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SCIentific RESearch and Information Technology
Ricerca Scientifica e Tecnologie dell'Informazione
Vol 7, Issue 2 (2017), 103-114
e-ISSN 2239-4303, DOI 10.2423/i22394303v7n2p103

THE THIRD DIMENSION OF PLINY THE YOUNGER'S VILLA AT LAURENTUM IN S. K. POTOCKI'S VISION

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Abstract

The Villa Laurentina project seeks to present Count S. K. Potocki's brilliant vision of the legendary villa of Pliny the Younger at Laurentum near Rome, first rendered in the 1770s in over thirty colour drawings. This unique work, amazing in its formal and stylistic homogeneity, was produced in Rome, in collaboration with two Italian artists – Giuseppe Manocchi and Vincenzo Brenna – and probably Franciszek Smuglewicz, a Polish painter active in Rome. All the architectural plans, sections of façades and walls of the rooms are provided with scale bars in palmi romani and braccia polacche. The first stage of the project was to transfer the eighteenth-century drawings on to programs used in architectural planning studios. For this purpose, scans of the plates were transferred to a CAD programme, which enabled the plan traces, sections and renditions of the walls to be made. Historical systems of measurement were calculated according to the metric system.

Keywords

Art, architecture, archaeology, 3D, Rome, antiquity, enlightenment

The present text is composed of three sections. The first two are a kind of introduction to the issues in the research on iconographic sources to Count Potocki's (Fig. 1) conception – a conception which can be seen as the first attempt to provide a "modern visualisation" of a monument of the ancient world to be made in the later half of the eighteenth century. Methods adopted by the eighteenth-century scholar are here brought together with the modern forms of visualisation: digital design and 3D rendering. The later section of this this text is a visual guide of the *„Making of..."* type, in which step-by-step we shall describe the method of researching historical architectural designs that we proposed.

1. *Towards the "visualised" Antiquity*

When in the late 1770's Count Stanisław Kostka Potocki was beginning his research on the reconstruction of Pliny the Younger's favourite seaside villa at Laurentum (Fig. 2), history of ancient art and archaeology were only nascent as fields of modern science. Amateur attempts at researching Antiquity by methods nearly unchanged since the times of the Renaissance humanism were gradually replaced with archaeological excavations conducted in the spirit of the Enlightenment and on the emergent scientific basis (Fig. 3). Making precise ground plans of ancient edifices, unearthing murals in the Etruscan tombs or discovering the ruins of Roman or Greek architecture during their continuous journeys and expeditions, were fascinating intellectual adventures of members of the European élite. With the development of modern sciences, modern archaeological research methods gradually took shape, including the emphasis on a meticulous, exhaustive *in situ* analysis of the finds, and museum institutions intended to acquire and protect works of ancient art were established. Simultaneously, various monographic and analytic texts were written, and outstanding antiquarians, such as Count de Caylus or Johann Joachim Winckelmann, with Count Potocki following in his footsteps, attempted to methodise and interpret anew the established and hitherto unquestioningly accepted vision of the history of ancient art[1].

[1] Apart from various textbooks and scattered works on this topic, the following publications should be mentioned: *Roma e l'Antico* (2010); *Il Settecento a Roma* exhibition catalogue with the article Liverani and Picozzi (2005); *Archives & Excavations* (2004); Schnapp (2002); *Fascination de l'Antique* exhibition catalogue (1998). See also Schnapp (1993); Raspi Serra (1993).

Fig. 1: J. L. David, *Portrait of Count S. K. Potocki*, oil on canvas, 1781, Museum of King Jan III's Palace at Wilanów (Warsaw)

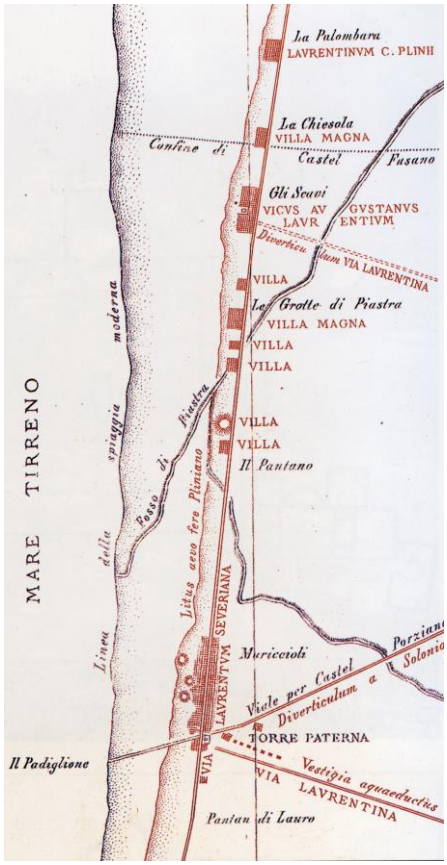

Fig. 2: Map of the vicinity of Laurentum, from Lanciani (1903)

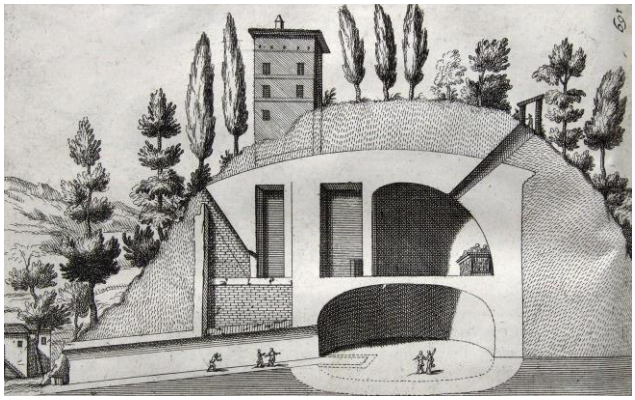

Fig. 3: An antique tomb, engraving, from: Ficoroni (1744)

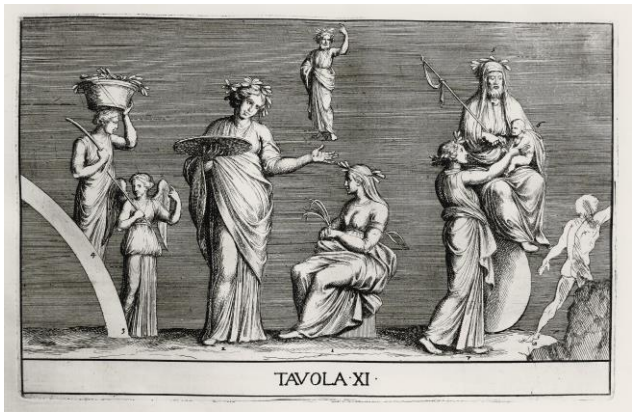

Fig. 4: Pietro Sante Bartoli, *Plate XI* (wallpainting in Domus Aurea), from: Bartoli (1706)

Fig. 5: *Mars*, engraving in: Montfaucon (1719), t. 1, suppl. 1

The growing popularity of research on Antiquity, and the newly-arisen desire to achieve its synthesis, went hand in hand with new ideas of how to present research results. Since the seventeenth century, making documentation drawings of the objects and monuments excavated at the increasingly numerous sites, and copying ancient murals were gradually becoming almost-universally established practices[2]. Works of the antiquarian and engraver Pietro Sante Bartoli with the commentary by Gianpietro Bellori[3] (Fig. 4), or the richly illustrated lexicon of ancient art by Bernard de Montfaucon[4] (Fig. 5) can be quoted as outstanding examples of this modern attitude to research and dissemination of newly discovered archaeological finds. In this period of well-developed Empiricism, the final effect of an antiquarian-archaeologist's work is often a publication in which there are more large-scale illustrations than pages with printed word. The Antiquity "described" and "philological", hermetic and inaccessible to the wider public, was being gradually superseded by the Antiquity "visualised", observed empirically through archaeological research. From then on, scientific texts were invariably accompanied by the *image*, which constituted an *argument* in the scientific discourse equally valid and important as a reference to an ancient author used to be before. An illustration became a proof, a substantiation of an argument, the better and more convincing the more precisely it rendered the appearance of its original[5].

At the same time, to cater to the needs of foreign travellers viewing the monuments of Rome, thousands of drawings in sanguine, separate prints and *folio* albums were made, so that the Grand Tour – the wonderful journey to the sources of the European values and to the roots of its civilisation – could be in a sense continued upon return to the cold residences of England, Saxony or the Commonwealth of Poland. The continually improved methods of engraving and printing permitted to mass produce prints of increasingly better quality, increasingly more faithfully rendering the beauty of masterpieces of ancient sculpture or painting. It was in the Eternal City, the centre of the most rapid development of graphic techniques, that the harbingers of the era of colour illustration appeared first. Years and years after the death of the most esteemed Pietro Sante Bartoli, his son Francesco with an assistant Gaetano Piccini made their living in a workshop where prints of the Roman monuments and other views were made still according to Pietro's designs and then coloured with watercolours[6]. In 1757 in Naples, the Herculanean Academy established by Charles III Bourbon began editing and printing the first volumes of the monumental *Le Antichità di Ercolano Esposte*, a work which was to number forty volumes of scientific documentation of objects unearthed in the first years of excavations in the "Vesuvius towns": Pompeii, Herculaneum and Stabiae[7]. A selection of paintings excavated at that time was later published in the watercoloured version [8] by the Roman publisher Ludovico Mirri. In a monograph *Recueil de Peintures Antiques, imitées fidelement, pour les couleurs…*, de Caylus, an outstanding French antiquarian, brought out the colour version of Bartoli's drawings in Paris. In this case, a specially-prepared engraved sketch of a fine contour was only a basis for a hand-painted watercolour. Interest in publications of this type was so great that in 1783, after de Caylus's death, the book was reprinted, enlarged by twenty coloured prints by Marco Carloni presenting

[2] In the first half of the 17th century, the Roman antiquarian and collector Cassiano dal Pozzo was a pioneer of a scientific approach to research on Antiquity. His *Museo Cartaceo* (Paper Museum) – a monumental collection of drawings and prints pertaining to natural history and monuments of the ancient world – constitutes the earliest manifestation of this approach. Artists employed by dal Pozzo executed hundreds of exceptionally detailed colour drawings of sculptures and copies of murals and mosaics. This unusual compendium contained c. 7000 objects; although never published, it was used, with the permission of the owner, by contemporary scholars; see Whitehouse (2001).

[3] E.g. Bartoli (1693, 1697, 1706). On the popularity of copies of ancient murals engraved by P. S. Bartoli, see also Pinot de Villechénon (1990).

[4] De Montfaucon (1719).

[5] On this topic, see Burke (2003), pp. 277-280.

[6] In 1724, the biographer Nicola Pio wrote rather sarcastically of his activities: "[…] Francesco Bartoli antiquarian and draughtsman […]. He inherited some aptitude for drawing, engraving and painting from Giovanni Santi Batoli (sic!) his father, under whose guidance he much benefited, as that one was a great master. But when his father and master had died, all that remains to him is the occupation of an antiquarian […]. Now he is copying various antiquities from engravings, which he afterwards puts together anew and colours, naming them according to his own whim and selling them to foreigners saying that they have been found somewhere in the ruins of ancient Rome" (Pio, 1977, p. 37).

[7] See Ciardiello (2013) and *Bajo la cólera del Vesubio* exhibition catalogue (2004).

[8] Pinot de Villechenon (2000).

murals discovered in the Villa Pallavicini Rospigliosi at the Quirinal[9]. Giovanni Volpato used a similar technique in 1772-1776 when he published copies of Raphael's frescoes in the Vatican *Loggias*; a decade later he improved it in the mass-produced series of Roman cityscapes[10] (Fig. 6) made in cooperation with Louis Ducros. From 1776 onward, the antique dealer, antiquarian and visionary publisher Ludovico Mirri was printing two versions, a black-and-white and a colour one, of the exclusive album *Vestigia delle Terme di Tito e loro interne pitture…*, containing copies of murals discovered in Nero's Domus Aurea during the excavations which he financed and which were conducted under the supervision of Vincenzo Brenna (Fig. 7)[11]. This album, with its sixty exceptionally meticulously coloured plates, was certainly an editorial milestone and for a long time set out the direction for the development of the genre. Never before had a monument of ancient Rome received such a perfectly prepared monograph. In keeping with the spirit of the age, the image, faithful rendering and precise representation of the monument played the main rôle in the album[12].

Authors of the drawings for this album, Franciszek Smuglewicz and Vincenzo Brenna, grew instantly famous; it was certainly this fame that prompted Count Potocki to employ at least one of those draughtsmen as his assistant. Smuglewicz's participation in the famous excavation and documentation works contracted by José Nicolàs de Azara at Villa Negroni in 1777 remains debatable (Fig. 8)[13]. In 1777 or 1778 Stanisław Kostka Potocki probably visited the site of Sigismond Chigi's ongoing excavations on the grounds of Baron del Nero's estate in Porcigliano (Castel Porziano; today the grounds of the presidential villa) on the lands of an imperial residence (Tor Paterno). He also visited the ruins of another Roman villa, the so-called Villa Palombara, which were partially unearthed in 1713 and which were then thought to be the remnants of Pliny the Younger's seaside villa. It was probably there that the idea to prepare its first-ever full paper reconstruction took shape[14].

Participating in the antiquarian and artistic *milieu* of the Eternal City, Potocki for the first time encountered the new, "visual" approach to Antiquity and soon rejected the old-fashioned models of reconstructing Roman architecture; models which, still in keeping with the spirit of the Baroque, ignored archaeological finds almost entirely. By that time, gathering appropriate iconographic materials for the project – a project which, as has been demonstrated, fitted totally into the phenomenon of the „Antiquity-mania" of the 1770's – must have been not at all difficult.

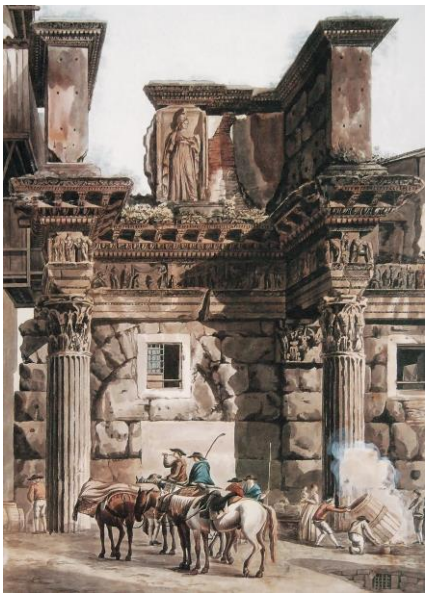

Fig. 6: Giovanni Volpato, Abraham Ducros, *„Colonnacce" Forum of Nerva*, c. 1780, engraving, private collection

[9] The excavations were conducted in 1709 on the site of a house from the 1st c. AD thought to have been the remnants of the Baths of Constantine. On this topic, see Connor Bulman (1999), p. 205.

[10] See *Volpato* (1988) and *Ducros* (1987), pp. 23-25.

[11] The influence of this publication on Potocki's conception was first emphasised by Prof. Stanisław Lorentz (Lorentz 1946). On Mirri's publication itself, see, among others, Pinot de Villechenon (2002), Pasierb and Janocha (1999), pp. 232-250 and Meyboom and Moormann (2013). See also Miziołek (2010, 2011).

[12] Even before *Vestigia delle terme di Tito…* was published, the Roman press reported from the public exhibition of Brenna's drawings: "[…] Next, one went during the day into a separate place more suited to viewing the copies of those paintings, which consist of numerous trace drawings coloured by the said Mr. Vincenzo Brenna. Copied with the greatest fidelity and precision, they aroused much admiration when they were compared with the Originals. For this very reason the said Mr. Mirri will bring out all those paintings in the form of prints, in such colours as they possess in the Original and in the Drawings" ("Diario Ordinario" of April 22, 1775, no. 32, pp. 17-18).

[13] On the excavations in the Villa Negroni-Montalto and the publications of murals there discovered (Buti 1778), see Joyce (1983), Paris (1996) and Culatti (2009).

[14] This issue still requires thorough study. On Sigismond Chigi's excavations in Castel Porziano, see Liverani and Picozzi (2005), p. 107. On excavations in Castel Fusano, see Ramieri (1995) and Buonauguro, Camardo and Saviane (2012), pp. 65-85.

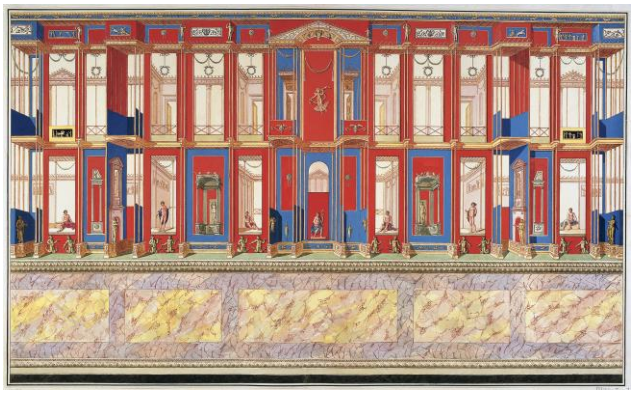

Fig. 7: Marco Carloni, after Franciszek Smuglewicz and Vincenzo Brenna, *Wall decoration in the Domus Aurea*, from: Mirri (1776), The National Museum, Warsaw

Fig. 8: Pietro Maria Vitali, after Anton von Maron (Franciszek Smuglewicz?), *Bachus and Ariadna*, coloured engraving of fresco from theVilla Negroni, Rome, in: Buti (1778), British School at Rome

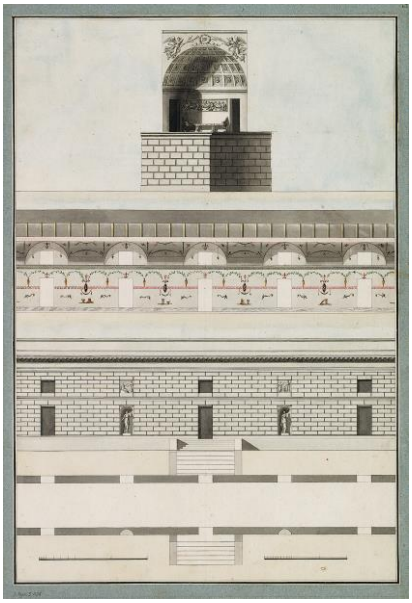

Fig. 9: S. K. Potocki and V. Brenna, *Heliocaminus of the Villa Laurentina*, plan, elevation and cross section of the cryptoportico, 1777/1778, National Library, Warsaw

Fig. 10: The Villa Laurentina and its heliocaminus as seen by Count S. K. Potocki and his collaborators, 3D visualisation, 2007/2014

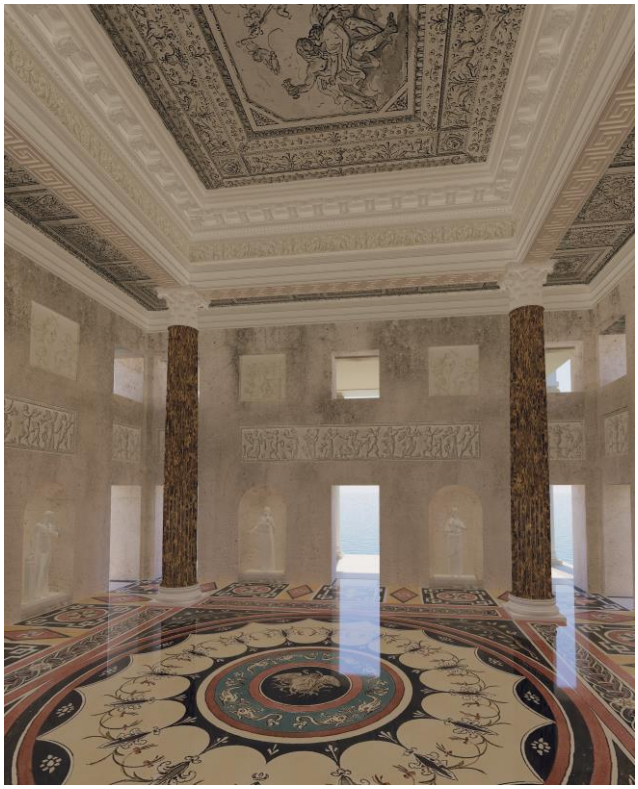

Fig. 11: The main triclinium of the Villa Laurentina as seen by Count S. K. Potocki and his collaborators, 3D visualisation, 2007/2014

2. *Laurentina in the era of digital technologies*

Among new horizons opened to us by the digital era, the 3D technology seems to be one of the most adaptable and useful, developing a whole range of tools and applications which constitute an immense advance in practically all areas of existence[15]. Gradual increase in the computers' processing power offers new possibilities also to the Humanities, which is no longer limited to make use of purely traditional research methods. A perfect case in point is the application of 3D modelling in archaeology, both on the level of documentation and of popularisation of research results, as well as in reconstructions. Methods applied in archaeological visualisations can be successfully used in research of ancient monuments of a more complicated character. A 3D visualisation of the imaginary garden described by Francesco Colonna in the fantastic story *Hypnerotomachia Poliphilii*[16], published in 1499 in Venice, was an interesting endeavour of this kind. In the first half of the sixteenth century, the description of this garden and prints which visualised it became a point of reference for many Renaissance architects and designers. In 2002, the Franco Maria Ricci publishers brought out an album of views showing places and objects in virtually reconstructed world, which very closely followed the original sixteenth-century prints[17]. The popularity of publications of this kind, applying 3D visualisations in researching various phenomena in the Humanities in the broadest sense, has been growing steadily. The research project entitled *3D-Bridge – transferring of cultural heritage with new technology*[18], conducted jointly by several centres of science in Europe, is an example of a similar undertaking. Its aim was to prepare tools and applications based on the 3D technology which would make it possible to "translate" monuments of the European cultural heritage into the language of visual communication which will be used by future generations. The team led by Professor Elisabeth Kieven (Biblioteca Hertziana in Rome) has built a 3D model of the "villa palace for three illustrious persons"[19] designed by Filippo Juvarra for the Clementine Contest in 1705[20]. The effect of their effort is a 3D model based on the mechanism of a FPP (First Person Perspective) computer game, which enables the viewer to roam freely around the interior of an edifice which in the real world has never been built. The exhibition *Roma Barocca: Bernini, Borromini, Pietro da Cortona*[21], held at the Castel Sant'Angelo in Rome, was an equally interesting event, in which great emphasis was attached to those architectural designs by the great masters of Roman Baroque which had never been carried through. Huge wooden models were made on the basis of extant drawings, making it possible to visualise in three dimensions edifices which hitherto had been known only from drawings, and only to a narrow group of specialists. At the exhibition *La Roma di Piranesi* at Museo del Corso, in turn, presented was the 3D visualisation of Giovanni Battista Piranesi's never-executed design of remodelling the apse of the St. John in the Lateran basilica[22]. The recent exhibitions devoted to the Domus Aurea, the frescoes in the Santa Maria Antiqua church at Forum Romanum and the Mercati di Traiano have brought truly astonishing results in the application of 3D technologies in the field of archaeology and art history[23]. It seems that research of this kind has already yielded some interesting results and will certainly be bringing still more in the future.

The paper reconstruction of Pliny the Younger's villa at Laurentum was, without doubt, an undertaking of a similar nature. Thirty-two colour sheets constitute an almost complete architectural design, both of the villa itself and of its surrounding garden, located in a still-wider spatial environment. The designs, provided with two measurement scales and containing numerous cross-sections of the building's body and particular rooms, enabled us to carry out the vision of the Enlightenment scholar on a virtual building site. Those thirty-two drawings seen separately constitute, above all, a first quality work of art and a reflection of the late eighteenth-

[15] Full classification of applications of virtual worlds in scientific visualisations was proposed by Kim H. Veltman, see Veltman (2001), p. 252.
[16] Colonna (1998).
[17] Fogliati and Dutto (2002).
[18] http://www.arthis.jyu.fi/bridge/index.php

[19] *Progetto ideale per un palazzo in villa per tre illustri personaggi*; plans and sections extant at Accademia di San Luca in Rome (ASL 0140; 0141; 0142), and the perspective projection at Kunstbibliothek in Berlin (HdZ 1151).
[20] http://wissensgeschichte.biblhertz.it/3d-bridge-html/
[21] See *Roma Barocca* (2006).
[22] See Barry (2006).
[23] See Viscogliosi (2011) and Meneghini (2017). See also *Beyond Illustration* 2008.

century antiquarian taste. Yet when due to 3D programs they can be seen as a whole, they are an attestation to Stanisław Kostka Potocki's exceptionally unified and well thought out vision.

Fig. 12: The Villa Laurentina as seen by Count S. K. Potocki and his collaborators, 3D visualisation, 2014

Looking from the perspective of a scholar researching the traditions of Antiquity, a virtual reconstruction can constitute a very good tool for a more profound research of the building itself. Already at the first stages of work it was possible to answer questions, which until then seemed impossible to answer, regarding the identification of the villa's rooms. The application of CAD programs, coupled with painstaking analysis of the dimensions of walls and characteristic details, permitted to finally identify designs with Egyptian and Etruscan motifs[24] as decorations meant for two different spaces, and to attribute them to particular rooms in the villa's plan[25]. Also due to a meticulous analysis of the drawings in 3D it was possible to establish that one of them, featuring a colonnaded gallery seen from a room with a coffered cupola, does not belong to the reconstruction of the Laurentina, but is a part of the design for the Museum of Fine Arts[26]. This method will of course require some development, but it is already evident that it permits to study an architect's conception from a new, hitherto unknown perspective: from the inside. The researchers of the traditions of Antiquity in Polish culture will soon, therefore, face new and fascinating challenges, since a large number of designs for edifices and urban plans has fortunately been preserved in various museum and archive collections; to mention just a single, very impressive set: the plan to remodel the Royal Route and the Royal Castle in Warsaw, complete with triumphal arches, commemorative columns and obelisks.

The brilliant vision of the father of Polish classical archaeology, rendered on over thirty colour sheets, is amazing in its formal and stylistic homogeneity. All the extant architectural plans, sections of façades and walls of the rooms, details of the wall, floor and vault decorations and elements of furnishing constitute a harmonious whole. It seems as if Potocki's designs, never published in print, were only awaiting an appropriate form of presentation. Today, when our familiarity with the ancient world is incomparably deeper than at the end of the eighteenth century, it is with a feeling of profound respect that we return to the vision of our enlightened erudite. Now, when it is possible to render his designs in a realistic visualisation, the artistic and historical value of the unique reconstruction can finally be appreciated fully. Pliny the Younger's villa can now be looked upon with Stanisław Kostka Potocki's mind's eye (Figs. 9-12).

3. *Stages of work on the realistic visualisation of the Laurentina*

3.1 CAD (Computer Aided Design)

The first stage of our project was to transfer the eighteenth-century drawings into programs commonly used in architectural planning studios. To this effect, scans of the reconstruction sheets were transferred to a CAD program, in which the plan traces, sections and renditions of the walls were made. Historical systems of measurement (the *palmi romani* and *braccia polacche*) were calculated in the metric system chosen for the entire project. Then, on the basis of vector plans and trace drawings the three-dimensional model of the building itself and its surroundings was constructed. Due to the specific method of proceeding required by the program, it was possible to eliminate from further research on Pliny's villa several errors repeatedly found in the printed sources, for instance those regarding the location of rooms in the overall plan of the villa. It was also decided that the total height of the three elements of the façade (base + column + capital) shall be 6.3 m, and the approximate height of the whole building 20 m.

[24] Inventory no. WAF 68.5029; 5031.
[25] They are not, as has been supposed hitherto, alternative variants of decoration of one room; see Gutowska-Dudek (1997-2005), vol. 1, cat. no. 231, 232.
[26] Gutowska-Dudek (1997-2005), vol. 2, pp. 163-164, cat. no. 814-820. See also Miziołek, Baliszewski and Tarkowski (2016).

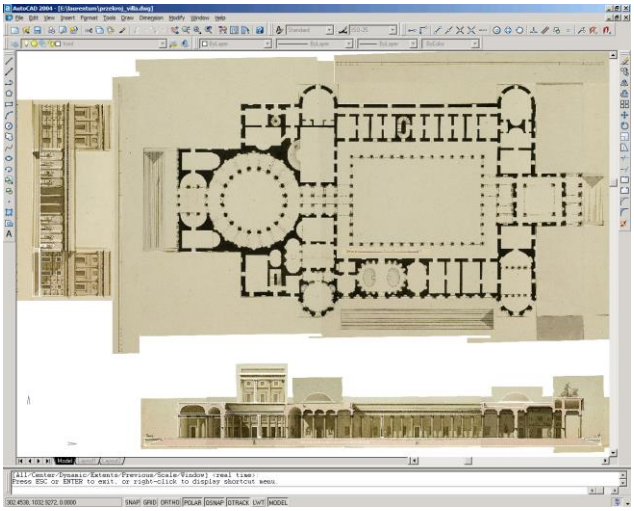

Fig. 13

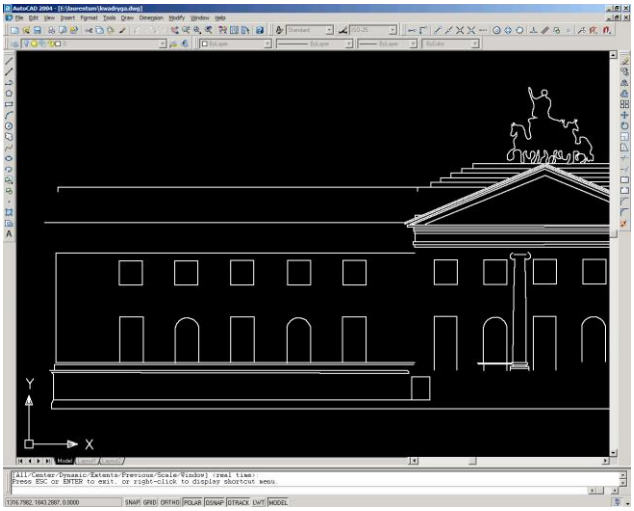

Fig. 14

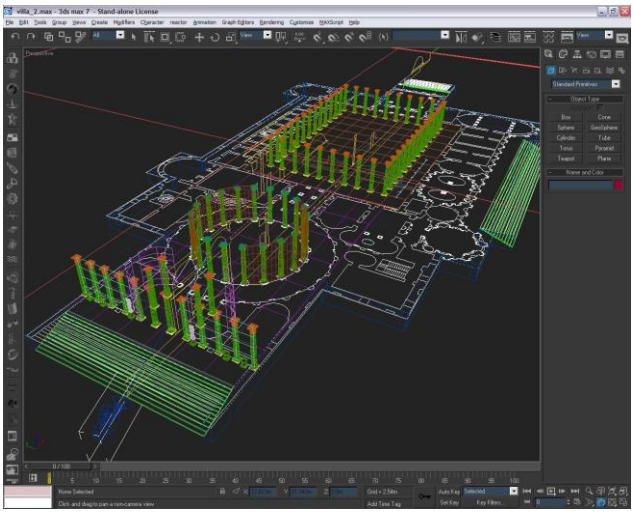

Fig. 15

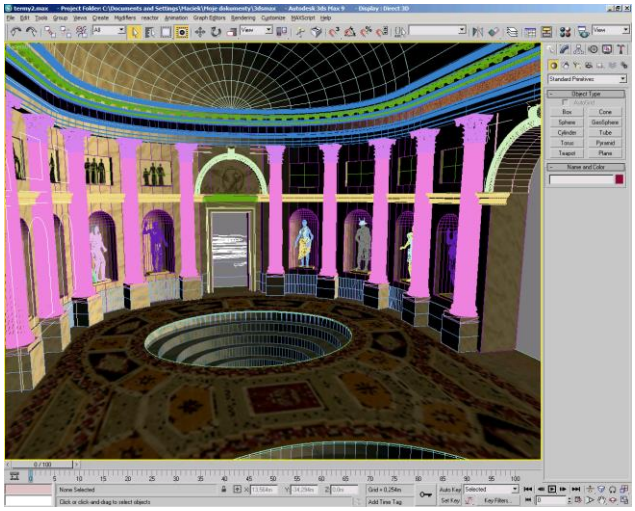

Fig. 16

3.2 Construction of the three-dimensional model

At this stage, 3D programs enabling the production and visualisation of complex three-dimensional models were applied. On the basis of vector drawings transferred from the CAD program, separate elements of the landscape, the body of the villa, the garden pavilions, the cryptoportico and the architectural details began to be modelled. Models of the quadriga, of the sculpted decoration of the façades, and of the garden trees and shrubs were prepared.

3.3 Visualisations of the rooms

In order to faithfully render the original project, particular rooms were constructed in separate files. Every room of the villa was modelled according to the same framework. First, the structural model of the room was constructed on the basis of its detailed plan, and the room was precisely placed in its location on the overall plan of the villa. Parallel to that, modelling of architectural details, e.g. the capitals and cornices, together with modelling of the objects furnishing the rooms, such as the plinths, bathtubs and tripods, was conducted. The statuary decoration was rendered in a program used for modelling three-dimensional human figures.

Applying the textures, which were specially prepared in advance, onto the models was the next stage. In most cases, in order to retain the artistic qualities of the original, scans of the drawings were used for this, whereas texturing of the plastered walls and marble surface facings was done with the aid of high-resolution photographs.

Figural bas-reliefs were made on the basis of the decoration project. In order to avoid building separate grids, the *bump map* technique was used; it consists of rendering the convexity of the relief with the aid of a bitmap in greyscale according to the principle that the pixel percent values correspond to the varying heights of the relief's surface.

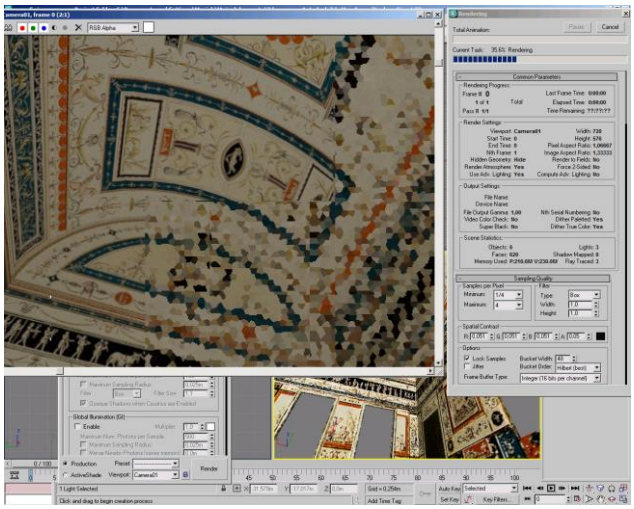

Fig. 17

3.4. Rendering

Rendering is a process of generating the picture in the basis of data contained in the 3D scene, which comprises the following elements: three-dimensional models, textures, lighting, and atmosphere. The program calculates, according to accepted parameters, all the crucial relations between those elements and a virtual camera. In visualisations of historical interiors, colour temperature and light intensity are of particular importance[27]; hence our decision to put special emphasis on finding parameters which would bring the effect of natural sunlight.

In order to do this, we applied the so-called *Sunlight System*, which makes it possible not only to choose the parameters of light themselves, but also to set the geographical coordinates, the date and the hour. The system, therefore, makes it possible to realistically simulate the natural movement of the sun upon the sky in any given place on the globe. Thanks to this system, the natural lighting of Laurentina's rooms at various times of day and year, and of the type characteristic for the sub-tropical zone, was achieved.

Conclusion

The research presented in this paper was conducted in the years 2006 -2016 – in The Getty Research Institute and in the Museum of the University of Warsaw. Some of the visualizations in 3D were produced already in the early stage of the work, while the others in 2014. Thanks to the applied technologies it was possible to put in order all 32 drawings ordered by Potocki, to build up a digital model of the villa and to answer difficult questions regarding the identification of some of the villa's rooms. The analysis of the dimensions of walls and characteristic details helped to identify designs with Egyptian and Etruscan motifs as decorations meant for different spaces and to place them properly in the villa's plan. Due to a meticulous analysis of the drawings in 3D it was possible to create such fascinating interiors as triclinium, unctorium, cenatio as well as a semi-opened space, that is heliocaminus. The "virtual" visualization method established in the Villa Laurentina Project can now be further developed. Increasing possibilities of mobile devices and software, especially in relation to the VR and AR technologies (e.g. smartphones, tablets, VR headsets) shall be examined in the first place.

[27] Research conducted by a team of archaeologists from Bristol university demonstrated that depending on the lighting, there are substantial differences in the appearance of murals decorating a visualised room. Computer simulation made it possible to show how the murals in one of the rooms at the Vetius House in Pompeii looked like in the natural lighting environment, that is lit with oil lamps. See Devlin and Chalmers (2001).

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