

Digital Reconstruction by Imaging and Post Processing Techniques of the Nicopeia Icon Transformations

Magdalena Stoyanova¹, Diego C. Stoyanov², Lilia Pavlova³

¹ Ca' Foscari University, Centro Interdisciplinare di Studi Balcanici ed Internazionali,
Venice, Italy

² University of Padova, Faculty of Engineering, Padova, Italy

³ Laboratory of Telematics, Sofia, Bulgaria

mgstoyanova@hotmail.it, pavlova.lilia@gmail.com

Abstract. The famous palladium of Venice, the *Nicopeia* icon kept in the basilica of San Marco, 1968 underwent spectral and micro chemical investigations. Their largely overlooked to the moment findings proved the existence of more superimposed images of Our Lady, not identical with the one visible today. The present paper analyzes the issues of these laboratory examinations from technical-technological point of view to the end to gain as many as possible insights into the composition, sequence and plastic construction of the original painting and its successive transformations. The visualization of the outcomes and the evaluation of the various work hypotheses are supported by imaging and post processing techniques ranging from digitization and optimization of old analogue photos to image manipulation methods. The results allow to draw conclusions not only about the appearance of the hidden Mother of God and about its original significance, but also to address for first time with scientific criteria the question of the icon's date and provenance.

Keywords: Image Post Processing, Mother of God Nicopeia, Technical-technological Analysis.

1 Introduction

The *Nicopeia* icon hosted in the basilica of San Marco in Venice is considered to be one of the earliest Byzantine icons in Occidental Europe, and, therefore, of exceptional art historic importance and rarity. It was identified with the *Nicopeia* icon (Kondakov, *Iconografia Bogomateri*, 1915, p. 124) stolen 1204 by the Venetians in Constantinople¹ only in 1559, when (Ramusio, 1559) published an account of famous voyages. He based his description of the icon's capture on an eyewitness account of the Sack of

¹ The Byzantine Empire had two palladium icons: a *Hodigitria*, kept in the *Hodigon* monastery, and the *Nicopeia*, to which was dedicated a chapel of the Great Palace (Codinus, 1839, p. 69). The earliest written source considered to refer to the capture of the *Nicopeia* by the Crusaders is a document of Pope Innocent III from 1225 (Riant, 1876, p. 76-78).

Constantinople by (Villehardouin, 1962).² His presumption that the Venetian *Nicopeia* was captured during the Fourth Crusade (1203–04) and had been brought back to Venice as part of the spoils of war, was later shared by (Tiepolo, 1618), (Querini, 1645) and (Corner, 1761, p. 1), while others as (Zanetti, 1733, p. 95) and (Moschini, 1815) considered it a *Hodighitria* painted by S. Luke or, as (Grevembroch, 1760), avoided to engage with its Constantinopolitan origin and stated that it had gained the lagoon already in 1198. Instead, (Molin, 1821) and (Veludo, 1887) maintained that the icon was not part of the imperial booty and rejected any possibility it could be the miraculous image of the Byzantine *Νικοποιος*. Not to wonder that the Latin owners of the Byzantine icon for centuries disputed about its true name, date and provenance: tracing the history of this iconographic type of Mother of God, whose appearance is documented already at the time of Emperor Mauritius, has been hindered since earliest times by the confusion Byzantines themselves made between *Nicopeia* and *Hodighitria* (Kondakov, *Iconografia Bogomateri*, 1915, p. 124–6).

Sanuto (1879–1902) who reported the display of this icon representing the *Theotokos* and Christ during natural disasters,³ states that since the early sixteenth century it was venerated as one of the holy protectors of Venice. On 17 April 1618 the officials at the Basilica of San Marco transferred the icon from the sacristy to her new altar in the north transept and in 1645 (Querini, 1645) glorified it as *Nicopeia* (Bringer of Victory) and palladium of the Venetian Republic.

Prisoner of the totemic linking of the *Nicopeia* to the Venetian triumph at Constantinople in 1204 as well as of the belief that it was one of the premier imperial icons in that city, up to present day scholarship continues to address exclusively its historic background. Instead, the technical-technological peculiarities of the icon rested a *taboo* and were in great part misunderstood or largely overlooked: even by (Rizzi, *La Madonna Nicopeia*, 1979) and (Rizzi, *Un'icona costantinopolitana del XII secolo a Venezia. La Madonna Nicopeia*, 1980) who published its spectral and micro chemical analyses carried out by (Lazzarini, 1979). His classification of the icon as a 12th c. Constantinopolitan work was not the result of an evaluation of these findings within the context of the various iconographic schools, but an arbitrary conviction built on few photographic comparisons and ignoring the relation of the painting to its precious enameled metal fittings datable already in the 11th c (Kondakov, *Iconografia Bogomateri*, 1915, p. 140).

The actual technical-technological investigation tries to overcome the one-sidedness of previous research. With the support of digital imaging techniques it brings to light some substantial indications for the art historical research, concretely with regard to the painting process, the substances used in it and also to the various phases of visual transformation the icon underwent. In the second chapter are digitized past copies, replica and documented restorations of the icon; the third section provides digital images of the analogue IR and XR photographs and reports about the outcomes of the micro chemical investigations carried out in occasion of the restorations 1969 - 1979. On base

² A more detailed report about the vicissitudes of the icon in Venice by (Gallo, 1967, p. 135).

³ Vol. III, col. 632; vol. XII, col. 98; vol. XXXVIII, col. 254; vol. XLVIII, col. 275. The years are 1500, 1511, 1525, and 1528, respectively.

of these, in chapter four are presented two digital models that delineate the peculiarities and extension of the main transformations the icon underwent over time. The last section schedules the future work necessary for to validate and render more precise the conclusions relative to the employed materials and the attribution. All analyses are based on the visual records in VIS, raking light, XR and IRr created in occasion of the restorations 1968-1979 and kept in the Photographic archive at the Laboratory for Scientific Investigation and Restoration of the Gallerie-Misericordia, Venice. Other documents of importance for this case study are available at the Procuratoria of San Marco and the Polo Museale of Venice.⁴

2 The Historic Metamorphoses of the Venetian Palladium

2.1 Archival Images

Several copies and replica of the San Marco *Nicopeia* have been preserved. To them count copies carried out in aquarelle (Grevembroch, 1760), tempera painting on wood, i.e. the copy by Th. Bathas, 1594 (fig.2a), or the *Nicopeia* in the Likhacev collection acquired in Venice end of 19th c. (fig.2b)⁵ as well as paper prints (fig.1) and some early photographs from the end of the 19th c. (Fig.3). Kondakov (1915, p. 139) even maintains, the Byzantine *Nicopeia* probably was the prototype of some of the 13th c. mosaics in the basilica. Despite all these parallels reflect the original in quite relative manner, they are indispensable for to obtain an idea of the visual alterations the icon underwent and how its status of conservation changed. Judging on the paper prints, at the beginning of the 17th c. the pictorial text was almost integral, while the earliest photos prove that the later interventions touched the expression of the face, the color of Our Lady's garments (it drastically altered from blue to deep purple and to azure), as well as the plastic elaboration of the folds, whose original, detailed and rhythmic design regrettably was not recovered with the restorations 1968-79.

2.2 Written Sources

At least three interventions on the *Nicopeia* icon have been documented after its arrival in Occident, namely in 1594, 1959, and 1968-79 (Rizzi, *La Madonna Nicopeia*, 1979). The first, in 1594, is described as “*acconciatura*” by the Greek icon painter Thomaso Bathas who made also a copy of the icon (Fig.2a), preserved at the Institute for Hellenic Studies in Venice. Up to the second known intervention in 1959, improperly defined “restoration”, when Mauro Pelliccioli provided to weld some *sollevamenti* of the pigment (Forlati, 1959-60, p. 264), (Gallo R. , 1967, p. 152-3), (Lorenzetti, 1974, p. 191),

⁴ The author gratefully acknowledges prof. L. Lazzarini, IUAV Venice, for the support to access them.

⁵ Here are intended only copies and replica of the icon kept in the San Marco basilica, not of the *Nicopeia* iconographical type in general, which actually is preserved in other Venetian churches (Rizzi, *Un'icona costantinopolitana del XII secolo a Venezia. La Madonna Nicopeia*, 1980, p. 301-302) or elsewhere.

surely have been made also other tryouts to “improve” the conditions of the painting: Kondakov (1915, p. 139-140), who saw the icon end of 19th c., notes that the Our Lady’s garments were of a “chocolate” color. The third restoration, appointed by the Soprintendenza dei Beni Artistici e Storici of Venice to Antonio Lazzarin, was carried out 1968-69 and 1979, with the funds of the American Committee Save Venice.



Fig. 1. Left: popular paper print with the «Madonna miracolosa di S. Marco». Right: Incision of 1618 (source (Likhacev, 1911, p. 79,80)



Fig. 2. Left: Copy of the *Nicopeia* by Thomas Bathas, 1594, 41,2 x 53 cm. Center: an icon replica of it acquired by Likhacev in Venice end of 19th c. (source (Kondakov, *Iconografia Bogomateri*, 1915, p. 150). Right: Photo of the *Nicopeia* from the end of the 19th c. (source (Likhacev, 1911)

By radically eliminating the posterior layers, he tried to rediscover the original pictorial text adulterated by repaints and smoke of candles and previously almost illegible. Regrettably, the original image was not recovered. Ten years later, in 1979, the same restorer had to mend the consequences of a criminal attack on the icon that caused lesions and destruction of the paint layer in several areas.

3 Spectral and Material Analysis

In occasion of the restoration of the *Nicopeia* icon 1968-79, thanks to funding by SAVE VENICE Inc., for the first time was opened the opportunity for a technological and material investigation of the icon. The X-ray and IR reflectography taken at that time allowed a first look at the earlier representation of Mother of God. Contemporary, cross cuts of the painting layer structure carried out by prof. L. Lazzarini (ex Scientific cabinet of the Soprintendenza alle Gallerie e alle Opere d'arte di Venezia), confirmed the existence of at least three phases of painting and determined the composition of some of the materials used there (Lazzarini, 1979).



Fig. 3. Left: the *Nicopeia* in 1962 with its original Byzantine frame of gilded silver with gold enamels, pearls and gemstones, gold cloisonné and jeweled halos (long with the magnificent cover). Center: before the restoration 1968. Right: after the restoration when metal fittings were removed and displayed apart, in the treasury.

3.1 The Spectral Examination of the Panel

The radiological investigation (plain X-ray). In paintings on wooden support like icons, the examination of the radiographic image has to study the support (e.g. wood specie(s), structure, density and age; presence of living worms, water infiltrations, wood oxidation, presence of metal particles), the process of the painting creation, changes in composition, underlying paintings, pigment's composition (of white, red, blue and yellow mineral pigments, for example presence of Pb, of Hg (in the bolus for gilding or in the red pigment); presence of gesso integrations, the existence of older restorations, etc. Together with the mapping of original painting extension and its status of conservation, it helps the solution of the authentication problem (Stoyanova, Maximova, Mazina, & Provorova, 2017, p. 109-122).

In our case, the plain XR, carried out in soft rays, has not been useful to answer this entire question, as in the resulting image (Fig. 4.1.a) the contribution of the ground and of the successive paint layers and restorative interventions dominate. The grain of the

wooden board or tree rings do not stand out, which is due to the type of wood used (Poplar). On the X-ray image of the panel are visible the numerous damages of the wooden board, strongly exhausted by grinders. Feeding ducts of wood-destroying insects are characterized as thick, dark lines oriented vertically, long the course of the wood fibers. Where these scavenges reach the surface and in previous restorations were filled in with more absorbing putty (i.e. on the mantle of Our Lady), the contour is also bright to see. The holes of the nails that were beaten for to fix the enameled aureoles are clearly recognizable. Probably for the oxidation of the wood in contact with them, in the past it was consolidated with restoration stucco (white on the XR) and then nails were fixed on the same place again. From the X-ray is also visible that the aureole under the nimbus of Mother of God and of the Child and the *tituli* -medallions were designed directly on the wooden support. They, like the enameled frame, were not covered with *levcas*, but with special mastic.

The degree of absorption in the various areas of the XR image is determined by the layer thickness, the material density and, above all, by the weight of the contained elements. The preliminary design (visible as white lines due to the accumulated in the graphs Pb white) is well distinguishable (Fig.4.2.a). It does not correspond to the design visible in IRr (black lines, Fig. 4.1.b, c; 4.2.b), particularly of the head cover and the garment folds. As regards the painting itself, four main groups of employed substances are distinguished on base of their less or more common reaction to X-rays: *i*) organic (madder?, crimson?, carbon/soot black); *ii*) derivatives of metals with a low periodic number or with a small percentage of metal (earths); *iii*) derivatives of metals with average numbers (lapislazulli); *iv*) derivatives of heavy metals (Pb, Hg) (Stoyanova, Maximova, Mazina, & Provorova, 2017, p. 122). Natural colorants, resp. lakes and lacquers based on such, are visible as black spots on the Child's garments. Pigments such as ultramarine, which consist of light elements, are penetrated by X rays without large weakening, producing on the film a lot of radiation that results in a less strong "blackness". Areas containing heavy elements as Pb or Hg absorb the radiation strongly and are clearly visible in the X-ray image. Because the white pigment lead white, who contains the highly absorbent element lead (Pb) is very frequent in ancient tempera painting, clear areas in the X-ray image and in the painting often coincide. Also the Hg containing cinnabar strongly weakens the radiation. Gold leaf supports, however, are hardly noticeable because of their very low layer thickness of only few micrometers.

Investigation in the IR register. The investigation in the IR register had to learn more about the underlying layers of the painting, eventual modifications in the composition (*pentimenti*); to recognize the preparatory design: a hidden element, of particular importance in the attribution and dating and to collect eventually data on the chemical composition of employed materials on base of already registered issues, for example to make distinction between carbon, iron, copper cadmium containing yellow and red pigments; if based on oil or shell lack (Stoyanova, Maximova, Mazina, & Provorova, 2017, p. 91-108).

Regrettably, the bad quality of the IRr published in B/W (Rizzi, *Un'icona costantinopolitana del XII secolo a Venezia. La Madonna Nicopeia*, 1980), without the due technical references, and the extremely complex situation created by the over

position of several paint layers, could give a sure answer only on what regards the design. It has been established that over the original painting covered with darkened varnish, at a time that could be the intervention of Bathas 1594, a second design has been traced with a carbon or soot containing substance visible as black line. It does not follow very precisely the underlying one but tends to simplify it, particularly in the area of the head cover and the garment folds. Some restrictions of the contours of the head and the shoulders were also made in this occasion.



Fig. 4. 1st line, left: XR; center: IRr close up; right: IRr. 2nd line, left: schematization of the XR; center: optimization of the IRr; right: map of the samples.

3.2 Micro Chemical Investigation

April 1968 Prof. Lorenzo Lazzarini⁶ collected 7 samples for microscopic and chemical examination from which a stratigraphic section was obtained to be studied under a microscope. The residual fragments were subjected to a micro analytic chemical examination to determine the nature of the binder and the pigments used. It was established that the support consists of a single Poplar board and that the preparation is rather thin and consists of two layers of gypsum and animal glue. Four pigments have been

⁶ Ex Scientific Cabinet of the Soprintendenza ai Beni Artistici e Storici di Venezia.

identified, namely yellow and burnt, very finely ground, ochre; lead white, cinnabar, natural lapis lazuli. It was also cleared that the original fragments of gilding are all in subtle gold foil, on a yellowish-brown bolus of natural ocher, maybe burnt. The micro imaging has further evidenced the intervention of Thomaso Bathas dated 1594, distinguished by gilding on red bolus with gold foil on the Child's garments, and by the repainting with lapis lazuli of the *maphorion* of the Mother of God. Besides in the dark blue mantle of the Virgin, repainted areas were revealed also in the golden parts of the margin surrounding the mantle itself at the top and in the robe of the Child at the bottom.

4 Art-technical and Technological Analysis

The actual examination of the spectral and material analysis excludes any doubt about the Byzantine origin of the icon. This is further confirmed by: *i*) the presence, on the reverse side, of *levkas* and painting, an exclusive for the orthodox iconography tradition; *ii*) by the typical for classic Byzantine icons frame with raised profile on the inner edge of the wooden support consisting of a single board. Also the wood species Poplar, a very habitual tempera painting support in Italy, Spain and the South of France, is frequently encountered among the woods used by Byzantine masters. Moreover, the correspondence among shape, dimensions, style and technique of the painting and of the precious gilt silver and gold enameled fittings that covered nimbus, background and frame of the *Nicopeia* up to the restoration 1968, comfort the hypothesis that these last are not later additions, but synchronal and conceived with the icon.⁷ This circumstance, together with the exclusively fine original design of the garments, of which no other parallels result as far to me, proves that the carefully elaborated project of the entire work has been commissioned to one or more workshops that served the highest élite of the époque.

Without the fittings which, since the criminal attack on the icon 1979 are displayed a part in the treasury of the basilica, a heterogenic condition is recognizable characterized by revisions over several centuries. Their extension and temporal definition is possible with limitation to the changes before (phase 1) and after the arrival of the icon in Occident (phase 2) (Fig.5), mainly on base of the differences that distinguish the Byzantine from the European tradition in the plastic construction of the figures (Grenberg, 2000), (*Inkarnat und Signifikanz – Das menschliche Abbild in der Tafelmalerei von 200 bis 1250 im Mittelmeerraum*, 2017). Concerning phase 2, some further precisions could be formulated on base of the archival images and the micro chemical analysis. Those details that ultimately determine the character and quality of painting, i.e. the exact coloring, the type of modeling, the transparency, luminosity and dominance of the color surfaces, the fineness of the brush strokes and the exact course of contouring are only occasionally recognizable and cannot be reconstructed for the entire painting.

⁷ As evidenced by the XR, changes in the holes of the nails that fix them on the board are due to repairs carried out in Venice, cf. &3.1.1.

4.1 Situation 1: The Original Nicopeia (before 1204)

Situation 1 comprises a glue-gesso *levkas* that covered the panel from the recto (with the exception of the aureole, the *tituli* - medallions and the frame) and the verso; the first gilding of the background and the first, today concealed image of Our Lady. For the first painting, it is possible only to draw certain conclusions about design and coloration from the XR and the micro chemical analyses. The incarnate should have



Fig. 5. Left: digital model of phase 1; right: digital model of phase 2, earliest version. The digital images do not represent reconstructions of the painting; they visualize the results of the investigation, via indications of lines and chromatic saturation, exposition, contrast, etc.

been darker and more contrasting than the version visible today. Highlights were more linear and restricted, in respect to phase 2, whose incarnate is typical for European tempera where, up to beginning of 13th c. at least, it was depicted on clear background (Inkarnat und Signifikanz – Das menschliche Abbild in der Tafelmalerei von 200 bis 1250 im Mittelmeerraum, 2017). The explanation is that the original *Nicopeia* was painted following the principle of classic Byzantine tempera where plastic rendering consists in gradual clearing the specific dark preparation (*πρόπλασμα*) of every principal chromatic area. This means volumes were gradually modeled with clearer tones over the dark under paint, contemporary marking contours, and shades and, at the end, highlights (*ἔγγυσμα*) with lead white. In fact, as micro chemical analyses prove, the first paint layer of the Mother of God and Child's face contain dark particles (burnt earth?), while under the first lapis lazuli layer of her mantle there is a carbon black containing layer. Thoroughly in the classic Byzantine icon painting tradition are all the

discovered pigments as well as the preparation of yellow, (red) and white⁸, very finely ground ochre used as bolus for the gold leaf. It is to suppose that the binder of the original image was egg; for the blue mantle - white of egg, animal glue or milk; for the colored lake of Christ's garments - natural gums.

4.2 Situation 2: After 1204

The “acconciatura” by Th. Bathas 1594. In respect to the original painting carried out exclusively in distemper, phase 2, painted over the old varnish, could not use egg binder more, but only oil and, eventually, natural resins and gums. Therefore it is not in tempera, but in oil or mixed technique. It was carried out on a clear preparation, a kind of imprimatur, in which the presence of lead white can be justified only by its drying properties; hence there was an oil binder there. This is not typical for classic Byzantine icons, but for the European plastic principles at the epoch. End of 16th c. in Italy the tempera technique was almost completely replaced by oil painting where properly the use of imprimatur (oil with drying, mainly Pb containing pigments) appeared. Bathas, who belonged to the well integrated in the Latin cultural traditions Greek community in Venice, surely were aware of these methods like many other Greek icon painters capable to work both *alla greca* and *alla latina*.

Therefore, phase 2 is not less important witness for art historic research as phase 1, concretely on what concerns the “westernization” of orthodox painting: besides for the introduction of imprimatur and oil binders, also for the presence of lakes colored with natural pigments, which are documented in Italian gilt leather already end of 15th c. (Stoyanova, *Tecnologia e arte dal Levante in Europa, secoli XV-XVII. Problemi di attribuzione e di tutela*, 2010). Out of the figured area, the use of oily binders may be supposed in the restorative stucco in the aureole visible as bright white spots.

Interventions between 1594-1968. For this long period indicative are the archival images which allow distinguishing a phase at the end of 19th c. (Fig.2.c) on base of Kon-dakov's witness. Red pigment given with oily binder over the blue mantle produced a chocolate-like brown, further darkened by the oily varnish. In the occasion also the faces were embellished in “realistic” manner. Another change is documented on (Fig.3.a) from 1962, where the Our Lady's mantle is in clear blue color. All these modifications seem to have only superficial character and are not of interest for the present study.

5 Conclusions and Further Work

Digital image manipulation techniques have been indispensable for the visualization and reuse of the scientific analyses carried out on the *Nicopeia* icon 1968. However, in the meantime many innovations in the sphere of optical, photographic, instrumental

⁸ Probably kaolin

and biochemical methods have been introduced. Given the exclusive importance of the Venetian *Nicopeia*, a new, updated investigation is highly necessary for to deepen in its peculiarities. They have to focalize in first place on a detailed surface analysis with digital microscope of the icon recto and verso; on the exact chemical composition of binders and pigments, i.e. of the original varnish, of the colored lakes (if oil veils or mono-phase lipid varnishes); on the presence of living worms – for to assure the correct conservation strategy of the icon. The most important question however, of key role for the precise attribution of the original *Nicopeia*, rests the assessment of its precious metal fittings, and this is the next step the present case study will affront for to establish the date and cultural provenance of the icon.

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