

## IRR INVESTIGATIONS OF THE OVER-PAINTED LAYERS ON TWO OHRID ICONS

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### Abstract

*The Icon Gallery in Ohrid, Macedonia presents 36 icons chronologically dated from the early 11<sup>th</sup> until the first half of the 19<sup>th</sup> century. Most of the icons from the Byzantine period are still exhibited with over-painted layers. Through IRR researches performed on two icons from this period, Jesus Christ from 1262/3 and Archangel Gabriel (Annunciation) from the 11<sup>th</sup> or 12<sup>th</sup> century, the authentically painted layer was distinguished. This method enabled panoramic visibility of the original drawing, distinct from the style that became public portrayal of these well-known icons. Conceiving these facts, old conservation dilemmas have been resolved and scientific conservation brought its contribution to their authentication.*

**Keywords:** Icon; Over-painting; IRR method, Authentic layer

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### Introduction

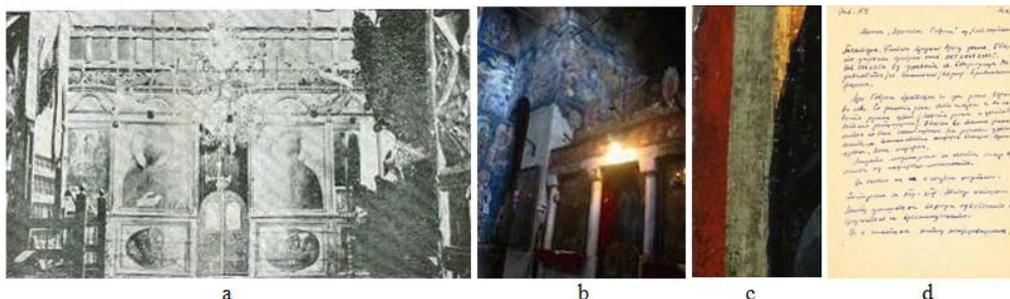
The Collection of Ohrid icons represented in 1961 on the XII Byzantine Congress held in Ohrid [1] became the main entity for the reconstructed Gallery of Icons in 1982 [2]. This collection hosts ones of the most distinguished icons from the Byzantine period [3] of the Palaiologos dynasty such as the icon of Jesus Christ Pantocrator from 1262/3 [4] and the Annunciation [5-6]. During their conservation process in 1957/8 and 1970-80, the main subject of interest was the icon presentation and the localization of the over-paintings. Through previous researches some of the layers were recognized as layers that did not originate with the authentic iconography. In the period 1958-1961, conservation treatments were performed to remove these re-painted surfaces, but some of the conservation doubts about a few local painted areas remain the conservators' interest. However, attempts to establish dates or periodization of the over-paintings can prove to be not satisfactory enough. Further researches reconsidered the non-destructive methods for aimed to discover hidden information below the over-painted layers, using the IR reflectography, method used by other researchers [7, 8], next to histochemical and microchemical techniques [9-14].

Huge waves from the Macedonian renaissance brought the strength of the Christian spirit in the orthodox churches built in the period of the 19<sup>th</sup> century in Macedonia [15]. This elation will be imprinted in every artistic creation such as woodcarving, architecture, fresco and icon painting which rose from the blooming economy and merchandise in the 18<sup>th</sup> century [16]. The re-birth of the new young talented painters after the Ottoman slavery provided the artistic needs but at the same time they were engaged to revitalize the damaged condition of the iconostases and old icons. The painters who gathered in groups were not ready enough for the traditional icon painting and were recognized by their decadent style of repainting or over-

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painting the old images of the icons. These interventions demonstrate the reflections of protection through the attempt to maintain and heal the whole icon. At the same time they were used as refreshment to restore the painting, iconostas image and function [17]. Nowadays, many interventions during this period have been detected, especially the over paintings undersigned by the famous master painter D.K.-Dico Zoograph [18]. In 1866 he stayed in Ohrid for the second time and was engaged in the refreshments of the new iconostasis (Fig. 1a) in the church of St. Clement [19, 20]. The presumption is that some refreshments have been made over the icons which were deposited in the prevailing iconostasis scenery in the same church (Fig. 1a and b). Nevertheless, the frame of the icon of Jesus Christ which belonged to this church was over-painted with colored deposit, very strong and severe (Fig. 1c), which was described in the conservation report in 1970 (Fig. 1d).



**Fig. 1.** Iconostasis in the church of St. Clement (Virgin Perivlepta): a - Old iconostasis and the refreshments by D. Krstevich-Dico Zoograph in 1866; b - Nowadays iconostasis; c - Detail - Green over-painted intervention on the frame of the icon of Jesus Christ, d - Handwritten description from the Conservation file reg. no. 129-Arc.Gabriel, 1961

## Materials and Methods

The objective of the measurements was related with the identification of specific pigments and the detection of the over painted layers. The following investigations were performed:

1. The pigments and binders from various parts of the icons were analyzed from cross-sections (prepared by embedding each samples in polyester resin in molds with size  $1 \times 1 \times 1$  cm) with an *Optical Microscope* (Carl Zeiss Axioplan2). An optical microscopy was used to obtain information about the thickness and order of application of the individual paint layers. Images of the cross-sectioned samples were recorded using Axiocam mounted on microscope. Magnification of  $100\times$  and reflected light was used.
2. *Histochemical and microchemical analyses* have been obtained as well, in order to determine the nature of binding media as well as kind of pigment of the sample.
3. *X-ray fluorescence spectroscopy* (XRF) has been applied for analysis of inorganic pigments and ground layer of the icons. The samples have been analyzed with Spectrometer for X-ray fluorescent analysis (XRF MIDEX Spectrometer, Spectro 10009264). The preparation layer and four different points with characteristic colors (green, blue and red) were measured with portable XRF spectrometer.
4. Details from the over painting layer were visually distinguished through *micro digital shouts* (CANON Eos 5D Mark II, ISO 1000, exp.1/30sec, no flash).
5. *IRR technology* was used for panoramic and detailed shots made over the icon surfaces with an adapting camera NIKON (900-1100 nm), without removing the exponents from their exhibit places.<sup>1</sup>

<sup>1</sup> Nuclear Technique in Protection of Cultural Heritage, - IAEA International Agency for Atomic Energy and the Croatian Restoration Institute from Zagreb with Mr. Mario Bruni was invited to investigate these over-painted layers on three icons for the needs of the doctoral thesis, A. Popovska, *Historical evaluation of the conservation methods in R.Macedonia through the conservation treatments of the Ohrid icons*, **PhD Thesis**, Institute of National History-Skopje, University St.Cyril and Methody, 2012,pp.333

### *Samples and previous results*

Previous researches identified local over-paintings on the icon of Jesus Christ (Fig.2) placed on the scroll, on the frame and on some contour parts of the figure (Fig.3a) but on the icon of Archangel Gabriel post painting interventions were identified in the background and on the angel's wings (Fig.3b).



Fig. 2. Front and back side of the icon with inscription.

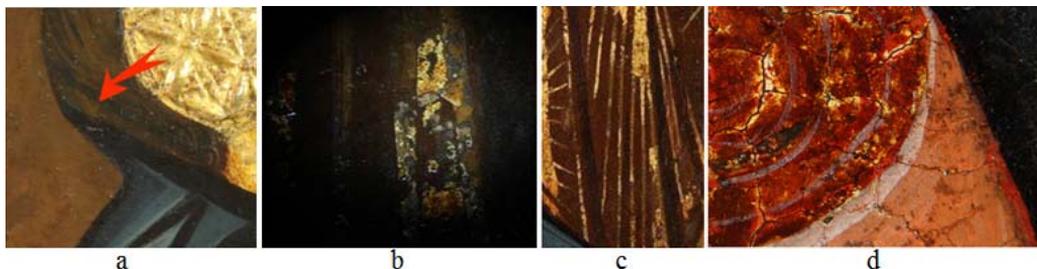


Fig. 3. Graphic documentation from 1999: a- Over-painted layer located with green, b - Post painting interventions located with yellow

#### *a) Icon of Jesus Christ*

Some details strongly dominated about the possible over-painted layers-such as the edge of brown garment underneath the blue (Fig. 4a). Other details of over-painting have been recognized as interventions made above degraded surfaces, such as the brown decorative stripe with different shapes from the damaged golden lines beneath (Fig. 4b and c) and the over-painting on the scroll recognized as white circles painted over the damaged final varnish (Fig. 4d).

The sample from the upper blue garment has a multi-layer structure: gypsum ground, painted blue layer and varnish of resinous nature which improves the traditional icon multi-layered painting; but also there was another blue layer placed above the final varnish which is an evidence for over-painting presence. Chemical analyses identify pigment of blue ultramarine on the upper layer and a mixture of blue ultramarine and white lead  $\text{Na}_2\text{Al}_6\text{Si}_4\text{O}_{24} \cdot 2\text{PbCO}_3\text{Pb(OH)}_2$  on the lower layer.



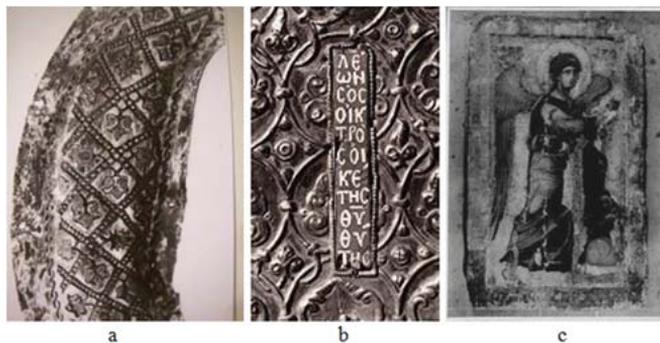
**Fig. 4.** Details of Christ's icon: a - Lower brown garment with the arrow and over-painted blue garment, b- Microscopic photo of the golden stripes, damaged beneath and over recovered; c - Forms of the recovered golden stripes of the decorative band; d - Over-painted white circles on the scroll placed over the damaged varnish

*b) Icon of Archangel Gabriel*

Annunciation from the 11<sup>th</sup> or 12<sup>th</sup> century is depicted archaically in two separate icons: the icons of Archangel Gabriel and of Virgin Mary (Fig. 5a). According to the text on the enamel tablets (cloisonné) hollowed in the silver coat (Fig. 6b) with the name of Leon as the first archbishop in the church of St. Sofija in Ohrid (1037-1056), N. Kondakov first comprehended the dating of this icon in 1909 [21]. Additional assumption compared the Annunciation from the 12<sup>th</sup> century in Sinai Monastery St. Catherine with this Annunciation and the name of Leon to the reference of the archbishop Leon Mung (1108-1120) [22]. Further thesis concerned the floral ornamentation of the coat very similar to the fresco ornaments in the church of St. Sofija in Ohrid and the period of the 12<sup>th</sup> century [23]. During the conservation treatment in 1961 (Fig. 6c) the removal of the silver coats completes the epilogue that coats were applied afterwards, because of the inscription found beneath them.



**Fig.5** Icon of Annunciation in two separate icons



**Fig. 6.** Fragments that identify the period of creation: a - Detail of the lost silver coated oreol, b - Enamel tablets with the name of Leon, c - During the conservation process of removing the silver coat in 1961

Gilded fragments at the ends of the wings beneath the coats strongly dominated this conclusion, where the brown contours from the edges of the wings were indicated (Fig.7a). In that sense silver coatings referred to the period of the 12<sup>th</sup> century, but the icon painting belongs earlier, in the period of archbishop Teodul [24].



Fig. 7. Archangel Gabriel icon: a – full picture, b - detail of the brown contour from the edge of the wings painted on the golden background

The successive over-painting deposit was connected with the western influence in the late 14<sup>th</sup> or 15<sup>th</sup> century, identified by the lily flower in the left angel's hand and the decorative clouds instead of golden background [25]. Due to this puzzlement, these parts have been removed through conservation processes in 1961 simply to contribute the Byzantine enclosure (Fig. 7b). Heavily over-painted interventions placed directly on the damaged wooden support did not contain other painting tissue below (Fig. 8a). Some parts have been removed but the rest of the icon painting sustain as a dilemma about the recognition of the over-painted surfaces.

In 1999 year one probe (1cm<sup>2</sup>) was made by mechanical removing of the upper blue layer located on the bottom of the garment, under the right knee, where the red layer with golden stripes was discovered below (Fig. 8b). Apparently, this surface compared with the upper decorative stripe (Fig. 9) on the arm became an evidence for the expected archangel decoration discovered from the bottom probe [26-28]. Through XRF analyses this sample No.4 contains blue azurite –  $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$  mixed with modern titanium white on the upper layer and red cinnabar pigment –  $\text{HgS}$  (Fig.10) mixed with the white lead pigment on the lower layer. The preparation ground layer indicates gesso -  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$  the same as in the sample No.1. The binding media in layers, the lower and the upper is protein based which indicates tempera technique.



Fig.8. Details of the red layer of Archangel Gabriel Icon: - Destructive mechanical probe 1cm<sup>2</sup>; b - Micro digital photo of the authentic red layer with golden stripes



Fig. 9. Detail of the upper decorative stripe

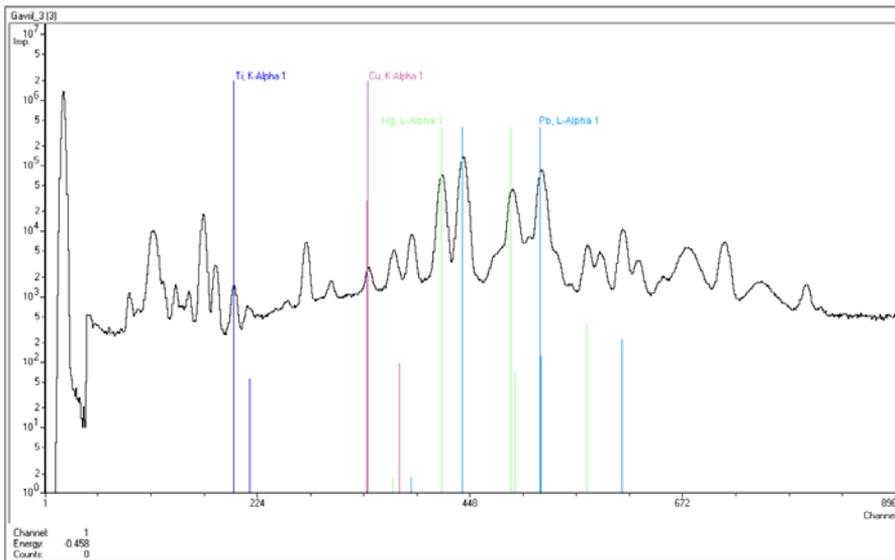


Fig. 10. XRF spectra: Sample No.3 -pigment cinnabar, pigment chromium oxide green

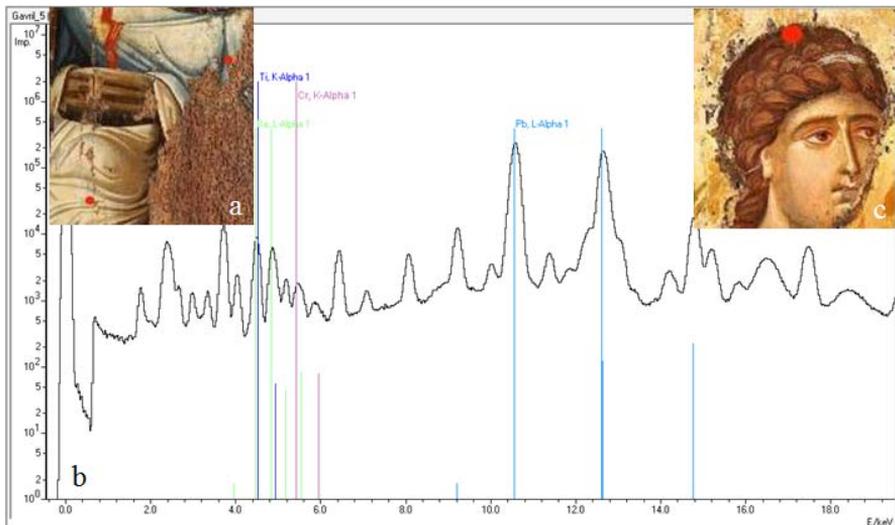


Fig.11. Localization of the samples for chemical analyses in 2011: a - From the garment; b – XRF Spectra for Sample No.1 - Chromium oxide green, titanium and barium white, c- From the hair

The sample from the light blue robe indicates two different white pigments (Fig. 11a). Lead pigment on the lower and modern titanium and barium white pigment on the upper painting. The sample from the olive colored garment indicates ultramarine and lead white pigments on the lower and chromium oxide ( $\text{Cr}_2\text{O}_3$ ) green pigment on the upper painting (Fig. 11b). The samples taken from the edges of the angel's hair (Fig. 11c) identify two different paintings. The lower one with aged gypsum ground and painted layer of red ochre ( $\text{Fe}_2\text{O}_3$ ); and upper layer with white gypsum ground and painted layer of red ochre and carbon black. According to the samples locations and their analyses, over-painted area can be broadening up to the whole figure (Fig. 12).



**Fig.12.** Graphical presentation of the over-painted layers confirmed by the chemical analyses

### ***UV investigation, visual observations and archive documentation***

#### ***a) Icon of Jesus Christ***

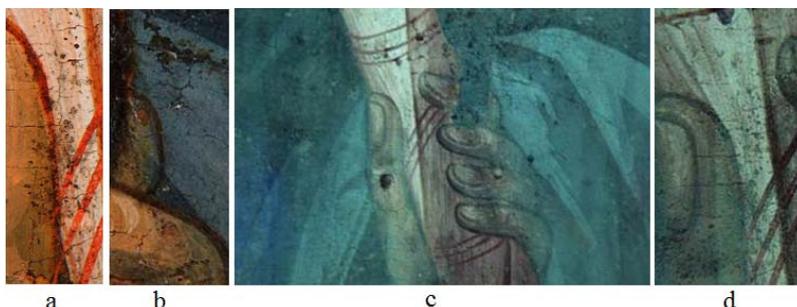
UV shots reconsider the retouches made during the several conservation treatments during the period of several decades until 2000 year. Different types of ‘cosmetic’ retouches were reported in the archive conservation documentation in the records of these icons, according to their style, technique and the depth of the damaged lagoons. According to the type, the retouches were in aquarelle (shallow), placed directly on the surface of the sustained ground, or in tempera (deeper) (Fig.13a, b and c), placed on the conservation ground [29].



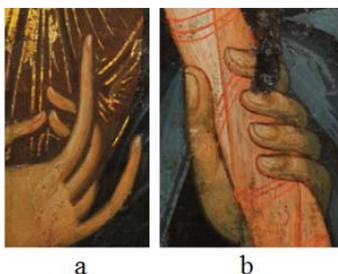
**Fig. 13.** Details of UV, IRR and digital shots from Jesus Christ's face: a - UV shot of the retouch on the right eye; b - IRR shot of the right eye; c - UV shot from the whole face and the damages; d - Digital photo of the staring look

The damaged places on the face of Jesus have been retouched with a conservation ground and chromatic tempera retouch. The staring, goggled look of Christ's eyes was the result of the renewed retouches which developed into massive deposit because of the many preventive interventions that followed before and after a lot of conservation processes (Fig. 13d).

One detail from the right hand displays transparently painting on the thumb (Fig. 14a) that is also notified on the knuckle of the fingers (Fig. 14b). According to the UV shots on the area of the scroll (Fig. 14c) one straight vertical line that halves the thumb was identified (Fig. 14d).



**Fig. 14.** Detail of the left thumb: a -Visible sign of a blue layer beneath the incarnation of the finger, b-Transparent painting over the blue garment, c - UV shot of the right hand with the scroll, d - Vertical line that halves the whole thumb



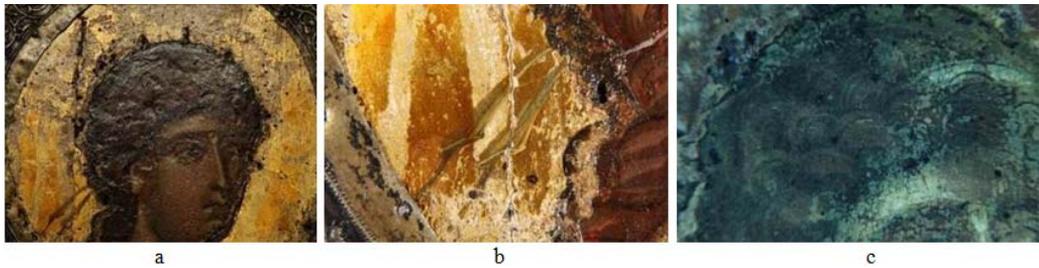
**Fig.15.** Details of the hands: a- Edges of the right hand, b- Edges from the left hand

These marks brought up the suggestion about the differences between the hands. The fingers compared from the both hands of Jesus confirm the difference in their tips: the right hand has fingers with sharp (Fig. 15a) whereas the left one has rounded tips (Fig. 15b). In order to eliminate the conservation retouches and focus on the authentic icon painting, this detail was taken into consideration for further researches about the over-painting and the motive for undertaking it. After eliminating the retouch zones, the surface of the blue garment was over-painted, including the interventions on the golden stripes on the garment and the white circles on the scroll. During this over-painting some reconstructions on the right hand have been made.

*b) Icon of Archangel Gabriel*

The main detected elements in ground layer are S, Ca and the presence of Ti and Ba as major elements is an indication that the white pigments in over painting are modern based pigments used after 19<sup>th</sup> century, as well as the presence of the Cr which use starts during the period of the 19<sup>th</sup> century [30, 31] These pigments indicated on the upper layer on the angel’s garment brought up the conclusion that this over-painting was created in the period not earlier than the 19<sup>th</sup> century New analyses distinguished two different paintings: one traditional icon multi-layered painting and one pigmented cover in oil technique used for over-painting, that is very common in the most of the old over-painted icons in this region [32].

Another characteristic is denoted especially on the hair surface, (Fig. 16a) where damaged lacunas of lower iconography system were covered by the over-painting which was used to camouflage this ruggedness.



**Fig. 16.** Details from the angel's head: a - The surface on the angel's head; b - Edges of the ribbon on the oriole and on the hair; c - UV shots from the angel's hair with the surface damages

Other details point to possible corrections so called 'post painting intervention'. The authentic ribbon (Fig. 16b) on the angel's hair is recognized from its ends on the golden aureole. They are yellowed by the degradation of the old varnish that was not removed in any conservation process in this local area, which was underneath the silver coated aureole. But on the other side one white stripe behind the ear, very similar to the white, spiral circles on the Jesus scroll, continues behind the ear and crowns the angel's head (Fig. 16c). The brush performance that is recognized as better artistic style is very different from the white lines that are placed on the hair just to retain the continuity of the ribbon.



**Fig. 17.** Details from the angel's head and neck concerning the fragment and retouch lagoons: a - Original crackled fragment sustained on the neck; b - Location of lighter retouch areas (under the ear and on the neck)

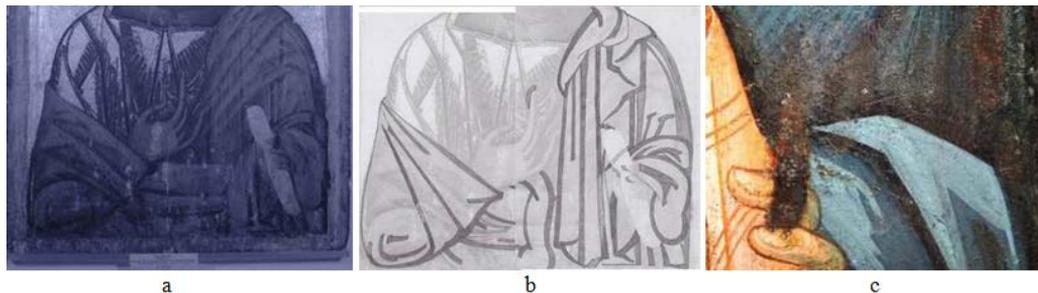
Several shade fragments from the neck display aging crackles [33] in contrary to the lighter surface (Fig. 17). Considering the primary retouch placed on the angel's face prove their interpretation (Fig. 17b) as chromatically lacunas lighter than the surrounded area that point to the primary retouch interventions done above sustained ground, probably during the first conservation process. The brush performance that is recognized as better artistic style is very different from the white lines that are placed on the hair just to retain the continuity of the ribbon. The decadency of these local corrections done directly above the authentic icon-painting, such as the white circles on the scroll of the icon Jesus Christ, white ribbon on the top of head, contrary to the dark shaded fragment on the neck and yellowed edges of the ribbon, point to the period which is far from the traditional icon-painting.

Some painting interventions according to a given description in one article from 1951 [34] pointed to interventions made 15 years earlier (meaning the period of 1933-35). The conservation made in 1949-1951 concerning the Ohrid icons, raised the conclusion that some reconstructions could have been performed during the period between the two World Wars. This period evidently denote rehabilitations done over the national heritage, including the old icon images. These remarks indicate other observations considering the modulation of the curls on the hair, but also the modulation of the blue garment as an over-painting deposit.

## Results

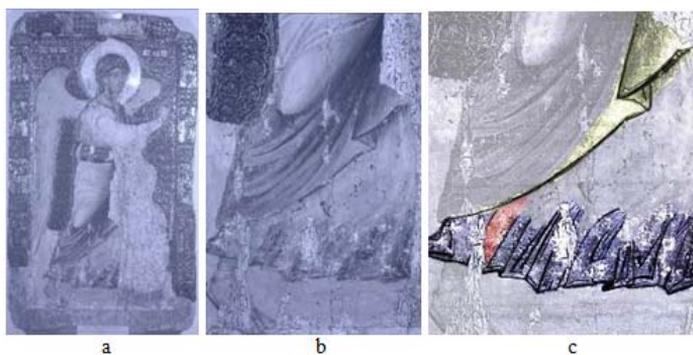
### *IRR Analysis*

Using IRR technology few detailed shots were made over the icon surface (Fig. 18a). The results of the IRR analysis identify lower drawing in a different modulation from the painting that is presented (Fig. 18b). New chemical analyses and IRR shots distinguish different painting styles, signed with different forms of the blue garment. In this way some of the documented scrapes (Fig. 18c) became logical parts from the lower pattern [35] concerning the modulation of the lower garment.



**Fig. 18.** Lower part of the icon of Jesus Christ: a - IRR shot with recognisable lower layer; b - Tracing of the lower painting; c - Detail of the scrapes on the gypsum ground

The IRR shot of the icon Arc. Gabriel (Fig. 19a) something similar appeared below the blue himation where the destructive probe was made (Fig. 19b). IRR researches discovered the reason for over-painting through the panoramic visibility of the lower surface specifying icon painting destruction where the wood is seen and a part of the garment pleats different from the cloth above (Fig. 19c).



**Fig. 19.** Infrared Reflectography: a - IRR of the whole icon; b - Detail of the garment; c - Tracing of the lower semi-damaged painting

The IRR shot on the region of the face confirm the locations of chromatically retouches placed on the damaged places, which were treated by conservation ground (Fig. 20a). On the other side, the IRR shots distinguished lighter lacunae as damages and darken lacunae as sustain parts from the painting layer (Fig. 20b). Excluding the evidential lighter retouches on the face, the other lighter areas have been over-painted by thin layer, which continues above sustained parts from the hair (Fig. 20c).



**Fig. 20.** Infrared Reflectography on the faces: a- Damages and retouches,  
d - Damages and sustained fragments of the lower painting, c - Detail of over-painted angel's curls

## Conclusions

One of the characteristics of the over-paintings is the homogenous content drifted in variable thickness upon the damaged lower system painting. Nevertheless, it have not been protected by any varnish layer, shows resistance in outdoor and indoor conditions or common effects of light, such as yellowing or cracking, compared to the visible aging crackling of the old painting layers and non-crackling on the homogenous over-painted layer. Oil technique and white lead indicated as a pigment, as a refill and as a catalyzer in a drying process [36] are common in the over painting from this region [37]. These conclusions contain the first reason for the over-painting as a recovery of the material devastation used as a shield against further degradation.

Displaying the new, modern style became the main characteristic in a period of the Macedonian renaissance, which brought up the conclusion about primary, image recovery. This mostly coincides with the recuperations, protective interventions and over-paintings, as well as important for the development of unique, artistic and technological style [38]. Painters from this period wanted to spread out their temporary art, including the re-painting of the old icons as a new creation. This type of painting, similar to these over-paintings, directs to the second reason for over-painting and that is displaying the new, modern style of icon-painting.

In these two Ohrid icons we verified the compilation of two different artistic styles. Infrared Reflectography was used to discover the lower drawings, recognized as authentic painting layer, from the period in which these icons are notified. This discovery supplied new information in the treasury of documents, which represents a syncretism of the most valuable cultural heritage from Ohrid, Macedonia. This non-destructive method is the most appropriate method for further investigation of the over-painted layers and it contributes to revealing the real formation of the icon painting below.

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