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# RESEARCH AND RESTORATION OF THE ICON 'THE TREE OF JESSE WITH THE MOTHER OF GOD KYKKIOTISA'

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## Abstract

The icon 'The Tree of Jesse with the Mother of God Kykkiotisa' from the church 'Saint Stefan' - Ticau from Iasi (Romania) is a Cypriot icon, painted in the first half of the 19<sup>th</sup> century, on gold leaf applied to the patterned ground. The author of the painting is Mihail, the son of Makariti K(o)sti. The painting was covered in 1855 with a silver revetment, donated by Ivascu and Susana Cerne, the people from the parish of Ticau and from the guild of grocers in Iasi. Over time, the icon suffered degradation due to the aging of materials, biological attack and due to inadequate subsequent interventions. For the research of the icon, physical analyses (radiographs, microscopic and ultraviolet light observations, FT-IR spectroscopic analyses) and biological analyses were carried out. The results of the investigations highlighted the method of making the icon and the revetment, the type of degradation, thus facilitating the establishment of the conservation-restoration process of the icon. After the restoration, the icon was valued by participating in temporary exhibitions and re-introducing it into the worship process, in the church of its origin.

*Keywords:* painting, wood, identification, FT-IR, restoration

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## 1. Introduction

The icon belongs to the church 'Saint Stefan'-Ticau from the city of Iasi (Romania). The church was founded in 1810 by Captain Constantin Tomovici, a native of Chisinau [1]. The church belonged to the grocers' guild [2].

In 1907, Nicolae Iorga wrote that the church had: an antimension from Chrysant of Cyprus (1800); two stone crosses from 1829 and 1839 respectively; a commemoration lists with the mention of the names of the founder Constantin Tomovici and his daughter Smaranda, married to Mihail Sirbu from Chisinau; a wooden tabernacle with the inscription: "This tabernacle was made at the

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expense of the servants of God Fraticu, Maria and their children, in 1870, November'; the books 'Pentecostarion' from Blaj (1808) and 'Menaion' from Buda (1804); an icon 'from Ivan Cerne and Susana, with the help of the people and the grocers' guild, from 1855'" [3]. Although N. A. Bogdan stated, in 1913-1915, that the church had no inscriptions and old valuable objects [1], this icon that Iorga wrote about, is still found in the church today. It is a very rare iconographic representation for Romania, in which Theotokos is painted with the Child, framed by the Tree of Jesse, with 12 prophets in medallions. The theme of Jesse's Tree is frequently found in Moldavian mural painting, sometimes it also appears in iconostasis, but it is rarely found in icons.

The painting is completely covered - except for the portraits - by a silver revetment (oklad, riza). For the research and restoration of the icon, the revetment was removed by extracting the 41 nails from the edges of the wooden support and from the halos of the Mother and Child (Figure 1).



**Figure 1.** The icon 'The Tree of Jesse with the Mother of God Kykkiotisa' from the church 'Saint Stefan' - Ticau (Iasi, Romania).

## **2. Materials and methods**

### **2.1. Physical investigations**

The icon was analysed and photographed in direct and tangential natural light, on the Leica MZ7 stereomicroscope with camera, as well as with the UV lamp (365 nm). The icon was radiographed with an X-ray machine, at 40 kV, 25 mA. The working technique of the iconographer and the forms of degradation suffered by the icon over time were analysed.

Micro-samples gathered from ground and painting layer was used for FT-IR analysis by diffuse reflectance modality. Before taking micro-samples, the icon was carefully examined and documented in order to limit the sampling points and to obtaining from them the maximum information as possible [4].

Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS) is a versatile tool for qualitative analysis of opaque solid powders. DRIFT spectra was measured using VERTEX 70 Bruker spectrometer. This instrument was equipped with an EasiDiff diffuse reflectance sampling accessory (Pike Technologies, USA). The spectral measurements have been processed with the Spectra Manager. Normalization of the spectra was based on an internal standard. All spectra were recorded from  $4000\text{ cm}^{-1}$  to  $200\text{ cm}^{-1}$  with 16 scans and spectral resolution of  $4\text{ cm}^{-1}$ . Samples have been ground with spectrophotometric grade KBr in an agate mortar. KBr powder was used as background of the spectrum.

## **2.2. Biological analyses**

### *2.2.1. Histo-anatomical investigations*

The plant material studied was represented by two fragments (A - from the icon's support, B - from a fixing pin of the crossbar) of secondary wood that were subjected to a boiling process for approximately nine hours in distilled water, after which were preserved in a mixture of 70% ethyl alcohol and glycerine, in a ratio of 2:1, for 24 hours. The sectioning of the plant material was done with the manual microtome and the botanical razor, and the obtained sections were subjected to double staining with green iodine and Ruthenium red. Observations and microphotographs were taken on the Euromex light microscope with included camera.

### *2.2.2. Entomological analyses*

The wooden support of the icon showed signs of an attack by xylophagous insects. Adult insects were collected from the flight holes as well as sawdust with droppings. Insects were prepared in 10% potassium hydroxide solution, neutralized with 9% acetic acid and rinsed with distilled water. Observations were made by means of Leica MZ7 stereomicroscope with camera.

## **2.3. Tests for the conservation-restoration of the icon**

### *2.3.1. Painting consolidation tests*

Consolidation tests of the detached pictorial layer from the wooden support were carried out with solutions of rabbit glue in various concentrations (5%, 8%, 10%). The major advantage of glue reinforcement is its compatibility

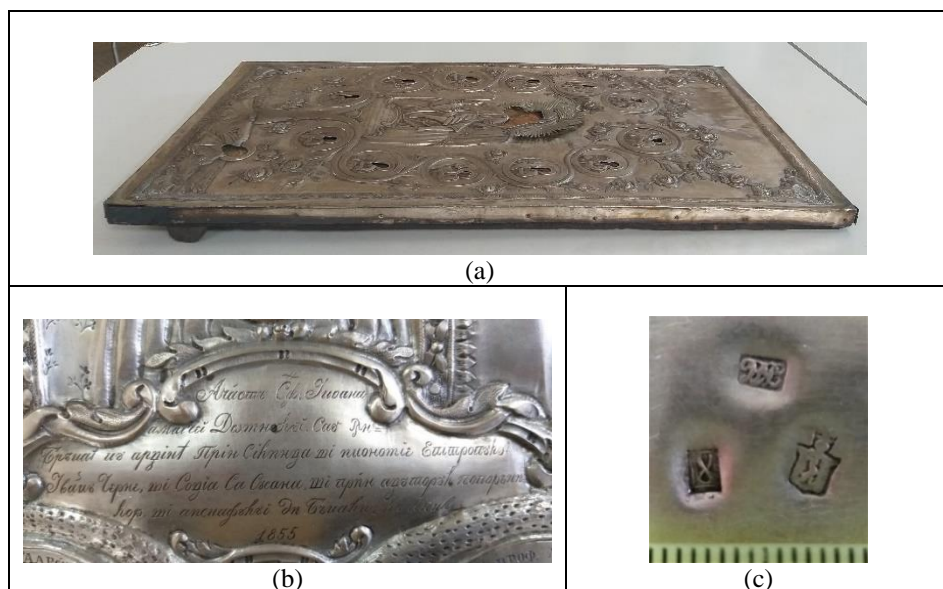
with the original painting, which allows restorers to intervene whenever necessary.

### 2.3.2. Painting cleaning tests

The presence of dirt deposits on the painting of the icon required cleaning tests. Cleaning tests were carried out with aqueous solutions (distilled water, ethanol 10%), with organic solvents (xylene, isooctane) and solutions based on organic solvents (ethanol, isopropyl alcohol, 2-ethoxyethanol, acetone, methyl ethyl ketone, ethyl acetate, dimethylformamide, dimethyl sulfoxide, ethylene glycol) and inorganics (ammonia, formic acid). The substances were used in a liquid state, so as not to leave residues on the painting. Cleaning tests on unpainted wood were done with aqueous solutions of 10% ethanol and 5% potassium hydroxide

## 3. Results and discussion

### 3.1. Description of the silver revetment

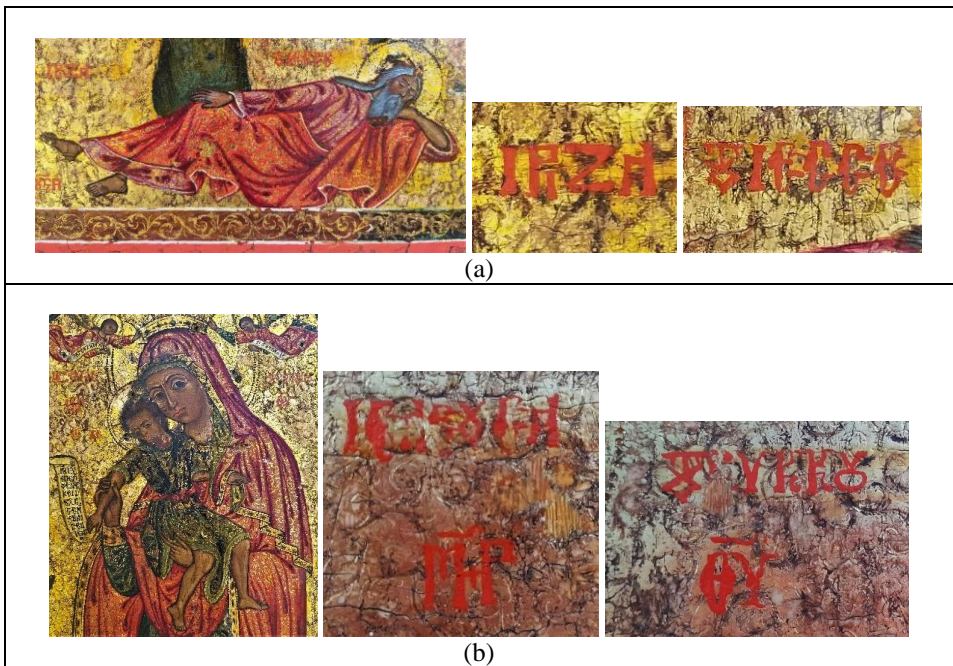


**Figure 2.** (a) Lateral view of icon, (b) the inscription of the silver revetment, (c) goldsmith's mark.

The silver revetment was placed on the icon in 1855, by the worshippers of the church 'Saint Stefan' - the church of the grocers' guild - as can be seen from the inscription incised in the lower part. The inscription is in Romanian, with Cyrillic letters: "This Holy Icon of the Mother of God clothed in silver through the strength and economy of Epitrop Ivascu Cerne, and his wife Susana, and

through the help of the people and the grocers' guild in 1855" (Figure 2b). In the lower left corner, the mark of the goldsmith's workshop can be seen (Figure 2c).

The decoration was made using stamping, repoussé, chiselling, incising techniques. The composition reproduces the Tree of Jesse, with the silhouettes of the Virgin Mary and the Child Jesus in the centre, and with those of the prophets arranged, in medallions, on the branches of the tree. The two branches have the appearance of rose stalk, in a symmetrical arrangement, relative to the central axis of the composition. The scene is framed by a rectangular border with a geometric zigzag decoration. In the corners of the border, decorations combining the palmette, the accolade and the rose leaves were made. The radial halos, with globular crowns and crosses, are separate pieces, added to the icon with the help of nails.



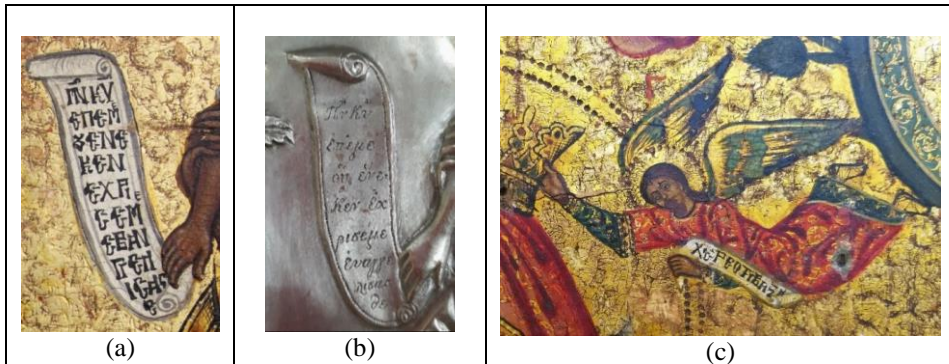
**Figure 3.** Details with the name of the icon: (a) above Jesse sleeping is written 'IPICZ' (the root) and 'TOY IECCE' (of Jesse); b - next to the portraits of the Virgin and Child are written the names 'Eleousa' (Tenderness) and 'MP' (abbreviation of the name Mary), as well as 'tov Kikku' (from Kikku) and 'ΘY' (abbreviation of the name Theotokos)

### **3.2. Painting description**

The icon is a representation of the Tree of Jesse with the Virgin Mary and the Child Jesus, in a simplified version. Although the theme of the Tree refers to the representation of the genealogy of Jesus, in which kings, patriarchs, prophets

of the Old Testament appear, in this icon only the prophets those who announced the coming of the Son of God into the world, are represented.

The Mother and Child were painted on the model of the icon from Kykkos (Cyprus) - a variant of the Eleusa type - in which Jesus is on the right, in a frontal position, with bare feet hanging over the hand of His Mother (Figure 3). Jesus holds in his right hand a scroll on which the text is written: “The Spirit of the Lord [is] upon me, He anointed me to bring good tidings.” (Figure 4)



**Figure 4.** The scroll of Jesus on the painting: (a) in Greek and on the cross, (b) in Romanian, (c) angel with a scroll in hand.

The central axis of the icon is the trunk of the tree, which rises from the sleeping Jesse, and continues with the Virgin Mary with the Child. The other compositional elements are represented symmetrically with respect to this axis: on the Virgin’s left and right are two angels who support her crown and hold in their hands scroll with the message “Rejoice [...]” (Figure 4c); 12 prophets surround it from the sides and at the top, framed, in turn, by symmetrically arranged roses.

The prophets are represented with the signs specific to each one and are framed by medallions with their names and with a verse of praise for the Theotokos: “Rejoice, rod” (Aaron), “Rejoice, key” (Gideon), “Rejoice, candlestick” (Habacuc), “Rejoice, water spring” (Samuel), “Rejoice, ladder of heaven” (Jacob), “Rejoice, door of heaven” (David), “Rejoice, tabernacle” (Solomon), “Rejoice, water difficult to cross” (Jeremiah), “Rejoice, golden censer” (Zechariah), “Rejoice, tree with bright fruit” (Daniel), “Rejoice, boundless room of God” (Zephaniah), “Rejoice, lily with sweet fragrance” (Moses) (Figure 5).

From the inscription located on the left side, at the bottom, we find the name of the iconographer Mihail. The text is written in red letters, on the golden background: “Χειρι του Μηχαηλ ηου του μακαριτι ΚΣΤΗ”, which means “Hand of Michael, son of Makariti K(o)sti” (Figure 6).



**Figure 5.** The medallions with the 12 prophets: (a) Aaron, (b) Gideon, (c) Habacuc, (d) Samuel, (e) Jacob, (f) David, (g) Solomon, (h) Jeremiah, (i) Zechariah, (j) Daniel, (k) Zephaniah, (l) Moses.



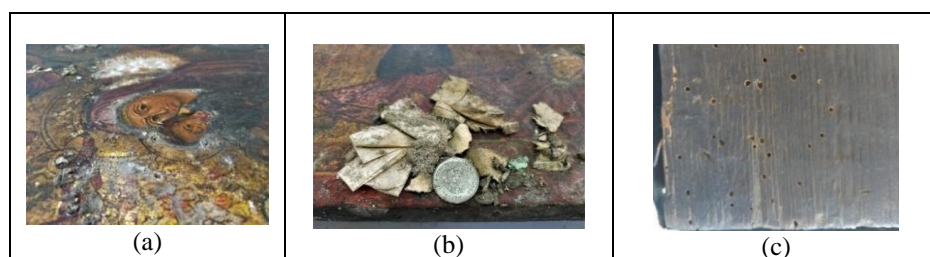
**Figure 6.** The lower left inscription, mentioning the icon painter Mihail, son of Makariti K(o)sti.

### 3.3. Preservation status of the icon

The icon was executed in the tempera technique. The painting was made on a layer of white ground, about 1-1.5 mm thick, fully covered with red bole and, later, with a gold leaf. Layers of colour were applied over the gold leaf,

after which the colour was removed to obtain the decoration of the clothing, the border and the inscriptions on the medallions. The background was decorated over the gold leaf, being printed a spiral geometric pattern, inspired by stalks. This motif, of the stalk, is repeated in several forms: the branches of Jesse's tree are represented as two sinuous wreaths with roses and leaves, and the borders of the icon and the medallions are decorated with leaves.

Macroscopic and microscopic observations revealed degradation of the icon, both on the pictorial layer and on the supporting wood. Over the decades, deposits of dirt, lint, soot, abrasive materials used to clean the silver revetment and which leaked onto the painting, commemoration lists, coins from the 20<sup>th</sup> century have accumulated on the painting, under the revetment (Figure 7 a-b). The ground has a network of ancient cracks. Also, starting from the border, continuing towards the central field of the icon, there are a series of deep cracks, about 0.5-1 mm wide, with a slightly irregular horizontal path. The flesh of the characters has its own network of early cracks.



**Figure 7.** (a) Degradations of the icon: deposits of dirt drained from the oklad on the icon, (b) commemoration lists and coins inserted under the oklad, (c) active attack by xylophagous insects.

The gold and colour layers have undergone a cleaning intervention, as they have numerous lacunar areas, more or less deep. The lower border has numerous scratches. Deep gaps to the wood can be seen in the top, central part of the icon, on the border and in the area of the nails of the oklad.

The wooden support suffered slight deformations over time and cracked due to structural defects. The warping of the panel allowed dirt and bugs to accumulate under the lower crossbar. The wood cracks extended through the entire thickness of the panel as well as into the pictorial layer. An attack of xylophagous insects affected the wood, with flight holes visible, especially on the right of the panel (Figure 7c). The upper crossbar has been lost, probably by ungluing the wooden pegs (the crossbar being attached to the support, not embedded in a sliding channel) (Figure 9b).

### **3.4. Results of physical investigations**

Ultraviolet fluorescence (UVF) examination is a method of surface analysis of paintings to characterize the varnish layer (identification, integrity)

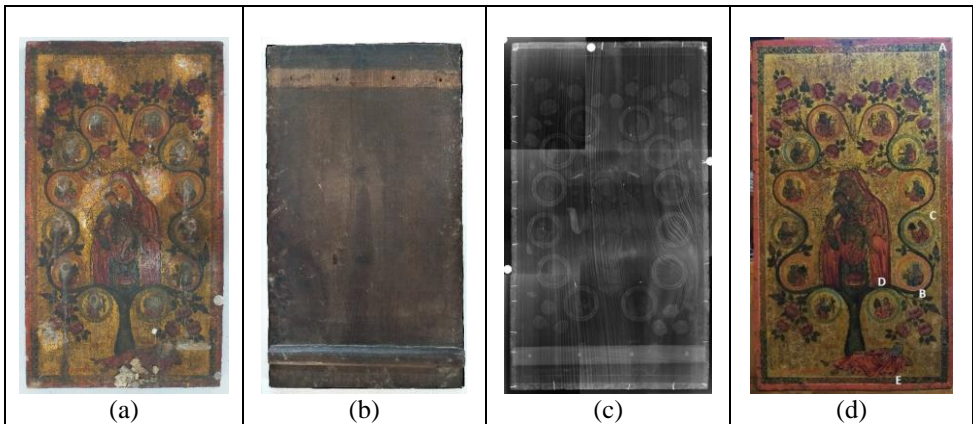


and locate repaintings and touch-ups, which generally lack fluorescence in contrast to the bright appearance of old, original varnishes [5].

Under UV light, it was observed the existence of repaintings made in the lacunae, but also over the original painting. Green areas in the border, from the plant elements in the medallions, appear darker in UV, almost black, which confirm the repainting of the respective areas (Figure 8).



**Figure 8.** Comparative view of the medallion with the prophet Solomon: (a) in visible light and (b) in UV light - the repainting and dirt in the gaps can be seen in dark tones.



**Figure 9.** (a) Icon after the removal of the silver revetment (obverse); (b) the reverse of the icon, before restoration; (c) radiographs of the icon; (d) FTIR analysis points (A - ground, B - green, C - blue, D - red, E - white).

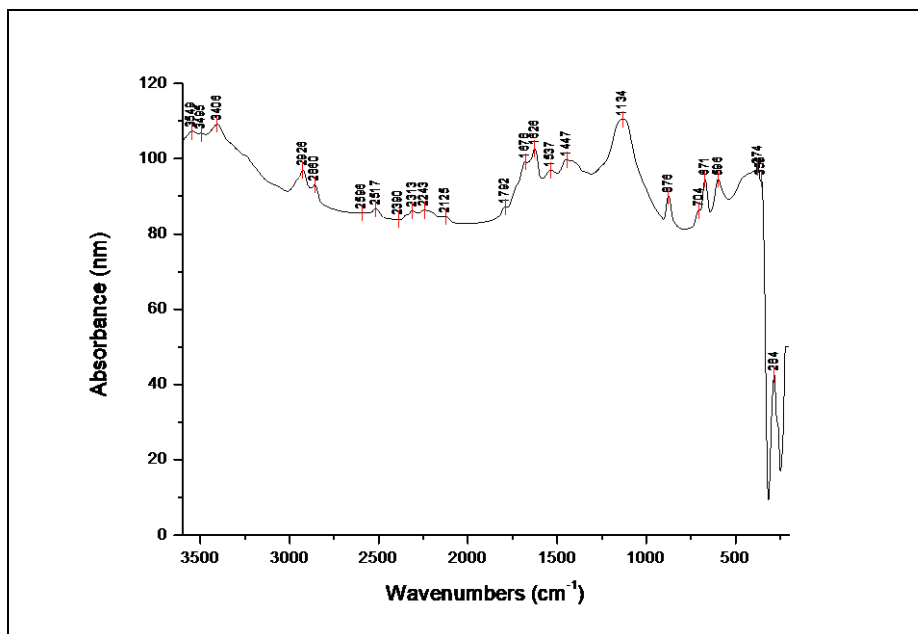
Frequently, radiography is the decisive technique able to show the work of different artists' hands, the state of preservation and past restorations of old panel paintings [6, 7]. The radiography of this icon allowed the visualization of the traces of the metal elements inserted into the wooden support (the mounting nails of the silver revetment). They appear, on film, with the most intense white. Note the number of nails, but also the size and position of those in the side

edges. Over time, several nails were inserted into the upper corners of the icon (two on the left and four on the right), which indicates either a repeated adjustment of the revetment, or the fact that these corners were not well fixed on the wooden support. Also, the radiography showed the irregular arrangement of the wood fibres, on the right side of the panel, as well as the pegs of the lower crossbar (Figure 9c).

### 3.5. FT-IR spectra results

FT-IR analysis was performed in order to investigate the composition of the materials of studied painting (Figure 9d). Study and interpretation of FT-IR spectra were obtained by comparing the experimental results with previous papers and spectral databases [*Spectral Data Base*, Infrared and Raman User Group (IRUG), Edition 2000, <http://www.irug.org>].

Ground. The FT-IR analysis of ground confirms the presence of gypsum (bands at: 3549, 3406, 2243, 2125, 1134, 671 and 596  $\text{cm}^{-1}$ ) with minor quantities of calcium carbonate (bands at: 2517, 1792, 876 and 704  $\text{cm}^{-1}$ ). The bands of proteins can also be observed, confirming animal glue (bands at  $\text{cm}^{-1}$ : 1626, 1537 and 1447  $\text{cm}^{-1}$ , for amide I and amide III, respectively).



**Figure 10.** FT-IR spectrum in DRIFT modality of the micro-sample A taken from a lacuna of preparatory layer in the upper right side of the icon.

FT-IR spectrum in DRIFT modality of sample A (binding media) is presented in Figure 10. The spectrum reveals another organic compound with bands at 2926  $\text{cm}^{-1}$  probably due to aged proteins. These results are in

concordance with other results of FT-IR analysis [8, 9]. The bands of 355 and 284  $\text{cm}^{-1}$  can be attributed to cinnabar found on upper layer.

Green pigment. The presence of the band OH stretching at 3448  $\text{cm}^{-1}$  and the area 1100–900  $\text{cm}^{-1}$  of Si-O stretching lead us to characterize the green earth as celadonite (sample B) [10].

Blue pigment. The characteristic band of synthetic ultramarine at 445  $\text{cm}^{-1}$  [11] appear on FT-IR spectra of blue colour samples (sample C). According IRUG Data Base [<http://www.irug.org>], the presence of proteins is indicated by presence of peaks at 2927, 1646, 1457  $\text{cm}^{-1}$ .

Red pigment. According Vahur the characteristic bands of vermilion (HgS) are: 344, ~282, 266  $\text{cm}^{-1}$ . In this case red pigments have strong bands at 348, 300, 258  $\text{cm}^{-1}$  who indicate probably the presence of vermilion (sample D) [12].

White pigment. A band at 1523  $\text{cm}^{-1}$  indicates the presence of carboxylate group, part of lead carboxylate, forming by reaction of lead white using as white pigment with carboxylic acid part of siccative oil [4] (sample E).

### 3.6. Results of histo-anatomical investigations

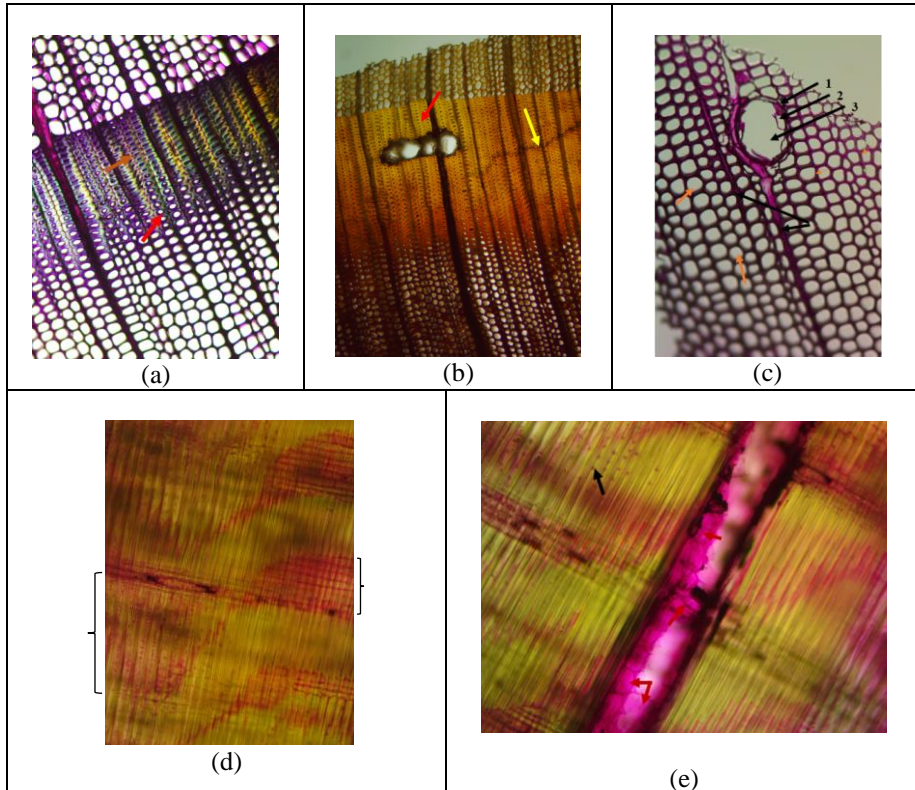
The structural characteristics observed during the histo-anatomical analysis of the cross-sections led to the conclusions that the analysed wood has the structural characteristics of the species *Pinus brutia* Ten. [13-15].

The secondary wood is homoxylous, consisting exclusively of tracheids organized in annual rings (early tracheids dominate quantitatively, each time, representing approximately 2/3 of the total thickness of the annual ring); the transition from earlywood to latewood is abrupt (Figure 11a).

In the walls of the tracheids of the early wood, areolate punctuations characteristic of the species were observed (Figure 11d).

Axial secretory ducts are mainly present in the latewood, with dimensions between 130-200  $\mu\text{m}$ , but they also appear in the early wood, most often isolated. In the analysed specimens, the presence of traumatic secretory ducts was identified in the latewood (Figure 11b). These traumatic ducts, often uneven, with a tendency to merge, constitute defence structures that appear in response to disturbances in the external environment; the fact that they are more than usual indicates their role in the production and flow of oleoresins. Their formation is often associated with the defence mechanism against the attack of some insects, pathogenic fungi and it a possible response by which some individuals have survived at some point strong outbreaks of attack. Thyloid formations are also present. These are epithelial cells that increase in size, do not produce resin, and block the secretory duct, abnormalities that also occur in normal ducts when are disturbing environmental factors [16].

The medullary rays are uniseriate and homogeneous, but in some places biseriate medullary rays also appear, and simple pinoid punctuations have been observed in their walls [13].



**Figure 11.** The structural characteristics of the wooden support of the icon: (a) annual ring of *Pinus brutia*: the tracheids in the vicinity of the early wood have a wider lumen (red arrow) compared to the tracheids formed later, whose lumen is very narrow (brown arrow); latewood tracheids have a slightly rounded outline, with small air spaces, which indicates the presence of ‘reaction wood’ (transverse section through the secondary wood; x 200; double staining with Ruthenium red and iodine green); (b) traumatic type axial secretory ducts (red arrow); the yellow arrow indicates discontinuities in the wood, a sign of its damage (cross-section through the secondary wood; x100; natural colour of the secondary wood); (c) secretory duct in earlywood; pink-stained cell walls indicate absence of lignin (orange arrows indicate earlywood tracheids; black arrows indicate tracheid rays) (transverse section through secondary wood; x400; double stain with Ruthenium red and iodine green); (d) latewood tracheids with uniseriately arranged areolate punctuations (left) and medullary rays (right) (longitudinal-radial section through secondary wood; x100; double stain with Ruthenium red and iodine green); (e) secretory duct (resiniferous): many epithelial cells have become tyloid formations blocking the channel (red arrows), and resin, dark in colour, is present in small quantity; tracheids with areolate punctuations (black arrow) (longitudinal-radial sections through secondary wood; x400; double stain with Rithanium red and iodine green).

Both wood analysed samples (A and B) belong to the same species.

The analysed wood is pycnoxylic type (narrow tracheids and small rays) compact, with an almost exclusive dominance of tracheids, with strongly

thickened and lignified walls and with a parenchyma reduced to only uni- or rarely biseriate medullary rays, with narrow, radially elongated elements.

A particular aspect of the analysed specimens is the different reactions, even within the same section, of lignin and its selective dye, iodine green. Lignin, as a result of the application of iodine green dye, is coloured green (in lighter or darker tones). Cellulose, after staining with Ruthenium red, turns pink. In the analysed wood, the parenchymal cells of the medullary rays and the early tracheids have a purple colour that is probably produced by the interaction of the two dyes used with the cellulose and especially the lignin in the process of destruction; the compounds that copolymerized for lignin genesis (coniferyl alcohol, p-coumaryl alcohol and sinapyl alcohol) are decopolymerized or in the process of decopolymerization.

Another special aspect is the presence of secretory ducts in the earlywood, although, in general, they are mainly found in the late wood. Such a duct has three distinct zones: 1 - tangentially flattened tracheids that form a mechanical sheath to protect the duct, 2 - resin-secreting epithelial cells, 3 - collector channel (Figure 11c).

Within the latewood ring is observed that the tracheids in the vicinity of the earlywood have a wider lumen, compared to the later formed tracheids, whose lumen is very narrow due to the uniform, strong thickening of the cell walls. Also, most latewood tracheids have a slightly rounded outline with small air spaces, which leads to the idea that the wood used for the icon is a reaction wood (to counteract the force of the wind or the effects of a landslide that could lead to damage to tree, they respond by producing a unique type of wood known as reaction wood [17]. This type of wood reflects the tree's attempt to straighten its trunk and branches whose natural orientation has been altered) (Figure 11a).

The cell walls of the tracheids in the late- and earlywood have different colours; although they are sections of the same sample, it can be observed that the lignin has a golden yellow or reddish brown colour, colours otherwise specific to pine, which indicates a variation in the content of the three component alcohols that copolymerize to form this lignin specific to gymnosperms: coniferyl alcohol, p-coumaryl alcohol and sinapyl alcohol. It is observed in Figure 11b the existence of some discontinuities (which are not caused by the mechanical act of sectioning the specimen) which are caused by the different quality of the lignin in the tracheid walls (note the colour of the tracheid walls located above and below these discontinuities). Therefore, the portion from which the specimen was detached indicates that the wooden support of the icon shows signs of deterioration in its strength.

### **3.7. Entomological analysis results**

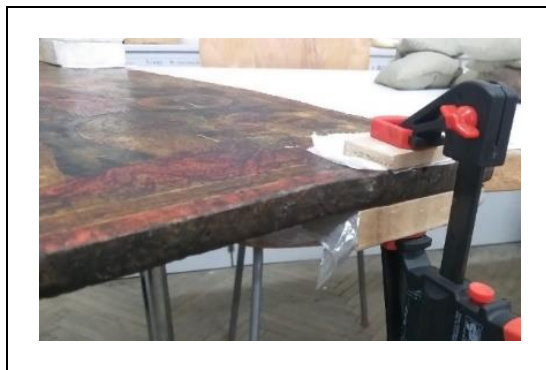
The support of the icon is made of a pine wood board, to which two crossbar of the same essence were attached with the help of eight pegs. The wood was degraded by xylophagous insects of the species *Anobium punctatum*

(Coleoptera, Anobiidae). The surface of the icon, especially on the reverse and on the edges, has insect holes about 1.5 mm in diameter, some of which are filled with fresh sawdust. The light-coloured wood holes, the existence of wet sawdust in the galleries, its accumulation under the icon are the signs of an active attack, which required the implementation of a disinfection treatment.

### **3.8. Conservation-restoration interventions of the icon**

#### **3.8.1. Interventions on the wooden support**

The cleaning of the wood (reverse, edges, lower crossbar) was done by dusting and then by soaking, swelling the dirt with 10% ethanol and removing it with a scalpel. Icon biocide was achieved by injecting and brushing a 2% permethrin-based solution [18]. The insect holes were sealed with slightly reversible putty based on wax and dammar resin. The upper crossbar was redone according to the shape of the lower crossbar. After staining, the crossbar was added on the back of the icon with the help of four beech pegs, fixed in the original holes. The wooden support was superficially impregnated with 15% Paraloid B72 in butyl acetate, for increase mechanical resistance and structural cohesion [19].



**Figure 12.** Consolidation of the icon.

#### **3.8.2. Interventions on the pictorial layer**

The commemoration lists and coins were removed from the painting, after which dust removal was carried out with soft brushes and controlled vacuuming. Consolidation of the painting was done with a 10% rabbit glue solution (Figure 12). The dirt adhering to the surface was removed in stages with distilled water and xylene (Figure 13). The dirt embedded in the varnish was removed using solutions based on ethanol and turpentine (Figure 14a) [20]. Filling the deep gaps in the ground was done with a putty based on chalk and rabbit glue (Figure 14b). The grouts were chromatically reintegrated with the watercolours, through the *tratteggio* method. Finally, the painting was protected with 10% Mastic

varnish (Figure 14c). After the varnish dried, the silver revetment was added using the original nails.



**Figure 13.** Phases for cleaning paint with xylene.



**Figure 14.** (a) Icons after cleaning, (b) grouting and (c) chromatic reintegration.

#### **4. Conclusions**

The icon 'The Tree of Jesse with the Mother of God Kykkiotisa' from the church 'Saint Stefan' - Ticau (Romania) is important for the history of the city of Iasi, by highlighting the close cultural relations between Romanians and Greeks and by preserving historical data related to the parish of Ticau and the grocers' guild in the city. Also, the restoration of the icon allowed bringing back to light the painting, respectively this iconographic theme - extremely rare among Moldovan icons - thus making it possible to disseminate this representation among icon painters and believers.

The research of the icon through physical and biological methods, allowed the dating of the icon by identifying the pigments used, finding out the provenance of the icon by identifying the species of the wooden support, as well as the existence of cleaning and retouching interventions of the painting.

The conservation-restoration interventions carried out aimed at consolidating the icon, stopping the active degradation processes and putting it in value, by cleaning and completing the lacunar areas. The icon was returned to the parish to be worshipped again, to continue the purpose for which it was created.

## Acknowledgement

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