested to register only a few measurements just to serve as a comparison with our projections. This appeal was accepted, and we visited Vila Viçosa for this fieldwork. At that time we already had the plans that resulted from combining information from the different existing drawings. The outcome of the overlapping between floors had an evident failure, once almost neither of the main walls had a structural overlay (fig. 8). We were dealing with a large degree of uncertainty and definitely would have different results than we expected to obtain with our usual process doing archaeology of the architecture. The ancient plans

we had access to are ideal representations of the Palace, with too many orthogonal angles – a constructive stiffness that we know is not usual in these buildings. And drawing over some scans brings several irregularities of perception. One can read the spatial relationships, but not the built reality. With this outcome, and because it was really a waste of opportunity to develop such a study without being able to make a proper architectural survey in a building that still exists, we got back to having the authorization to carry out the work as we had envisioned originally.

Fig. 6 Drawing of the ground floor of the Palace of Vila Viçosa, obtained by vectorization of overlapped scans of the existing plans (2012).

Fig. 7 Drawing of the noble floor of the Palace of Vila Viçosa, obtained by vectorization of overlapped scans of the existing plans (2012).

Fig. 8 Superimposition of the two plans under study (2012).

Observing some of the areas of that courtly architecture gave several hints that required us to update our information. We had already detected some clues that we wanted to confirm and it is surely more appropriate to obtain a deeper knowledge of the Palace prior to the survey. We are used to detecting different wall thicknesses or to look at the different types of cutouts of doors and windows with its construction details and thus realize the architectonic fractures and continuities, so it is very important to deeply know every detail of the building. Another way to search for the original Palace structure is by looking at some of the ceilings that are now interrupted and reconstituting those spaces, or trying to fit the tile panels from the time of D. Teodósio that are now being recovered – in its overall composition they should fit up with some of the main rooms.

With this kind of analysis of empirical surveillance, at the time of this communication it was already possible to propose a possible development of the palace over time. It was a primary projection, only reporting a possible volumetric evolution. We still have so much to learn, mainly concerning what D. Teodósio had to deal with when he decided to increase his family's residence and how he imposed an advanced form of architecture in a preexisting structure.

The Continuous Research

At this time, we have concluded the survey work but the investigation is ongoing. We continue to discuss the issues regarding the communication of the architectural research so that the Palace can be perceived not only by specialists in this fieldwork. It is important that this knowledge can be shared with the whole public.

We are looking for a virtual model that fits specifically in giving a physical and architectural context to the existence of the 6303 objects surveyed over 637 folios. The 3D models and plans that reconstruct the architectural spaces change our view about the past, both as researchers and as citizens. They also make it possible to be continuously questioning interpretative options, and redefining architectural hypothesis. There is an awareness of the fact that these virtual reconstructions change the standard tools used in teaching and learning about art and architectural history. They allow people to earn a visual consciousness that becomes more attractive and coherent than the interpretative variations that literature allows. It is clear for the researchers of the *D. Teodósio* research project that the purpose of these models should be to recover the measures, spaces, and architectural language of buildings (palaces, in this case), helping to reflect on the construction processes and materials that were applied, and clarifying their different stages of existence. Digital reconstructions are increasingly becoming one of the key resources of the research teams in the field of art and architectural history. One can say that, despite the advanced technology that already exists, in this kind of researches this is something that is still maturing. Renderings and movies demonstrate certain capabilities that are now being adopted and that make it inevitable to take up these tools as a part of its growing development.

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Illustrations

Fig. 1 Ana Lopes (author's photo), Palace of Vila Viçosa, Vila Viçosa, Portugal.

Fig. 2 Ana Lopes, Three-dimensional reconstruction of the Portuguese military settlement in Safi, done under the research project 'Portugal and southern Morocco: Contacts and Clashes between the XV and XVIII' [FCT PTDC/HAH/71027/2006], Morocco, 2010.

Fig. 3 Ana Lopes, Three-dimensional reconstruction of the Portuguese military settlement and urban occupation in Azemmour, done under the research project 'Portugal and southern Morocco: Contacts and Clashes between the XV and XVIII' [FCT PTDC/HAH/71027/2006], Morocco, 2009.

Fig. 4 Ana Lopes, Plan of the Portuguese military settlement in Ksar—Seghir (remaining ruins' survey) and zoom of the citadel's plan, done under the research project 'Cities and architectures of Portuguese origin in northern Morocco: Asilah and Alcacer Ceguer' [FCT / CNRST], Morocco, 2011.

Fig. 5 Ana Lopes, Drawing reconstitution of the bulwark excavated by the archaeologists recovering the moat section of the Portuguese castle in Azemmour, done under the research project 'Portugal and southern Morocco: Contacts and Clashes between the XV and XVIII' [FCT PTDC/HAH/71027/2006], Morocco, 2009.

Fig. 6 Ana Lopes and Nuno Senos, Drawing of the ground floor of the Palace of Vila Viçosa, obtained by vectorization of overlapped scans of the existing plans, done under the project 'All His Worldly Possessions. The patrimony of the 5th Duke of Bragança, *D. Teodósio I',* [PTDC/EAT-HAT/098461/2008], Portugal, 2012.

Fig. 7 Ana Lopes and Nuno Senos, Drawing of the noble floor of the Palace of Vila Viçosa, obtained by vectorization of overlapped scans of the existing plans, done under the project 'All

His Worldly Possessions. The patrimony of the 5th Duke of Bragança, *D. Teodósio I',* [PTDC/EAT-HAT/098461/2008], Vila Viçosa, Portugal, 2012.

Fig. 8 Ana Lopes and Nuno Senos, Drawing superimposing the two plans of the Palace under study, done under the project 'All His Worldly Possessions. The patrimony of the 5th Duke of Bragança, *D. Teodósio I',* [PTDC/EAT-HAT/098461/2008], Vila Viçosa, Portugal, 2012.

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[1] The paper here presented concerns the first phase of works that I have been developing as a member of the research team of the project 'All His Worldly Possessions. The patrimony of the 5th Duke of Bragança, *D. Teodósio I'*, Centre of Overseas History (CHAM), *Faculdade das Ciências Sociais e Humanas*, *Universidade Nova de Lisboa* and the *Universidade dos Açores*, in collaboration with the Foundation of the House of Braganza (FCB), and financed by the *Fundação para a Ciência e Tecnologia* [PTDC/EAT-HAT/098461/2008]. The project is directed by Jessica Hallett (coord.), Nuno Senos (CHAM) and Maria de Jesus Monge (FCB).

[2] The accepted submission I made to the European Scientific Foundation, for a short visit grant, made it possible for me to attend the workshop *Virtual Palaces, Part II*.