**BRVKENTHAL. ACTA MVSEI** 

XIII. 4

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**MUZEUL NAȚIONAL BRUKENTHAL** 

# BRVKENTHAL ACTA MVSEI

## XIII. 4

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#### BRUKENTHAL NATIONAL MUSEUM IN 2017: A CHRONICLE OF RESTORATION EXHIBI-TIONS AND EVENTS

Dana Roxana HRIB \*

**Abstract:** The present study is a synthetic presentation of Brukenthal National Museum's cultural offer in the field of restoration during 2017.

Keywords: Brukenthal National Museum, restoration, 2017.

**Rezumat:** Articolul de față constituie o prezentare sintetică a ofertei culturale a Muzeului Național Brukenthal în domeniul restaurării, pe parcursul anului 2017.

Cuvinte-cheie: Muzeul Național Brukenthal, restaurare, 2017.

#### Muzeul Național Brukenthal, restaurare, 2017.

In 2017, Brukenthal Museum celebrated 200 years of public activity.

The Bicentennial provided a moment in time to acknowledge the importance of the Museum as the first to be established in Romania. The goal assumed was to coordinate a year-long celebration comprising museum projects and activities along additional events staged by local and national partners.

2017 was dedicated to the long mission in promoting the heritage that the museum carried on up to our days but, it addressed to people, to the general public.

In organizing 2017 Bicentennial Year, the Museum emphasized on the special experience binding museum employees, cultural partners and visitors to the Brukenthal identity – as all of us are beneficiaries of a two hundred years project meant to facilitating access to culture.

## 1. Permanent exhibitions: new permanent exhibitions on the 2<sup>nd</sup> Floor in Brukenthal Palace<sup>1</sup>

Project inside the 2017 Brukenthal Bicentennial program, the works at the  $2^{nd}$  Floor in Brukenthal Palace continued the concept developed during previous years, focusing on the interior atmosphere in the late  $18^{th}$  c. and the early  $19^{th}$  c. along with thematic rooms.

During 2017, were completed the works for the *Library* sector, presenting books from von Brukenthal's original collection (personalized by the von Brukenthal family coat of arms on the cover) as well as books from the collections added to the library in the late 19<sup>th</sup> c.

The project involved the participation of the restoration specialists from Brukenthal National Museum's Restoration Laboratories at all levels employed by the setting of the new exhibition, from conservation and restoration works to curatorial endeavor.

Other refurbishment works addressed to the *Masterpieces of Brukenthal Collection* permanent exhibition; according to the visitor's observations and requirements, the illumination was improved in this sector for a better visibility of the works. The number of exhibits was increased from 23 to 34 as the result of a selection based on the newest research in the European painting collection and the efforts of Museum's restauration laboratories.

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<sup>&</sup>lt;sup>1</sup> The short descriptions of permanent exhibitions are selected from the texts given by the curators (Dorin

Barbu, Dana Hrib, Adrian Luca, Alexandru Sonoc and Robert Strebeli) for public information.

#### 2. Awards

#### \_Brukenthal National Museum won the competition "Together We Save Romanian Cultural Heritage" IFA-CEA

Of the eight pieces participating in the competition, the jury chose the tower clock mechanism from the Evangelical church in Bradu, Sibiu County to be consolidated by ARC-Nucleart, Grenoble, France, the completion of the restoration process to be continued in the Museum's laboratories. Made of wood with iron components, the mechanism was donated to the Brukenthal Museum in 1909 by the parish priest Schuller.

#### \_National Restoration Salon Craiova 2017

Twelve items of the museum's heritage and eight restorers with the Brukenthal Restoration Labora-

tories participated in 2017 at the National Restoration Salon Craiova: Celestina Albişor ("Still Life with Vase" by Christian Berentz, inv1012), Dorin Barbu (jury), Ioan Brai (Blunderbuss Pistol M3263, Mist Pistol M3275), Cristina Fău ("Still Life with Pitcher" by Christian Berentz, inv. 1011), Maria Fota (Church book, no. 206625, Patent, GD33773, Patent, GD33713), Vasile Godici (Chest, M7150), Iulia Maria Pascu (Documentary Graphics "View of Sibiu" GD13695) and Ruxandra Stroia (Leather Bag, M1172, Bag, M5542).

Brukenthal team received the following awards: Cristina Fău – "The Great Prize for Oil Painting Restoration" and Vasile Godici – "Excellence Award for Wood Restoration"!

#### REFERENCES

Dana Roxana Hrib (coord.), Muzeul Național<br/>Brukenthal din Sibiu, Raport Anual 2017http://www.brukenthalmuseum.ro/despre\_noi/rapoarte.htmlDana Roxana Hrib, Brukenthal 2017http://www.brukenthalmuseum.ro/virtuale/evenimente/<br/>Agenda:online source on events:http://www.brukenthalmuseum.ro/index2.php/en/news/<br/>http://www.brukenthalmuseum.ro/index2.php/en/expoonline exhibitions:http://www.brukenthalmuseum.ro/index2.php/en/expo

#### THE NŰRNBERG EGG

#### Dorin BARBU\*

**Abstract:** The Nuremberg Egg owned by the Brukenthal Museum was manufactured at the end of the XVI century and entered our collection in 1900. It was donated by K. Weinhold from Munich. According to the restoration principles, for such a historical mechanism, the conservation of its pieces takes precedence over its functionality (as opposed to watchmaking). This article describes the restoration - conservation operations applied.

*Keywords*: portable watch, Nuremberg Egg, conservation

**Rezumat:** Oul de Nürnberg deținut de Muzeul Național Brukenthal realizat la sfârșitul secolului al XVI-lea, a intrat în colecție în anul 1900 fiind donat de K. Weinhold din München. Conform principiilor restaurării la un astfel de mecanism istoric primează conservarea pieselor și nu funcționalitatea ceasului (ca în ceasornicărie). Articolul descrie operațiile de restaurare – conservare aplicate. **Cuvinte-cheie:** ceas portabil, Ou de Nürnberg, conservare

"Days may be equal for a timepiece, but not for man" Marcel Proust

The watch collection of the Brukenthal National Museum is comprised of a relatively small number of highly valuable and diverse pieces: sundials, tower clocks, wall clocks with pendulum, chimneypiece clocks, table clocks, picture frame shaped clocks, pocket watches and one of the first portable watches – The Nuremberg Egg. The portable watch could be worn in a leather pouch attached to the belt or attached to a chain around the neck.

In 1490, Peter Henlein from Nuremberg manufactured the first small-sized watches by replacing the weights of the then existing mechanisms with steel coiled springs, and in 1504 he produced the first portable ball-shaped watch that could function for about 40 hours (Rațiu 1938, 34). The egg-shaped watch made its debut in the second half of the XVI century; it carried the name "The Nürnberg Egg", so named after the home city of the mechanism's inventor (Meis 1982, 52). The oldest portable watch currently known, which is signed and dated: Caspar Werner of Nuremberg, can be seen in the Wupertal Watch Museum (Oberhänsli 1976, 107).

Watches built before 1660 had a single hand, showing the hour (Koch 1989, 148). Only in 1677 was the second hand, showing the minutes, added (INFOLIFE 2017). The shapes were not the finest possible; the engravers had not yet reached the

height of their craft. Watches with a hammer mechanism often have a cracked back lid, due to the hammer strokes marking the hour (Meis 1982, 55).

The Nuremberg Egg owned by our museum dates from the end of the XVI century and was probably manufactured in a Nuremberg workshop. It entered our collection in 1990, being donated by K. Weinhold from Munich. The oval-shaped watch casing was cast from bronze and gilded on the exterior. It used to have 2 lids; the back lid was already missing when the watch entered the collection. The silver dial, adorned with engraved arabesques, displays roman numerals (the hand was also missing) and is covered by a framed crystal made of rock quartz (according to Mr Ciuntu's analysis report).

Because of the missing back lid, the (incomplete) mechanism had fallen out of the casing; hence some of its pieces are also missing. Dimensions: length 48mm, width 41mm, thickness 14mm. In addition to the mentioned missing parts, the conservation state of its pieces (mechanical products, copper and iron corrosion products) made displaying the watch impossible. This is why I started a documentation process, both here and in the country of origin (Deutsches Uhrenmuseum, Arbeitsgemeinschaft der Restauratoren) since 1999. Similar artefacts were hard to find, due to the fact that only a small number of watches from that particular time period remain, a period when all

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watches were handmade (one of a kind). But according to the restoration principles, for such a historical mechanism, the conservation of its pieces takes precedence over its functionality (as opposed to watchmaking). For the disassembling and reassembling of the mechanism, I turned to the watchmaker Andrei Albert from Sibiu (who volunteered for this project).

The casing and the two brass components of the mechanism were degreased with organic solvents, then immersed in a 20% orthophosphoric acid bath, brushed under a jet of water and neutralized in distilled water, protected through rubbing its surface with a cotton cloth<sup>1</sup> impregnated with a substance that clean and protect. The gears, springs and other components were dusted, degreased and cleaned with the laboratory laser<sup>2</sup> (65 mJ, 10 Hz, 0.6 W) then brushed with a fibreglass pen. Upon

assembly, each piece, including three wheels that had fallen off, was greased with fine watchmaker oil. To make the Egg look like a watch, we had to make the hand (from iron similar to other artefacts we have encountered), the bow of the key, and Mr. Albert manufactured the axle for the hand and a screw for the existing casing on the lathe.

Finally, all that remained was to decide how to display the "Nuremberg Egg", namely under a glass covering. Although the watch was restored a few years ago, it has never before been displayed. This however will change beginning with 18 May 2018, when the museum wing containing "curiosities" will be opened

<sup>&</sup>lt;sup>1</sup> Hagerty - Jewel Cloth – HAG22

<sup>&</sup>lt;sup>2</sup> ArtLight LARYA001.1 by LAMBDA Spa

#### REFERENCES

INFOLIFE 2017	INFOLIFE, <i>Tic-Tac Să măsurăm timpul, Ceasul!</i> , 4th martie 2017 http://infolife.ro/diverse/tic-tac-sa-masuram-timpul/ accesed in 30.04.2018
Deboule 2013	Jean Baptiste Deboule, <i>Pendant watch c. 1630</i> , Geneva, - Mathematisch-Physikalischer Salon 2013, Dresden - DSC07901.JPG
Koch 1989	Rudi Koch, Uhren und Zeitmessung. BI-Lexicon, Leipzig, 1989
Meis 1982 -	Reinhard Meis, Taschen Uhren, von der Halsuhr zum Tourbillon, München, ed. Callwey
Oberhänsli 1976	Heinz H. Oberhänsli, Uhren von einst bis heute, Ch, Spreitenbach, 1976
Rațiu 1938	Ioan Rațiu, Tehnica și Arta ceasornicarilor, giuvaergiilor, țintuitorilor, gravorilor și opticienilor, Cluj, 1938

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1. Front side before restoration



2. Back side and mechanism



3. Mechanism Detail before restoration 4. Mechanism Detail before restoration





5. Mechanism Detail after restoration



6. Mechanism Detail after restoration



7 Parts detached from mechanism



8. Left out parts after restoration



9. Analogy, Oberhänsli 1976, p 110



11. Front side after restoration



13. Front side after restoration



10. Analogy, J.B. Deboule



12. Back side after restoration



4. Back side after restoration



15. Watch exhibited under a glass covering

#### A 1787 DOCUMENT ON PARCHMENT. MACROSCOPIC AND MICROSCOPIC APPROACH

Polixenia Georgeta POPESCU \* Iulia-Maria PASCU\*\* Ruxandra-Ioana STROIA\*\*\*

**Abstract:** The article presents the study results of a parchment document (pharmacist's diploma) from the collection of memorial objects of the Brukenthal Museum Sibiu - Museum of Pharmacy History. At the macroscopic and microscopic level were identified, highlighted and to the extent of possibilities assessed: the state of preservation of the document, some features of the constituent materials and the artistic technique of engraving that ornamented the document. The results of the study were subsequently used in its conservation.

Keywords: diploma, heritage object, parchment, engraving technique, conservation, optical microscopy.

**Rezumat:** În articol sunt prezentate rezultatele studiului efectuat asupra unui document pe pergament (diplomă de farmacist) din colecția de obiecte memoriale a Muzeului Brukenthal Sibiu- Muzeul de Istoria Farmaciei. La nivel macroscopic și microscopic au fost identificate, evidențiate și în măsura posibilitaților evaluate: starea de conservare a documentului, unele caracteristici ale materialelor constituente și tehnica artistică de realizare a gravurii care ornamentează documentul. Rezultatele studiului au fost ulterior utilizate în interventiile de conservare ale acestuia.

*Cuvinte-cheie:* diplomă, obiect de patrimoniu, pergament, tehnică de gravură, conservare, microscopie optica

#### A. Introduction

The 1787 document on parchment "Friedrich Schuster Pharmacy Diploma" from the year 1787, with inventory number F 3404, is part of the Museum of Pharmacy History collection of university diplomas. The collection includes a number of nine university diplomas from the field of healthcare, medicine and pharmacy (diplomas of a pharmacist, master and doctor, doctor in medicine diploma) issued between 1787-1892, from various prestigious universities: Vienna, Pesta, Gratz, Innsbruck, Cluj. Eight of the university diplomas from the collection are on parchment, handwritten or printed in Latin and are validated by the seals of the issuing universities.

The Pharmacy Graduation Diploma issued on behalf of Friedrich Schuster in 1787 by the University of Pest (now part of Budapest) in Hungary, is a manuscript document in Latin on parchment. It is ornamented in the printing technique of engraving. The holder data are completed manually with ink. The diploma is validated by the university pendent seal, cast in red wax and protected in a wooden skippet. The seal is linked to the diploma by a two-color textile cord (Fig.1,2). The pharmacist Friedrich Schuster, the holder of the diploma that is under the present study, inherited in 1802 the pharmacy located on the ground floor of a building constructed in the Small Square, over the Ocnei street, from his father, Johann Gotlieb Schuster (native of Warenbuck, Saxony) who founded in 1762 the fourth pharmacy in Sibiu named "La Coroana" (Roth 1970, 330-331).

## **B.** Argumentation regarding the artistic technique of achieving the diploma ornamentation

The decorative elements of the diploma, namely the border executed in lines with vegetal details, the ornamented letter of three-lines height, framed, also, in a border with floral ornaments at the cor-

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ners (Fig.3), the first three lines of text, two with ornate letters, one with cursive letters, the central coat of arms with the presence of the bicephalous eagle with open wings holding the sword and the scepter were made through printing. A specific intaglio<sup>1</sup> process was used in this case, namely the process of engraving<sup>2</sup>. The marks left () showed the typical features of this process (Maltese 2009, 281) with parallel and orderly cross-hatching lines that gave the diploma a rigid, austere, formal appearance. Another recognizable feature was the extreme clarity of line edges that begin, and eventually end, with a pointed end (Fig. 4 Fig. 25a). The line was modulated; the black value was actually proportional to the width and depth of the incisions in the plate and could vary in intensity (darker or translucent gray) depending on the amount of ink it contains.

The printing of the diploma was done on parchment<sup>3</sup>. This was a suitable support material for important documents (parliamentary documents, certificates, legal documents, and diplomas), *devotionalia*, commemorative prints, or artwork due to time durability, nice appearance, reusability, the preciousness of the material and the compatibility with printmaking (Stijnman 2012).

During the diploma printing process, the damp parchment was compressed against the plate, creating an embossed frame that reflects the edge of the plate. This three-dimensional characteristic, considered as a distinctive mark of an authentic intaglio prints (Ellis 2017, 70), was visible, as can be seen in the picture (Fig.5).

The text with official form regarding the diploma holder - Fredericus Schuster - who was granted the academic achievement recognition, the enumeration of the selection board (Gabriele de Vezza, R. A. Mattis, Georgio Stahli, Iacobo Iosepho Winterl) and the ascertainment of date (die 12 Mensis Octobris.....Anno Millesimo Septingentisimo Octvagesimo Septimo [Fig.6]) was written with cursive penmanship in dark brown ink, displaying a neat calligraphy with aesthetic valence. The diploma presented in the inferior area the ornate validation signatures. Ink, in this case, was light brown (Fig.9).

### C. Diploma characterization and conservation status

#### C. 1. Description

The pharmacist diploma, with inventory number F 3404, had a rectangular shape with the following dimensions: height 500mm width 700mm. The thickness measured at several points was variable and had values between 0.18-0.3mm. On the surface of the parchment, front and the back of the diploma, at two different points, the pH was recorded, having the values of 7.8-7.6 respectively  $7.9-7.6^4$ .

The parchment, the supporting material of the diploma, does not show any obvious defects. The color is white-yellow, matte; the preparation surface is slightly slippery, without any roughness. The finishing quality is better on the diploma's front side compared to the back side.

The lower edge of the diploma shows a 24mm wide folded-up section (plica<sup>5</sup>) where the pendand seal<sup>6</sup> is attached (Fig. 8). The seal is protected by a

<sup>&</sup>lt;sup>1</sup> Intaglio is the general term for all printing processes using metal plates with active surfaces that hold ink, incised, manually, mechanically, and chemically, and neutral surfaces that do not receive ink (Ward 2008, 547-548).

<sup>&</sup>lt;sup>2</sup> Engraving is the printmaking technique that involves incising the polished surface of a metal plate (mostly copper) in such way as to be able, when loaded with ink, to create through compression of paper, parchment or other suitable printing support an exact representation of the design. The distinctive marks of engraving, represented by elegant, high-quality lines with a clean edge, modulated, at different angles, are hand-made with a square or diamond configuration instrument with a wooden, mushroom shape handle, called burin. The applied pressure on the instrument at the time of engraving dictates the amount of ink that can be stored by the incised line. (Olteanu 1992, 59).

<sup>&</sup>lt;sup>3</sup> Parchment has been widely used as a support material for manuscripts but also as binding material. Generally, for the manufacturing of parchment, animal, calf, goat and sheep skins are used. After cleaning and soaking in a limestone bath, the soaked skin is stretched on a frame to dry. Simply stretching and drying determines the structure of the skin's fibre to settle in a stable, stretched and compact condition. The result is a thin, flat and rigid skin. The surface is normally treated with an abrasive material such as pumice stone to obtain a certain texture. Various fillers, such as chalk dust or gypsum, are applied to bleach the skin and create a responsive surface for paint and ink (Dignard and Mason 2018).

<sup>&</sup>lt;sup>4</sup> Measurement was performed with surface, electronic pH meter, FT11 (Electronic Meter for pH value)

 $<sup>^{3}</sup>$  *Plica* the reinforcement of the lower edge obtain through folding the bottom of the sheet from a document where is fixated the cord of the seal. (Olteanu 1992, 284)

<sup>&</sup>lt;sup>6</sup>Pendant seal - seal made of wax and attached to the document with the help of a cord. The binding system consists of the respective folded-up section - of the

round-shaped skippet made of linden wood in which the red wax has been poured, afterwards the matrix with the legend "*FACULTAT MEDICAE REGIA UNIVERS. HUNGAR*" and the graphic emblem<sup>7</sup> of the Faculty of Medicine of the University of Pest have been applied. The seal is connected to the document with a twisted cord made of two yellow and black textile threads. The cord thickness is 2-2.5mm.

#### C.2. Condition report

The diploma was kept in a storage facility, under unstable microclimate conditions, with significant fluctuations in temperature and humidity, without light source. It was protected by a cardboard folder and covered with Japanese paper tissue (Fig. 9). Both the parchment and the folder were damp.

It was found, at a first analysis that the document originally was in a folded form (the presence of the folding lines, indicating this). Because of this fact, on the reverse of the diploma there were two large, darker areas on which an uneven layer of soiling (dirt embedded into the support) was observed. Areas that were, at one time inside the folded document, do not show this soiling because they were protected. We could get an idea of the document folding. In the restoration laboratory, the diploma entered into an unfolded levelled state (this form had the advantage that it was easier to handle the document and access to the information), probably, form obtained after a previous conservation treatment, about which there was no recorded information.

### C.3. Physico-mechanical, physicochemical and biological degradation

Besides the folding lines, the parchment support, also, had planar deformations in extended areas, where were identified sections with visible shrinkage of the support, and sections where cockling occurred due to high humidity. There have also been found deposits of uneven soiling and accretion, different hues stains of unknown origin, tide lines. We noticed the reduction of text legibility in certain areas. Ink signature validation was discolored. The wood of the seal casing exhibits insect exit holes. The wax seal is cracked and has deposits of dust and dirt. The seal cord showed small tears with and without loss of material (Fig.10-19).

#### D. Optical microscopy study of the parchment paper support document: pharmacist diploma Fridric Schuster, inv. F 3404

The study by optical microscopy of the document aimed to identify and / or confirm the nature of the constituent materials of the object: the support material (parchment) and the textile fibers of the cord, by which the validation seal is related to the diploma, the highlighting of the surface of the document (the particular aspect of the parchment), particularities such as printing and writing (structure of the printed and written surface, ink transfer capacity), as well as aspects related to the artistic technique (the aspect of the graphic lines that confirm the engraving technique by which it is ornate the document). The study by optical microscopy also aimed at highlighting the morphology (structure) of the parchment and its morphological imperfections, identifying the degradations and assessing them. The surface of the document was investigated by optical microscopy in various selected areas for obtaining as much relevant information as possible (Fig. 20). The optical microscopy study was conducted in direct light and ultraviolet (UV abbreviated) light, both of which are adjustable at various microscope readings<sup>8</sup>, from twenty times (20x) to one hundred and sixty times (160x) the obtained micrographs (images captured from the microscope), being further processed to make the relevant details as visible as possible. The examination of the heritage object was done with a Leica S8 APO stereomicroscope with a 600x magnification, equipped with a digital image acquisition system (Leica DPC 290 digital camera) and a dedicated software for acquisition, archiving and image analysis.

## **D.1.** Optical microscopy study of document support.

The surface of the document was investigated nondestructively, without being conditioned (processed). The magnification given by the laboratory's stereomicroscope allowed the relief of the support to be highlighted. The same area of the document support surface (parchment) was examined gradually, at different microscope data, the surface being analyzed in this way in detail. At a magnification of twenty times (20x), the

lower edge of the document, parchment tags, cords or laces that attached the skippet to the document (Olteanu 1992, 329).

<sup>&</sup>lt;sup>7</sup> Graphic emblem - printed mark on the support surface of a deed made of wax, ink, gold or smoke solution, after the applying of the sealing matrix. (Olteanu 1992, 26)

<sup>&</sup>lt;sup>8</sup> The total magnification of the microscope (magnification) is equal to the magnification of the lens and eyepiece.

measured diameter of the circle in the microscope field is thirteen millimeters (13mm), while at a magnification of one hundred and sixty times (160x) the diameter is one and a half millimeters 5mm). Thus, the area visualized in the field of the microscope (the area of the surface of the object) and the area of the circle disc is one hundred thirty-two comma seventy-three millimeters square (132.73mm<sup>2</sup>) for a twenty (20x) one comma seven millimeters square (1.7mm<sup>2</sup>) for a magnification of one hundred and sixty times (160x).

### **D.1.a.** Microscopic analysis of the surface of the document parchment

The microscopic analysis of the relief of the parchment support surface of the document, exemplified on the top right (inside the border), both on the front side and on the reverse of the diploma, in the same place, allowed the comparative study between the details highlighted on both sides of the document. The comparative qualitative assessment of the corresponding areas of the studied (front side and reverse) surfaces of the diploma was achieved by joining the obtained micrographs (at similar microscope and similar light data) and comparing the images (similarly analyzed images) obtained between them. The comparative study of similar areas on the surface, on the front side and on the reverse of the document, in direct light, at stereomicroscope magnification from twenty times (20x) to one hundred and sixty times (160x) was possible due to the flatness of parchment surfaces in the areas analyzed, allowing for a correct assessment without the need for surface conditioning (Fig. 21). From the obtained images, the two analyzed areas show a characteristic relief for the parchment<sup>9</sup>, similar colors, a velvety appearance and no obvious defects. Ascertained facts let us affirm that the parchment is well processed and of good quality. In general, the obtained images are similar and the aspects revealed by them indicate a good conservation status of the analyzed surfaces (no exfoliation or degradation caused by cumulative factors: physical, chemical, biological) are visible. In conclusion, the parchment is finished on both sides and is uniform. The surface of the document's front side has a greater fineness due to the preparation (base) for writing. The microscopic evaluation of the surface of the parchment-support of the document did not allow the determination of the species of animal used for parchment processing (usually the parchment is made from the

skin of the animals: calves, lambs). In microphotographs, the arrangement of the hair follicles is not visible, as it is the clear element of identification of the animal species from which the parchment is made. We can assume that the lack of traces of hair follicles is an argument that advocates for the good quality of the backing of the document and for the fact that it was finished on both sides. Generally, the recognition of the animal species in the case of parchment on the basis of histological features of the skin is rarely possible through optical microscopy because the structure of the reticular layer is modified during the process of processing the parchment. The identification of the animal species through optical microscopy in the case of parchment is possible only in "lucky" cases, in which the hair follicles or the corium<sup>10</sup> fibers and blood vessels can be distinguished.

## **D.1.b.** Optical microscopy investigation in ultraviolet light of the parchment-support for the visualization of compositional homogeneity

The small thickness of the supporting parchment of the document allowed the investigation by optical microscopy in ultraviolet light to visualize the composite homogeneity of the parchment (structure) and the microscopic conservation status of the parchment, as well as the visualization of the morphological imperfections of the parchment (holes, bleeding). The result of document support texture analysis, possible by highlighting its structural details, following the optical microscopy study with ultraviolet (UV) light, at elevations starting twenty times (20x) and going up to one hundred and sixty times (160x) (Fig. 22), allowed us to confirm that the material of the support of the analyzed document is parchment (as it appears from the Object Record Sheet). In the details (photomicrographs) obtained in ultraviolet light is visible the structure (morphology) of the support of the analyzed document. In ultraviolet light at a magnification of one hundred and sixty times (160x) the fibers of the support, the fibers of collagenic material. characteristic of the parchment, are visible (fibers from the collagen fiber network are visible, giving the skin the appearance of particular parchment). Bv comparison with the images available in the literature, the results of the optical microscopy study were confirmed (Badea 2012, 99). At microscopic level, we can appreciate that the

<sup>&</sup>lt;sup>9</sup> Collagen is the determinant protein in the parchment structure (over 95%).

<sup>&</sup>lt;sup>10</sup> Corium, also called, derma, dermis. The deep inner layer of the skin, beneath the epidermis, containing connective tissue, blood vessels and fat (Collins Dictionary 2018)

conservation status of the parchment is good, and there is no visible damage that affects the integrity of the native collagen structure. The lack of visible microscopic damage to collagen in parchment (collagen material is stable) due to aging of the material is an argument for the good condition of preserving the parchment of the analyzed document.

A parchment may present "defects", morphological imperfections, visible as orifices, venous and bleeding. The fact that such negative isolates have been identified is an argument in favor of the conclusion that the supporting parchment of the analyzed document is a good quality parchment.

The study by optical microscopy in ultraviolet light also allowed to highlight some morphological imperfections of the parchment, namely holes and bleeding. When microscopic analysis of the surface of the document's backside in the writing area with dark brown ink, under the letter m (juramenti), at a magnification of forty times (40x) in direct light an orifice could be observed. Compared to the images available in the literature<sup>11</sup>, it can be considered a "flaw" of the parchment. The microscopic appearance at a magnification of forty times in ultraviolet light (40x UV) better outlines the presence of this morphological imperfection (Fig. 23).

In the microscopic analysis of the surface of the front side of the document in the area above the lower writing, another morphological imperfection ("defect") of the parchment was visible, namely an inclusion, a filiform sign of dark color present in the structure of the parchment, clearly visible in the light ultraviolet (UV). By referring to the available microscope images in the literature<sup>12</sup>, it has a similar appearance to hair follicle bleeding. In the photomicrographs of (Fig. 24) in direct light and ultraviolet light at a magnification of one hundred times (100x and 100x UV) the identified "bleeding" is revealed.

## **D.1.c.** Microscopic analysis of printed and written surfaces.

The structure of the printed and written surface, the transferability of the ink, some aspects related to the artistic technique (the graphic lines for confirmation of the engraving technique) were also the objective of the optical microscopy analysis. It was subjected to the microscopic observation of the surface of the parchment support, on the front

side of the document, in the upper area at the edge of the print, next to the "arrow" in the middle of the ornament. At a magnification of twenty times (20x) in direct light in the photomicrographs, the graphical lines that allow identification and / or confirmation of the engraving technique which ornaments the document (Fig. 25a) are well documented.

The microscopic aspects in direct light and ultraviolet light at a magnification of one hundred and sixty times (160x and 160x UV) Fig.25b and Fig.25c allow visualization of the parchment structure in the ornate area of the document black, the thickness of the layer black ink and assessing its degree of stability. The black ink with which it is ornamented in the top of the diploma retained its color and did not migrate to the depth of the parchment support of the document.

The brown-light ink that is written in the lower part of the document in the letter G area has lost its color intensity but is stable and has not penetrated the parchment support. The thickness of the ink layer is small. The superficial ink layer can be viewed at a microscopic level in details obtained at a magnification of forty times in direct light (40x) and in ultraviolet (40x UV) light (Fig. 26a and 26b). At a magnification of one hundred and sixty times in direct light (160x) and in ultraviolet light (160x UV), the appearance of the ink layer is more clearly revealed, and the structure of the parchment is visible (Fig.26c and 26d).

#### D.1.d. Microscopic analysis for highlighting and evaluating support degradation and correlating macroscopically visible aspects with the details revealed by the optical microscopy study

Optical microscopy has been subjected to two areas of the obverse surface of the document, in which visual (macroscopic) degradations were observed for the purpose of microscopic evaluation.

The first area was the one above the lower part of the writing, with stains of unknown nature. In the photophotographs made in direct light and in ultraviolet light at a magnification of forty times (40x and 40x UV) (Fig. 27 a and 26 7), stains on the surface of the parchment could be observed and that they did not affect the stability structural support. In photophotographs made in direct light and ultraviolet light at a magnification of one hundred and sixty times (160x and 160x UV) (Fig. 27c and 27d), it is clearly visible that the stains did not penetrate into the depth of the support, this

<sup>&</sup>lt;sup>11</sup> Dumitrescu G., Badea E. (coord)., 2015, p. 44, fig.5c

<sup>&</sup>lt;sup>12</sup> Dumitrescu G., Badea E. (coord)., 2015, p. 44, fig.5b

degradation being one surface, which does not affect the stability and structure of the support.

As far as the brown stains, on the surface of the document's back, in the lower right-hand area under the writing, the microscopic aspects indicate that it penetrated the depth of the parchment support, affecting its structure. This can be seen in details obtained in direct light, especially in those obtained in ultraviolet light, at forty times (40x), one hundred times (100x) and one hundred and sixty times (160x). Fig. 27, a, b, c, d.

## **D.1.e.** Optical microscopy study of the textile cord linking the document seal

The Optical Microscopy study allowed the identification of fibers from the textile threads of the cord linking the document seal. In the first phase the cord and the top of the cord were studied in direct light Fig. 29 and Fig. 29b, Fig. 30a and Fig. 30b and in ultraviolet light Fig. 29c and Fig. 29d and Fig. 30c and Fig. 30 d, the details visible at a magnification of one hundred sixty times (160x), giving an orientation on the nature of the textile yarn, which has the appearance of wool varns. For confirmation, samples were taken from the textile threads of the cord and the threads of the top of the string. From these, microscopic preparations were made in a neutral solution. Microscopic preparations made of black textile varns and those made of yellow textile yarns have allowed the identification of the nature of the fiber, based on its longitudinal appearance observed under UV light microscope. The visualized microscopic aspects (the appearance of textile fibers in a neutral solution) in ultraviolet light at a magnification of one hundred and sixty times (160x UV) allowed the fibers to be identified as wool. The processing of the obtained photomicrographs allowed a clearer emphasis to be drawn on the characteristic details (external appearance of the individual fibers) of the fiber mass of the microscopic preparations. The appearance of the fibers was compared with the standard images of the wool yarn longitudinal sections, which are available in the literature. Thus, it could be concluded that the textile threads of the seal are of the wool type. The microscope appearance of the sewing thread's textile yarns is consistent with their age, the identification characteristics of the individual fibers not clearly outlined (the wear of the "scales" from the outside is visible).

D.1.f. Conclusions of the study by optical microscopy.

Optical microscopy, non-destructive imaging technique has proven to be very useful for obtaining information that has allowed:

- identifying the nature of the constituent materials of the document, identifying the threads of textile threads by which the seal is attached to the diploma.

- confirmation of the nature of the constituent materials of the analyzed document, respectively of the parchment as the constituent material of the document support, by: highlighting the surface relief (namely visualizing the particular aspect of parchment) and by highlighting the structural, structural (by visualizing the fibers of characteristic collagenic material parchment).

- highlighting the general characteristics of the parchment (finesse, matte appearance of the surface).

- the microscopic evaluation of the visible macroscopic degradation and the assessment of the microscopic preservation state of the parchment (evaluation of the deterioration of the collagen structure), as well as the identification of the morphological imperfections ("defects") of the parchment.

- highlighting some features of inks and inscriptions on the document's back.

- highlighting some aspects that allow the identification and / or confirmation of the engraving technique.

#### E. Conservation treatments and storage

Conservation also involves documenting and researching. In this regard, literature reference were consulted with the general themes that deal with the materials and the execution techniques of this type of objects, the degradations and the factors that influence them, the conservation materials used and the applied conservation methods (Dumitrescu, Badea, 2015; Caring for collection 2014; Jordan 2011, 47-49), as well and references that exemplify case studies, treatments of objects similar to the diploma to be conserved (Benedek 2012, 150-152; Beöthyné, Kissné, Érdi, Orosz 2013, 189-203; Beöthyné, et al. 2013, 179-187).

#### E.1. Treatments

The purpose of the treatments applied to the document was to bring it to a stable conservation state by eliminating the surplus water by slow drying. In the studio of the restoration laboratory, the thermohygrometric parameters were maintained at a balanced level T =  $16-18 \circ C$  and UR = 40-50%.

Solubility tests were done in the writing areas to see if the ink used was soluble. Also, solubility tests were done on colored cords. Both tests were negative. The interventions were carried out in accordance with the "minimum intervention principle".

The document was placed on a suitable support and was cleaned dry both on the front side and on the back side. This operation was performed using a scalpel and soft brushes to remove the accretions from the support, poorly bonded to the surface. Knowing the risk of performing an aqueous cleaning for a wet parchment, it was considered that this operation is not necessary. The wet document was placed between sheets of blotters, non-woven polvester film and boards. The press was mild, balanced, with light marble weight  $(250g / 100 \times 50 \times 100 \times 1000 \times 10000 \times 1000 \times 1000 \times 1000 \times 1000 \times 1000 \times 10000 \times 10000 \times 10000$ 20mm). This type of press was made for the following reasons: because a strong press makes the parchment transparent, the thickness of the document is not uniform, and we have to keep track of the plate mark. The drying process was carried out slowly, over time, under constant control.

There was no treatment to remove stains, for there was a risk of deterioration of the parchment. It is important to keep traces of use, signs of the history and length of the document for further research.

The skippet, the seal and the textile cord have been cleaned dry and damp with distilled water without being detached from the piece.

At the time of pressing, they were protected by cutting around the materials used in this operation (blotters, non-woven polyester film).

There was no attempt in closing the exit holes on the edge of the seal housing.

#### E. 2. Storage

Proper storage of heritage objects increases their life span. The composite nature of the document parchment, ink, wood, wax and textiles, determines that its storage will encounter certain difficulties. To reduce the risks, it is necessary to implement appropriate values of the thermohygrometric parameters in the storage facility so that they oscillate between the recommended limits. Parchment has an extreme sensitivity to humidity variations, which can cause major changes in size and and the occurrence of stress factors within the material support of the diploma and, also, at the contact level of the area between the support material and the ink layers. For this reason it is essential that the document is kept in a stable atmosphere, with temperature conditions between 16-18  $^{\circ}$  C, and a relative humidity of approximately 40-50%, combined with a light intensity below 50 lux and an adequate air filtration system to avoid dangerous dust accumulation. It is also important to periodically check these objects every 3 months.

For the protection of the object, a preservation cardcardboard folder was made in which the document was placed between two sheets of Japanse paper.

## E. 3. Photographic documentation of the diploma

A Sony camera with a Canon lens of 70-200 mm was used. The original photo was subsequently digitally processed to highlight the degradation of this heritage object.

The document was photographed on the front side and on the back side, establishing some areas of interest in correlation with the degradation patterns, macroscopically identified.

After the conservation treatments, photographs were taken in the same areas of interest to monitor any possible changes.

**Note:** The authors' exclusive contributions are as follows:

- Polixenia Georgeta Popescu, "Optical microscopy study of the document with the support of parchment material: pharmacist diploma Fridric Schuster, inv. F 3404 "and Atlas of Microphotographs (Figures 21 -30).
- Iulia-Maria Pascu, "Argumentation regarding the artistic technique of achieving the diploma ornamentation"
- Ruxandra-Ioana Stroia, "Diploma characterization and conservation status" "Conservation treatments and storage" and "Photographic documentation of the diploma" (pictures 1-19).

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#### REFERENCES

Badea, 2012	Elena Badea, Dorte V. Poulsen Sommer, Kathleen Mühlen Axelsson, Renè Larson, Alexandra Kurysheva, Lucreția Miu, Giuseppe Della Gatta, <i>Damage Ranking of Historic Parchement: From Microscopic</i> <i>Studies of Fibre Structure to Collagen Denaturation Assesment by</i> <i>Micro DSC</i> ,e-PRESERVATIONScience, 2012, 9, p. 99. ISSN 1581- 9280 web edition.		
Benedek 2012	Éva, Benedek `Restaurarea scrisorii de privilegii a orașului Miercurea- Ciuc, dată de principele Transilvaniei Mihaly Apafi în anul 1670`, <i>ISIS</i> , Haáz Rezső Múzeum, Hargita, 2012		
Beöthyné, et al. 2013	Beöthyné Kozocsa, Ildikó Kissné, Bendefy Márta, Érdi Marianne, Orosz Katalin, 'Structura pergamentului și a pielii netăbăcite, calitățile și degradările specifice ale acestora, din punctul de vedere al restaurării obiectelor muzeale' <i>ISIS</i> , Haáz Rezső Múzeum, Hargita, 2013		
Beöthyné, Kissné, Érdi, Orosz 2013	Beöthyné Kozocsa, Ildikó Kissné, Bendefy Márta, Érdi Marianne, Orosz Katalin, 'Posibilitățile restaurării obiectelor din pergament și piele netăbăcită; consecințele tratamentelor de restaurare asupra obiectelor de artă' <i>ISIS</i> , Haáz Rezső Múzeum, Hargita, 2013		
Caring for collection 2014	<i>Caring for your collections: Parchment documents</i> (2014) [PDF] retrived data from http://www.slq.qld.gov.au/resources/preserving-collections [accessed 20/9/2018]		
Collins Dictionary 2018	Harper Collins, <i>Collins Dictionary</i> London, [website] (2018), retrived data from www.collinsdictionary.com, [accessed 1/10/2018]		
Dignard and Mason 2018	Dignard, Carole and Mason, Janet 'Caring for leather, skin and fur' <i>Preventive Conservation Guidelines for Collections</i> , [website] (2018), retrieved from https: www.canada.ca [accessed 1/10/2018]		
Dumitrescu, Badea 2015	Gabriela Dumitrescu (coord.), Elena Badea (coord), Pergamentulo poveste, fața nevăzută a documentelor pe pergament emise de Cancelaria domnească în vremea lui Ștefan cel Mare, Editura Excelența prin cultură, Bucuresti 2015, ISBN 978-606-93840-1-5		
Ellis 2017	Ellis, Margaret Holben, The Care of Prints and Drawings, Revised Edition, New York, Rowman & Littlefield, 2017		
Jordan 2011	Tammy Jordan `Using Magnets as a Conservation Tool: A New Look at Tension Drying Damaged Vellum Documents` <i>The Book and Paper</i> <i>Group Annual</i> 30 (2011) [PDF] retrived data from https://cool.conservation-us.org/coolaic/sg/bpg/annual/v30/bp30- 06.pdf [accessed 23/9/2018]		
Maltese 2009	Maltese, C., Le tecniche artistiche, Mursia Editore, Milano, 2009		
Ordeanu 1992	Olteanu, Virgil, <i>Din istoria si arta cartii, Lexicon</i> , editura Enciclopedica, 1992		
Roth 1970	Roth, F.I., `Primele farmacii din Sibiu si evolutia lor pana in secolul al XIX-lea`, <i>Studii si comunicari</i> vol XV 321-336, Editura Muzeului National Brukenthal Sibiu, 1970		
Rusanovschi, Dragnea 1980	Maria Rusanovschi, Adelaida Dragnea, Analiza chimică textilă, vol I,		

	Editura tehnică București, 1980.
Stijnman 2012	Stijnman, A.C.J., <i>A history of engraving and etching techniques:</i> <i>developments of manual intaglio printmaking processes, 1400-2000</i> , (doc), thesis (PhD), Faculty of Humanities (FGw) Amsterdam, (2012) retrieved from http://hdl.handle.net/11245/1.378167 [accessed 1/10/2018]
Ward 2008	Ward, G. (Ed.), <i>The Grove Encyclopedia of Materials and Techniques in Art</i> , Oxford University Press, 2008

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#### LISTA ILUSTRAȚIILOR

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1. Diploma, front side ensemble before conservation 2.Diploma, back side assembly before conservation



- 3. Diploma, front side detail before conservation
- 4. Diploma, detail, engraving, showing parallel lines and ordered hatching
- 5. Diploma, detail avers plate mark



- 6. Diploma detail written text
- 7. Diploma, detail Validation signatures



8. Diploma detail - folded-up section, cord and pendant seal



9. Diploma covered by Japanese paper tissue at laboratory entry

10. Macroscopic aspects of the degradation of the parchment - detail of the folding lines

11. Macroscopic aspects of degradation of the parchment - folding line detail, uneven deposition of dirt



- 12. Macroscopic aspects of the degradation of the parchment cockleing, tide lines
- 13. Macroscopic aspects of parchment degradation cockleing
- 14. Macroscopic aspects of parchment degradation front side detail, brown-red spots



- 15. Macroscopic aspects of parchment degradation back side detail, brown-red spots
- 16. Macroscopic aspects of parchment degradation front side detail, brown-red spots
- 17. Macroscopic aspects of parchment degradation back side detail, brown-red spots



- 18. Macroscopic aspects of seal degradation detail, exit holes
- 19. Macroscopic aspects of textile cord degradation detail, small ruptures with and without loss of material



20. The overall picture of the document with the marking of areas that have been analyzed and for which photographs have been made.

Document - front,	Document - front,	Document - front,	Document - front,	Document - front,
microscopic aspect,	microscopic aspect,	microscopic aspect,	microscopic aspect,	microscopic aspect,
in direct light, 20x	in direct light, 40x	in direct light, 60x	in direct light, 100x	in direct light, 160x
Document - back,	Document - back,	Document - back,	Document - back,	Document - back,
microscopic aspect,	microscopic aspect,	microscopic aspect,	microscopic aspect,	microscopic aspect,
in direct light, 20x	in direct light, 40x	in direct light, 60x	in direct light, 100x	in direct light, 160x

21. Table of micrographs of the surface of the parchment support, on the obverse of the diploma, in the righttop area (inside the border) at the 20x-40x-60x-100x-160x microscope, in direct light. Comparison with the photomicrographs of the surface of the parchment support, on the reverse of the diploma, at the magnets given by the microscope 20x-40x-60x-100x 160x, aspects in direct light. The same areas, obverse and reverse, of the document were compared.

Document, front,	Document, front,	Document, front,	Document, front,
microscopic aspect	microscopic aspect	microscopic aspect	microscopic aspect
in ultraviolet light,	in ultraviolet light,	in ultraviolet light,	in ultraviolet light,
40x	60x	100x	160x
Document, back,	Document, back,	Document, back,	Document, back,
microscopic aspect	microscopic aspect	microscopic aspect	microscopic aspect
in ultraviolet light,	in ultraviolet light,	in ultraviolet light,	in ultraviolet light,
40x	60x	100x	160x
	Document, front, microscopic aspect in ultraviolet light, 40x	Document, front, microscopic aspect in ultraviolet light, 40xDocument, front, microscopic aspect in ultraviolet light, 60xImage: Image: Im	Document, front, microscopic aspectDocument, front, microscopic aspectDocument, front, microscopic aspectin ultraviolet light, 40x60x100xImage: Strain

22. Table of the photomicrographs of the surface of the parchment support, on the obverse of the diploma, from the upper right (inside the border) to the 20x-40x-60x-100x-160x microscope, in ultraviolet light.

Comparison with the micrographs of the surface of the parchment support, on the reverse of the diploma at the 20x-40x-60x-100x 160x microscope, aspects in ultraviolet light. The same areas, obverse and reverse, of the document were compared.



23. Microphotographs of an orifice (morphological imperfection of the parchment) on the document's obverse, in the area of writing in dark brown ink under the letter m (*juramenti*) - microscopic aspects in direct light -40x and in light ultraviolet -40x UV.

24. Microphotographs of a bleeding (morphological imperfection of the parchment) on the obverse of the document, in the area above the writing - microscopic aspects in direct light -100x and in ultraviolet light - 100xUV.

25. Microphotographs of the area of the "arrow" in the middle of the ornament, from the top edge of the document's back: a. 20x direct microscopic look, b. 160x direct microscopic appearance, c. Microscopic appearance in ultraviolet light -160x UV.





26. Microphotographs of light brown engraving in the lower part of the document: a. Microscopic appearance in direct light - 40x, b. Microscopic appearance in ultraviolet light - 40x UV, c. Microscopic appearance in direct light - 160x, d. microscopic appearance in ultraviolet light -160x UV.



27 Microphotographs of the stained area located above the bottom writing on the back of the document: a. Microscopic appearance in direct light - 40x, b. Microscopic appearance in ultraviolet light - 40x UV, c. Microscopic appearance in direct light - 160x , d. microscopic appearance in ultraviolet light - 160x UV.



28.. Microphotographs of the right-bottom area under writing (brown patch) on the document's back: a. Microscopic appearance in direct light - 40x, b. Microscopic appearance in ultraviolet light-40x UV, c. Microscopic appearance in light direct - 100x, d. microscopic appearance in ultraviolet light - 100x UV. e. microscopic appearance in direct light - 160x, e. microscopic appearance in ultraviolet light - 160x UV.



29. Microphotographs of the sealing textile cord: a. Detail of the cord edge, microscopic appearance in direct light - 20x, b. Detail of the cord edge, Microscopic appearance in direct light - 60x, c. Textile yarn from the edge of the cord, detail, appearance microscopic in ultraviolet light - 160x UV, d. Textile yarn from the edge of the cord, detail, microscopic appearance in ultraviolet light - 160x UV.



30. Microphotographs of the top of the textile cord of the seal: a. Detail of the top of the cord, microscopic appearance in direct light - 20x, b. Detail of the textile threads at the top of the cord, microscopic appearance in direct light - 160x c. top of the cord, microscopic appearance in ultraviolet light - 160x UV, d. textile from the top of the cord, detail, microscopic appearance in ultraviolet light - 160x UV.



31. Microphotographs of the black textile cord at the top of the cord: a. Microscopic preparation - 160x, b. Microscopic preparation of neutral solution, microscopic preparation - 160xUV, c. textile threads in neutral solution, textile fiber detail, microscopic look - 160x UV.



32. Microphotographs of the yellow thread in the top of the cord: a. Microscopic preparation of neutral solution, microscopic appearance - 160xUV, b. Microscopic preparation of textile fibers in neutral solution, textile fiber detail, microscopic look - 160x UV, c. Microscopic preparation of textile yarns in neutral solution, textile fiber detail, microscopic look - 160x UV, d. Microscopic preparation of textile yarns in neutral solution, textile fiber detail, microscopic look - 160x UV, d. Microscopic preparation of textile yarns in neutral solution, textile fiber detail, microscopic look - 160x UV, d. Microscopic preparation of textile yarns in neutral solution, textile fiber detail, microscopic look - 160x UV.
#### ANTOLOGHION, RÂMNIC, 1766. CONSERVATION REPORT

#### Maria FOTA\*

Abstract: This article presents the stages of restoration of an ancient Romanian book of Orthodox cult "Antologhion" printed in Râmnic in 1766 and belonging to the National Library Brukenthal Sibiu. The restoration was done on "open volume" due to the deteriorations and degradations present both in the book block and its binding.

Keywords: Antologhion, restoration report, restoration, book block

**Rezumat:** Acest articol prezintă etapele de restaurare a unei carți vechi românești de cult orthodox "Antologhion" tipărită la Râmnic în 1766 și aparținând Bibliotecii Naționale Brukenthal Sibiu. Restaurarea s-a facut pe volum desfăcut datorită deteriorărilor și degradărilor prezente atât la corpul carții cât și la legătura acesteia.

Cuvinte-cheie: Antologion, dosar de restaurare, restaurare, bloc de carte

The book had proven to be one of the most useful technologies in the world. Almost immediately, mankind attributed to the written word a truly magical power, a power that was not disposed even today. Therefore, the term "book" was sort of an abbreviation for the infinite forms of written textual communication adopted in the societies of the past, using an extensive variety of material. The printing itself was relatively cheap, the largest expense with book production, up to the 18th century was just the paper, the cost of which could go up to the middle of the production price of a book. The 18th century was the century when the book market flourished for many literary genres.

Râmnic carries with itself, in Romanian history, a glorious past, and has become an authentic and unanimously recognized citadel of the Romanian national culture. A considerable number of books were printed at the printing house from Râmnic, with over 157 titles, among which was the 1766 *antologhion*, printed in red and black, on two columns with 40 rows. The book is mentioned in the Old Romanian Bibliography by Ioan Bianu and Nerva Hodoş (Bianu, Hodoş, 170).

Antologhion is a selection of *menaions* comprising the saints' services according to the calendar (Olteanu 1992, 29).

Our copy lacked the sheets from page 277 to the end and the endpaper was torn with inscriptions that were not legible.

At the moment of the entry in the laboratory, the book was severely damaged and degraded, both in the text block, and binding. Paper presented: physical-mechanical degradation with teared pages, cracks, torn, folded, creases, dust deposits, paper loses, prior interventions with tape, marginal inscriptions, wax dripping; physical-chemical degradations with tide lines, greasy stains, glue and rust stains, stains of different natures, photo-chemical degradation; degradations of biological and microbiological nature with flyspecks, dead insects, galleries and holes made by xylophage insects, traces of mold (Fig. 1-6).

The *antologions* paper is handmade from textile fibers. It has good sizing and its' thickness varies. The red and black ink is insoluble in both water and hydro alcoholic solution. The inscription and the stamps were protected following the conservation scientists recommendation.

Due to the multiple degradations, it was chosen to restore the text block by removing the binding.

After the disinfection of the volume with thymol vapors in alcohol in the vacuum drying stove, the photographing – whole and details, the conservator scientist analysis report and the diagnosis were made, the choice of treatments was done as following: dry treatments – dusting using WISHAB

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(Duhl, et al. 2018), removing the wax dripping through cross-section incision, and slightly adhering impurities; renumbering the pages, removing the binding, marking how the sheets are caught in the sections; washing treatments – protection of soluble inks, washing in a first phase in cold water, then in water at 40 degrees Celsius with a neutral pH detergent, followed by rinsing with running water until the detergent is completely removed. When the paper was wet the tapes were removed. The resizing was done with carboxymethylcellulose, 0.5% in water.

Drying of the sheets was made freely on blotters and Netex sheets.

Pressing, cleaning of the pages with the scalpel and tears mending were absolutely necessary for a good binding of the Japanese paper used for the filling of losses, with thickness, color and texture chosen as close to the support paper as possible. The actual restoration was done in the "double" technique, cleaning of the Japanese paper surplus on one side and the other side of the pages, reinforcing the edges with a carboxymethylcellulose of 2% in water. For the fiber rearrangement and a better flatness of the sheets, a new pressing was made followed by the size fitting of all the restored pages.

The sheets whose middles had fallen were assembled after the size of the pages that corresponded to their place into a section. At the end, the text block was reassembled and pressed firmly into the metal press (Fig. 7-10).

The bookbinder restored the binding and the co-vers.

I mention that the work was exhibited at the National Restoration Salon in Craiova in 2017.

#### REFERENCES

Bianu, Hodos	Ioan Bianu, Nerva Hodoș, Bibliografia românească veche, 1508-1830, TOM 2,
	București,
Duhl, et al. 2018	Duhl, et al., Surface Cleaning, received from http://www.conservation-
	wiki.com/wiki/Surface_Cleaning, 2018 [accessed 30.09.2018]
Olteanu 1992	Olteanu, Virgil, Din istoria si arta cartii, Lexicon, editura Enciclopedica, 1992

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- 2. Before restoration
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### LISTA ILUSTRAȚIILOR

- 1. Înainte de restaurare
- 2. Înainte de restaurare
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- 4. Înainte de restaurare
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- 6. Carte înainte de restaurare
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1. Before restoration



2. Before restoration



3. Before restoration



4. Before restoration



5. Before restoration – last page and endpaper



6. The book before restoration



7. Text block after restoration



8. Text block after restoration



9. Text block after restoration



10. Text block after restoration

#### PROTECTION OF RESTORED POTTERY DURING TRANSPORT

#### Simona Maria CURSARU-HERLEA\*

**Abstract:** This paper presents both aspects to be taken into consideration when designing packaging to protect the restored pottery from all elements that could damage or destroy them during transport, as well as the practical ways to produce this packaging. We have taken into account how the transport takes place, the environmental conditions that can be encountered, the properties of the materials used to make the packaging and how to handle and package the restored ceramic objects. Finally we have developed 5 types of packaging that have provided protection and good microclimatic stability to the restored pieces. **Keywords:** packaging, pottery, preservation, transport

**Rezumat:** Această lucrare prezintă atât aspectele care se iau în considerare atunci când se dorește realizarea unor ambalaje care să protejeze piesele ceramice restaurate de toate elementele care le-ar putea deteriora sau distruge în timpul transportului, cât și modalitățile practice de realizare a acestora. Am ținut cont de cum se realizează transportul, de condițiile de mediu care pot fi întâlnite, de proprietățile materialelor folosite pentru realizarea ambalajelor, de cum trebuie manevrate și ambalate obiectele ceramice restaurate. În final am realizat 5 tipuri de ambalaje care au asigurat protecție și o bună stabilitate microclimatică pieselor restaurate.

Cuvinte-cheie: ambalaje, ceramică, prezervare, transport

Beginning with 2009, we initiated a program for the restoration of archeological pottery pieces discovered at the archeological site in Capidava, involving in these activity students of the Conservation and Restoration specialization at the Faculty of Socio-Human Sciences, Lucian Blaga University, of Sibiu (Cursaru-Herlea 2011, 647).

The restored pieces were brought back to the deposit of the archeological site of Capidava, some of which were also displayed at the National Restoration Salon in Craiova (National Restoration Salon 2011, 26; 2012, 23; 2013, 12; 2017, 21, 22, 23, 24). Therefore, besides the specific activities of active conservation and restoration carried out in the laboratory, we have raised the issue of preserving these objects during transport and storage. Pottery has a low resistance to mechanical shocks and is generally resistant to microclimatic variations, except ceramic vessels with technological flaws of manufacturing. Humidity is dangerous because fungal attacks may occur and develop, but this is only possible if the ceramic vessel is held for a long time at a relatively high humidity. Under these conditions, pollution has a potentially damaging effect. Generally, a relative humidity of 45-65% is recommended for pottery without deteriorations (Szczepanowska 2013, 255). The problem changes to a certain extent when it comes to restored pottery, which is very sensitive to microclimatic variations and extremely sensitive to vibrations and mechanical shocks. This statement is absolutely logical given that most of the pieces have fragments glued with vinyl polyacetate (very sensitive to high humidity) and all pieces have missing fragments filled with modelling gypsum, which is a hygroscopic mineral binder that forms adherent mixtures with water to pottery ensuring stability of the vessel, but after strengthening does not resist the action of water and is very breakable.

To make packages for protecting the restored pottery pieces against all elements that could damage or destroy/harm them, we took the following aspects into consideration:

1. How does the transport take place?

The transport system will be by road. Since there are two highways connecting Sibiu to Capidava (Constanța County), this system is the most efficient and quite fast. The distance between Sibiu and Capidava measures 453 km, which can be driven in about 5h 44min. Vehicle transport is advantageous because it loads the items at the expe-

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dition point and unloads them directly at the destination without any transhipment or additional handling.

2. What environmental conditions can be encountered during transport and storage?

Sibiu is located in an area with a moderate continental climate, but with secondary microclimatic effects due mainly to the nearby mountains. The main elements that characterize the climate in the Sibiu area are as follows: the average multiannual temperature:  $8.8 \degree$  C, the absolute maximum temperature:  $37.4 \degree$  C, the absolute minimum temperature:  $-31 \degree$  C, the relative humidity of the atmospheric air, the multiannual average value is 75%. In summer, wet ocean winds from Western Europe are predominant, which causes rich rainfall. In winter it is the cold and humid air coming from northern and northwest Europe that brings snow and frost (https://ro.wikipedia.org/wiki/Sibiu, 14. 02. 2018).

Capidava (Constanța County) is in a temperate continental climate zone, but it has some peculiarities related to the geographic location and the physical-geographic components of the territory. The location of the settlement on the bank of the Danube ensures, through permanent evaporation of the water, increased air humidity and its heating adjustment. Annual average temperatures are higher than the average in Romania, ranging around 11°C. The minimum recorded temperature was -25 ° C (in Constanța County) and the absolute maximum temperature was +43 ° C.

(ro.wikipedia.org/wiki/Constanța 14.02.2018; www.cernavoda-turistica.ro/informatii-climatice 14.02.2018)

The transport of the restored pottery pieces takes place in July and October, months in which there may be significant differences between the environmental conditions between the two areas, but also the sudden variations in temperature and humidity that occur on the distance between Sibiu and Capidava. It should be noted that the vehicle is equipped with a temperature control system, but not a humidity control system. This means relative humidity is uncontrolled and can vary significantly. For this reason, the packaging must ensure relative humidity control. It should also be noted that the pieces will remain a longer or shorter period in the storage of the Capidava archaeological site, where there are usually no restored pottery and favorable conditions for depositing. So, for the protection of the restored parts, we recommend that they remain in the delivered packages.

3. What are the conditions that must be met by packaging?

First of all, it must provide protection against mechanical damage that may result from accidents (strikes, collisions, overturns). Therefore, the packages (boxes) must be made of rigid, but not very heavy materials, so that they can be easily handled. Packaging must ensure good thermal insulation of the contents, so we use materials with low thermal conductivity (Richard, Mecklenburg, Merrill 1997, (9/91) -2). However, it should be taken into consideration that no insulating material will eliminate the temperature changes inside the package, but by lining the walls of the packaging with insulating materials, these changes will be much slower (Richard, Mecklenburg, Merrill 1997, (9/91) -1). Packaging must provide protection against fluctuations in ambient humidity by using moisture absorbing materials. Packaging must provide protection against inevitable shocks and tremors, especially in the case of road transport. This can be done with the help of elastic buffer materials (Moldoveanu 2010, 261-262). Packages must conform to the shape of the object and must have the caps securely fastened by an easy open / close method, if necessary with signs to facilitate this operation. Packages must bear their handling codes/ instructions, of fragile object and the position of the item, and a label containing some object information (name, photo, holder, etc.). If necessary, a sketch can be placed inside the lid to help unpack the object.

It should be noted that, no matter how well an object would be packed, the effects of rapid fluctuations in humidity and temperature, shocks, vibrations, bumps against hard surfaces (in the event of accidents) will not be totally eliminated, but we want these effects to be reduced significantly.

4. What are the properties of the materials used to make the packaging?

It must be easy to use and affordable concerning the price. The outside of the boxes must have mechanical strength. Materials used for packaging must not be reactive but must be chemically inert. It must not damage the surface of the object. It must ensure the containment of the object under conditions of rapid fluctuations in humidity and temperature (low thermal conductivity, low water vapour transmission). It must provide vibration dampening and shock absorption. It must be light. The materials used for packaging other types of objects need not be reused. 5. What are the materials that should be used to make the packaging?

Rigid materials such as: wood, wood plywood, metal, reinforced polyester with fiberglass must be used to make the boxes. Other materials recommended for the packaging of pottery objects: unbleached and unpainted cotton, Tyvek (a very resistant material made of high density polyethylene fibers, chemically inert<sup>1</sup>, low weight, dimensional stability, resistant to fungi and molds), non-acidic paper, polyethylene foam, air bubble film, expanded polystyrene (Dawson, Hutcheson 2012, 6-7).

6. Handling and packaging of pottery objects.

Before proceeding to the packaging of pottery objects, we must prepare a place that is clean and free of other objects. The table on which the packaging is made shall be lined with high density polyethylene foam. Handling is done by trained persons, properly equipped (gloves and working coat) and always using both hands. The objects are caught on the upper and the most durable parts of their structure, never grabbing it by the handle or the rim, drain holes or embossed decorative elements. Detachable parts are handled separately. Heavy objects must be handled by two or more people who know very well what to do. The entire packaging process must be done with great care and without hurry.

### 7. Packaging:

After analysing these aspects and taking into account the financial possibilities, since 2010 I have designed and subsequently constructed together with the students of the conservation and restoration specialty ("Lucian Blaga" University of Sibiu), the following types of packaging for the restored pottery pieces:

A. Boxes of beech wood (subjected to thermal and fumigation treatments) joined together in the groove and tongue technique and reinforced at the corners on the inside with beech wood sticks caught with fastening screws (Fig. 1-6). The boxes were waterproofed with water-based wood paint. The dimensions varied according to the size of the packaged vessels. The largest box has a height of 100 cm and the sides of 56 cm. For a good thermal insulation of the contents, but also to ensure the stability of the vessel (amphora, generally) inside the box, we filled the box with expanded polysty-

rene plates of 10 cm in which we cut the shape of the amphora in the middle (Fig. 1). The plates were numbered in order to facilitate the repackaging of the vessel<sup>2</sup> (Fig. 1, 2). To ensure that the amphorae transported in these packages will be safely exposed, we have made metal supports (tripods) clothed in textile material (hemp string) to avoid scratching the pottery surface or the filled and chromatically integrated surface (Fig. 7). In order not to lose these supports, we felt it was necessary to put them inside the packaging. Thus, in this case, I cut the shape of the tripod (circle) into the polystyrene plate on the bottom of the box, I placed the tripod with the circle down into the cut ditch and cut the holes for the tripod feet in the next polystyrene plates. Amphora was seated in the middle, in the place cut for her, without touching the tripod. On the lid we have stuck another 10 cm expanded polystyrene plate in which we cut the mouth of the bowl (Fig. 2). The dimensions cut in the expanded polystyrene were larger than the 2-3 cm vessel to cover the vessel in the elastic buffer material. To protect the chromatically integrated areas, the pot was wrapped in a fine cotton fabric, then, as an elastic buffer material, the air bubble was used. Immediately below the lid was a sketch with the packing / unpacking mode. For easy closing / opening of the box, four "welded eye" bolts (Fig. 5) were used, and for easy handling (mandatory by two persons), the box was fitted with gripping handles (Fig. 3). On the cover a label was attached, including the dates of the object and the photograph, also of the tripod inserted inside (Fig. 5), and on one side there were inscribed international inscriptions concerning handling with care, moisture resistance, the fragility of the contents and the position the box should be kept in (Fig. 6).

B. Boxes of wood plywood reinforced with beech wood slats, attached on the outside with fastening screws (Fig. 8-12). The boxes have been waterproofed with a colourless, water-based lacquer. For thermally insulating the contents and for the stability of the vessels (amphorae) we proceeded as in case of A by filling the box with expanded polystyrene plates of 10 cm and cutting the shape of the vessel in the middle (Fig. 9). In order not to damage the surface of the dishes (especially the supplemented and chromatically integrated, which is more sensitive), but also to protect against shocks

<sup>&</sup>lt;sup>1</sup> Prolonged exposure to concentrated nitric acid or to sodium persulfate may result in decreased chemical resistance.

<sup>&</sup>lt;sup>2</sup> Re-packaging was necessary because the piece packed in the presented packaging participated at the National Restoration Salon in Craiova from 2017 (Catalog of the National Restoration Salon, Craiova 2017, p. 21)

and tremors, the pot was wrapped into a Japanese sheet and then into a thin film (1.8 mm) of white expanded polyethylene. The pieces packed in these boxes being amphorae, we have also ensured that they will be safely exposed by placing metallic tripods clothed in textile material fabric inside the boxes. Thus, in this case, we cut the shape of the tripod in the plate polystyrene that closed the bowl; we threw holes in the polystyrene sheets in the lower layers to insert the three legs and, after inserting the amphora into the box, put the polystyrene cap and then inserted the tripod (Fig. 10, 11). The wooden plywood lid, on which the plasticized label was stuck with the piece data and the photo, was closed with four fastening screws (Fig. 8, 12). The boxes must bear their handling codes/ instructions of fragile object and the position of the object in transport (Fig. 8).

C. Boxes made of small resinous wood boards (subjected to thermal and fumigation treatments), which were joined together in the groove and tongue technique, and the edges were fastened in with fastening screws (Fig. 13-19). For waterproofing and protection, we applied two layers of varnish based on water, weather-resistant at and also for UV radiation. For easy handling of the boxes, two metal handles were attached, each fastened in four fastening screws (Fig. 19). For thermal insulation of the contents, the inner walls of the box were lined with expanded polystyrene 2 cm thick. On the bottom of the box and on the lid 5 cm expanded polystyrene plates were glued, in order to be able to cut into it, the bottom and the mouth of the pottery (Fig. 14, 15), this cutting being important for the stability of the restored objects (amphorae for transport in general). In the plate of the bottom of the vessel a ditch was cut for fixing the metallic tripod, required to exhibit the restored object. The tripod was placed with the circle on the bottom of the box, fixed in the groove made in polystyrene and with its feet up (Fig. 16). The amphora wrapped in Japanese foil then in white polyethylene foam and then in bubble foil, was placed with the bottom in the carving made in the expanded polystyrene (Fig. 17). The amphora does not touch the tripod feet and is protected by the elastic buffing material that it was wrapped in. By closing the lid, the amphorae's mouth was fixed in the carving made in the polystyrene glued to the lid of the box (Fig. 18). On the outside of the lid a foil was glued, with the photo tag and the restored amphora data (Fig. 19). For easy closing / opening four zinc plated screws with "butterfly" head (Fig. 19) were used. The labelling on the box of their handling codes/ instructions, of fragile object and the position of the object in transport was made with a graffiti spray (Fig. 13). Beforehand, a cardboard template was made.

D. For smaller pottery pieces, up to 20 cm high (mugs, pots without handles, pots with one or two handles), we made boxes of resinous wood with the sides consisting of a single piece of wood, the edges being caught in fastening screws (Fig. 20-30). The waterproofing of the boxes was done by applying 2-3 layers of water-based varnish (Fig. 20-22; 25-27), linseed oil (Fig. 23-24) or impregnated with water-based wax (Fig. 28-30). To thermally insulate the contents, the box walls and the lid were lined with 2 cm thick expanded polystyrene, coated in Netex (Fig. 20, 21, 25, 28) or white expanded polyethylene foam (Fig. 23, 24). The white polyethylene foam was used due to its good thermal, chemical and mechanical insulating properties. It is chemically inert and protects the object from the penetration of moisture. The pots were wrapped in Japanese foil and then in Muflone textile (synthetic wadding), the latter being also used to fill the voids in the boxes. Some boxes have been provided with gripping handles to ease their handling (Fig. 22). The caps were fastened with fastening screws in form of hooks (Fig. 24, 30) or "butterfly, head fastening screws (Fig. 22, 26) to facilitate opening/closing of the boxes. The cap of one of the boxes is set with 2 metal hinges and closed with 2 fastening screws in form of hooks (Fig. 23, 24). All boxes have their handling codes (handling with care), fragile material moisture resistance, and position, but are made differently: with graffiti spray (Fig. 29), self-adhesive labels (Fig. 27, 22), plasticized and glued labels (Fig. 24).

E. Boxes made of white melamine-faced slabs, laminated with melamine palm and attached with hexagon palm screws (Fig. 31-34). These were made especially for small amphorae of approx. 35 cm. For the thermal insulation of the contents, but also in order for the pottery parts not to have any contact with the melamine palm, the inside walls were lined with 2 cm thick expanded polystyrene, clothed in a fine, white cotton cloth (Fig. 34). To ensure the stability of the amphorae transported in these boxes, on the bottom of the boxes we placed expanded polystyrene plates of 5 cm in which the shape of the pot was cut to about half of it. We did not put expanded polystyrene sheets in the box because insulation was made by lining the walls with expanded polystyrene and on the other hand we should have made bigger boxes, which would have occupied more space during transport, becoming too heavy and therefore difficult to handle. The lids of the boxes were also lined with expanded polystyrene clothed in fine white cotton cloth and attached with self-tapping screws to the palm, and hex keys were attached to the boxes in sight, to enable an easier opening. (Fig.33, 34). The restored pottery pieces were wrapped in soft white cotton cloth to protect the ceramic surface and, in particular, areas that have additions and chromatic inclusions (Fig. 35). All free space left in the boxes was filled with Muflone textile so that the pieces did not move in boxes, and this fabric also contributes to microclimatic stability (Fig. 36). In order to avoid the direct contact of melamine palm with other materials during transport, unloading or storage, we have attached a varnished soleplate (Fig. 31). In order to ease the handling of the boxes, we have mounted lacquer handles made from wood, on their sides (Fig. 32). Boxes have sticker labels with international inscriptions concerning handling with care, moisture resistance, the fragility of the contents and the position the box should be kept in (Fig. 31). Plastics labels with photos and amphora restoration data were also glued on the boxes (Fig. 33).

#### 8. Conclusions

All types of packaging have provided protection and good microclimatic stability to restored objects. But let us draw some conclusions about their advantages and disadvantages. The most accessible in terms of costs were the boxes made of wood planks (A, C), but these show less mechanical strength. The most durable and reasonably priced boxes are those made of melamine palm (E), but they are quite heavy, and they are only used to transport smaller objects. Another disadvantage they present, is a formaldehyde emission, but there are more expensive melamine palm boxes (than the ones we have used), which are glued with newer adhesives or special products called formaldehyde collectors that are used and the emission, in these cases, is very low or even zero. The wooden boxes with one piece (D) displayed a good mechanical strength, but also higher costs. They are quite light, but large packaging cannot be made. Another problem that presents itself is that, no matter how well the wood is treated, in time and especially if the packaging is stored in inappropriate conditions, it can change its size and / or biological degradation can appear (created by fungi and xylophages insects). This would also be a disadvantage for the boxes in the combined wood planks. However, this is only a disadvantage if packaging is to be reused. We have lower costs with wooden plywood (B), which is more stable and more durable than wood, and the mechanical resistance is given by the thickness of the plywood (those consisting of 7 glued veneer sheets have a more good mechanical strength). However, caution is advised - like at all semi-finished products that use adhesives for gluing, they emit formaldehydes.

#### REFERENCES

Cursaru-Herlea 2011	Simona Maria Cursaru-Herlea, <i>Concerns regarding the conserva-</i> <i>tion and restoration of the pottery from Capidava</i> , în <i>Brvkenthal</i> <i>ACTA MVSEI</i> , VI, 4, 2011, Ed. Muzeului Brukenthal, Sibiu, ISSN
	1842-2691, p. 645-655.
Szczepanowska 2013-	Hanna M. Szczepanowska, <i>Conservation of Cultural Heritage:</i> <i>Key Principles and Approaches</i> by Routlege, 2013 (www.ebook3000.com)
Richard, Mecklenburg, Merrill 1997	Mervin Richard, Marion F. Mecklenburg, Ross M. Merrill, Art in Transit. Handbook for Packing and Transporting Paintings, Na- tional Gallery of ArtWashington, 1997, ISBN 0-89468-165-6
Moldoveanu 2010	Aurel Moldoveanu, <i>Preventive Conservation of Cultural Goods</i> , Fourth Edition, Bucharest 2010
Dawson, Hutcheson 2012	Alex Dawson, Natasha Hutcheson, <i>Packing museum objects. A Collections Care How To Guide</i> , Norfolk Museums and Archaeology Service, 2012, collectionstrust.org.uk/resource/packing-museum-objects
National Restoration Salon 2011, 2012, 2013	2017 - Catalog of the National Salon of Restoration 2011, 2012, 2013, 2017, Oltenia Museum Publishing House, Craiova 2011, ISSN 2247-7624, ISSN-L2247-7624
www.portal.unesco.org,	UNESCO Constitution <i>Recommendation for the Protection of</i> <i>Movable Cultural Property</i> , 28 November 1978, access 12.02.2018
https://ro.wikipedia.org/wiki/Sibiu,	https://ro.wikipedia.org/wiki/Sibiu, access 14. 02. 2018
https://ro.wikipedia.org/wiki/Constanța,	https://ro.wikipedia.org/wiki/Constanța, access 14. 02. 2018
www.cernavoda-turistica.ro/informatii- climatice	www.cernavoda-turistica.ro/informatii-climatice, access 14. 02. 2018

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1. 2. 3. Type A packaging



4. 5. 6. Type A packaging



7. Metal tripod clothed in hemp string



8. 9. Type B packaging



10. 11. 12. Type B packaging



13. 14. Type C packaging



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#### REMARKS ON TWO PAINTINGS ON COPPER ATTRIBUTED TO NICOLAS PÉRELLE, OCCA-SIONED BY THEIR CONSERVATION

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Abstract: The two landscapes painted on copper from the Brukenthal National Museum's collection should be attributed to Nicolas Pérelle, as they were purchased in late 18th c. by Baron Samuel von Brukenthal, although this artist is known mainly as an engraver and his paintings (and especially those on copper) are scarce. In one of the two paintings ("View with Italian Garden") the artist borrowed some elements from the architecture of the gardens in Versailles, but without any intention to reproduce accurately the reality. Considering some similitudes with the two pools of the Lizards, the changes suffered during 1662-1700 by the Parterre of Latona to which the mentioned pools are linked in terms of the assembly's general concept, as well as some clues from the biography of Nicolas Pérelle, this work (and its pendant as well) should have been painted in Orléans and dated approximatively during 1683-1695. After almost 120 years since the last conservation of the "View with Italian Garden" (1899), the two works were quite well preserved, as an evidence of the fairly high endurance of the paintings on copper even more than 300 years after they were painted. The goal of their new conservation was both to prepare them to be exhibited and, if possible, to find new clues about their author. Their study allowed some remarks both on the 16<sup>th</sup>-19<sup>th</sup> c. technique of painting on copper and on the paintings on copper from the museum's collection.

Keywords: Nicolas Pérelle, painting on copper, rigid supports, primer, UV light, varnish

**Rezumat:** Cele două peisaje pictate pe cupru din colecția Muzeului Național Brukenthal ar trebui atribuite lui Nicolas Pérelle, cum au și fost cumpărate la sfârșitul sec. XVIII de către baronul Samuel von Brukenthal, cu toate că acest artist ete cunoscut mai ales ca gravor, iar tablourile sale (și în special cele pe cupru) sunt extrem de rare. În unul dintre aceste două tablouri ("Vedere cu grădină italiană") artistul a împrumutat unele elemente din arhitectura grădinilor de la Versailles, dar fără intenția de reproduce cu acuratețe realitatea. Având în vedere unele asemănări cu cele două bazine ale Șopârlelor, transformîrile suferite în perioada 1662-1700 de Terasa Latonei, de care amintitele bazine sunt legate din punct de vedere al conceptului general al ansamblului, ca și de unele indicia ale biografiei lui Nicolas Pérelle, această lucrare (și pandantul ei, de asemenea) ar trebui să fi fost pictate la Orléans și datate cu aproximație în perioada 1683-1695. După aproape 120 ani de a ultima restaurare a "Vederii cu grădină italiană" (1899), cele două lucrări sunt destlde bine păstrate, ca o dovadă a unei rezistențe destul de bune a tablourilor pe cupru chiar și după mai mult de 300 de ani de când ele au fost pictate. Scopul noii restaurări a fost de a le pregăti în vederea expunerii și, dacă este posibil, de găsi noi indicii despre autorul lor. Studiul lor a permis unele observații atât referitoare la tehnica picturii pe cupru în sec. XVI-XIX, cât și asupra tablourilor pictate pe cupru din colecția muzelui.

Cuvinte-cheie: Nicolas Pérelle, pictură pe cupru, suporturi rigide, grund, lumină UV, vernis

In the Brukenthal National Museum's collection there are two less known paintings (both in oil on copper) from the former collection of Baron Samuel von Brukenthal, who acquired them as works of Nicolas Pérelle. Despite its poor arguments, their later attribution to Gabriel Pérelle (the aforementioned artist's father) was never disputed until

now, because of the limited possibilities to verify both the already existing assumptions and the still possible emerging ones. In 1899, nearly a century after the collector's death (1803) and at least two centuries after they were made, the two paintings were apparently still quite well preserved (excepting maybe some gaps), as only one of them had to

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be restored (cf. Csaki 1901, 242; Csaki 1909, 263). The goal of their new conservation was both to prepare them to be exhibited and, if possible, to find new clues about their author, in the context of the current research on French, Italian and Spanish paintings from the museum's collection.

#### 1. The description of the two paintings.

Nicolas Pérelle (1631-1695), *Italian Park with Ruins* (Fig. 13 and 15)

Oil on copper, 32 x 38 cm. Inv. 882. Provenance: Baron Samuel von Brukenthal's collection.

Literature: Die Gemälde- Galerie 1844, 54, cat. 111; Führer 1893, 21, cat. 77; Csaki 1901, 241-242, cat. 867; Csaki 1909, 263, cat. 882; Csaki 1926, 23, cat. 882; Vollmer 1932, 401; Spek 1941, 25, cat. 882; Lisan 1987, 216 and 223, cat. 25.

On the left, in the foreground, there are some ancient architectural fragments: a socket supporting a fragment of an Ionic column, at its base an architrave fragment leaned on a fragment of an Ionic column's shift, and a little to right the fragment of a Corinthian capital and the base of a Ionic column. In a farther plane, closer to the aforementioned socket with a column fragment, there is a large decorative stone urn, adorned with a relief with several characters. Farther, on the upper end of a stairway, there are two staying figures (one being an Oriental in a red gown and a white turban), who are looking in different directions. In an even farther plane, behind a partially ruined enclosure wall, there is an archway of an ancient palace's ruins, of whose façade a rest with Corinthian columns is still staying. In front of the ruined gate of the palace, which is guarded by a sculpted bust, there are two slender silhouettes, discussing. Farther, on the bank of a river flowing to the right, but away from its bed, other two figures are discussing. Relatively young trees grow between both the architectural fragments on the left and the ruins of the palace. In front of the stone steps, in the middle of the work, there is a statue of Jupiter, holding in his right hand the bundle of lightning, to which his spread-winged eagle raises its head. On the right, at some distance from the statue, there are two peasants in a blue and respectively red coat, the first showing with his raised arm to the river, beyond the wooded bank of which, at the horizon, the mountains stand out. The sky is slightly clouded. By its colours and its well distributed lighting, the complex, well-structured composition in dominant green, greyish blue and ochre tones refreshed by blue and red accents manages to suggest the quiet atmosphere of an autumn day.

Nicolas Pérelle (1631-1695), *View with Italian Garden* (Fig. 14 and 16)

Oil on copper, 32 x 38.5 cm. Inv. 883. Provenance: Baron Samuel von Brukenthal's collection. The work was previously restored, in 1899.

Literature: Die Gemälde- Galerie 1844, 54, cat. 112; Führer 1893, 21, cat. 76; Csaki 1901, 242, cat. 868; Csaki 1909, 263, cat. 883; Csaki 1926, 23, cat. 883; Vollmer 1932, 401; Spek 1941, 25, cat. 883; Lisan 1987, p. 216 and 223, cat. 25.

Down, in the middle, on the edge of a terrace with two artesian fountains, a sitting man in a red cloak and a woman in a blue dress are talking. In the foreground, on the right, some ruined steps lead to the base of a monumental stairway with railing, having at its base a socket on which there is a decorative stone vase. In a further plane, on a stone bench located at the left edge of the terrace, a sitting figure looks to the statue of a soldier. A stairway decorated on both sides with statues of Roman inspiration (at left, the previously mentioned one, of a soldier and at right that of an hero) leads from this terrace to a promenade with several figures walking around, at whose end there is a building, with another artesian fountain in front of it. Just at the edge of the terrace, on the first step of the stairway, a woman in a yellow dress and a man in a red cloak are sitting, looking towards the promenade. Far in the background there are mountains. The sky is lightly clouded. By its colours and its well distributed lighting, the complex, wellstructured and animated composition in dominant green, greyish blue and ochre tones refreshed by blue, red and grey accents manages to suggest the quiet atmosphere of an autumn day.

## 2. Remarks on the attribution and on the date of the paintings.

Whereas during the 20<sup>th</sup> c. the conservation status of the two paintings on copper remained relatively stable, they could be admired, especially after 2007, in several temporary exhibitions organized within the museum, in which they were presented with their current attribution, as being made by Gabriel Pérelle (1604-1677), a known 17<sup>th</sup> c. French draughtsman and engraver. However, at the present state of research there are not too many (and also not too convincing) reasons to support the view that he would have worked also as a painter, excepting these two paintings from Sibiu, a landscape in the museum of Orléans and a landscape with ancient ruins in the collection of the university of Würzburg (Vollmer 1932, 401). There is only very few information about the painting in the Martin von Wagner Museum of the Julius Maximilian University in Würzburg (inv. F 116), as Professor Damian Dombrowski, the mentioned museum's Director kindly wrote to Alexandru Gh. Sonoc. Thise work's still unverified assignment to Gabriel Pérelle is due to its former owner, the pedagogue and musicologist Franz Joseph Fröhlich (1780-1862), who must have acquired it during the decades before 1859 (Hoffmann, Kope 1986, 150, n. 387, cat. K 495). According to the Joconde public data base on the collections of the museums of France endorsed by this country's Ministry of Culture, the painting (oil on canvas, 42 x 35 cm, inv. 700) which shows a landscape with a fisherman and a ruined castle from the Musée des beaux-arts in Orléans (till 1825 in the Delaage de la Rocheterie collection) is only attributed to Gabriel Pérelle (O'Neill 1981, 107). Therefore, the attribution of the two paintings in Sibiu to the mentioned French artist cannot be validated, as in the current state of research no paintings signed by him or at least which undoubtedly can be assigned to him are known to us. Thus, meanwhile no valid stylistic comparison which would support it seems possible.

The museum's founder, Baron Samuel von Brukenthal acquired the two paintings of a nowadays unknown previous provenance as being due to N. Pérelle, erroneously mentioned at c. 1800 in the handwritten catalogue of his gallery (ms. 628 in the Brukenthal Library) as a painter from the Netherlands. In the first printed version of the Brukenthal Museum's gallery guide (1844) the works were assigned to a painter of the Pérelle family, but without to indicate his first name, perhaps not only because of some doubts about the attribution with which they had been purchased, but also because Gabriel Pérelle was known only as a draughtsman and engraver and not as a painter too, while his son Nicolas was rather unknown. That is why, although in the 1893 edition of the gallery guide as author of the two paintings is mentioned Gabriel Pérelle, about the artist's true first name are kept some doubts, indicated by the use of a question mark. In the subsequent editions of the gallery guide published either by Michael Csaki in 1901, 1909 and 1926 or by Rudolf Spek in 1941, as author of these works is noted, without any reservation, Gabriel Pérelle. This attribution, never disputed since then, is kept as well by Mariana Lisan, who in 1987 continued to spell his name in the wrong form inherited from the whole previously mentioned German and Romanian museum literature (i. e. Perelle instead of Pérelle), which led already during the 19<sup>th</sup> c. to the erroneous conclusion (to which we shall return later) that an artist named Antonius Perelle would be an Italian painter.

Gabriel Pérelle was a student of Daniel Rabel (1578-1637) and of Simon Vouet (1590-1649). He was influenced by the latter's style, which is similar to that of François Millet (1642-1679), but stronger decorative. Already in 1638, Gabriel Pérelle had a studio which was specialized mainly in etching and taille-douce (intaglio) and had an exceptionally prolific production of several hundred engravings, made both from his own drawings and from his competitors as Israël Sylvestre, Paul Bril, Jacques Callot, Michel Corneille the Elder, Jan Asselijn, Jacques Fouquières, Cornelis van Poelenburgh, Gaspard Poussin or Sébastien Pontault de Beaulieu. They were published in Paris by various editors as Nicolas Langlois the Elder, Jean Mariette and Pierre Mariette the Younger, Nicolas de Poilly the Elder, Israël Henriet and Pierre Drevet. Most of these prints are more or less realistic views of the royal palaces and castles of France, landscapes around Paris and cityscapes from Paris, as well as some Italianate landscapes, which (as shown by the existence of some drawings) seems to be inspired by memories of a study journey undertaken in his youth, and some battle scenes and genre scenes. Not only his both sons Nicolas Pérelle (1631-1695) and Adam Pérelle (1640-1695) were educated and worked in his studio, but also (for a while) two sons of the engraver Jacques Callot and the latter's former student François Collignon. After 1665, when Gabriel Pérelle was appointed Director of the Royal Cabinet's Plans and Maps and as result he seems to have ceased his engraver activity, the production of his studio was continued actually by his two sons, although they were more interested in painting than in engraving.

During the last quarter of the 17<sup>th</sup> c. Gabriel Pérelle made also cartoons for the ceramics production of an undetermined manufactory, as evidenced by two plates kept at the Musée de la Faïence in Nevers (inv. NF 35 and inv. NF 219), which are mentioned in the Joconde public data base. As a painter Gabriel Pérelle is known, as already mentioned, only by very few works (Vollmer 1932, 401), whose attribution based on older, often insufficiently verified information does not seem to have been convincingly confirmed. Actually, in the Joconde data base where are listed 72 works of the artist, as paintings are mentioned only 19 anonymous pictoralizations after Gabriel Pérelle, kept at the Musée national des châteaux de Versailles et de Trianon and dated during the first quarter of the

17<sup>th</sup> c., being therefore made at least 23 years after the engraver's death

(http://www2.culture.gouv.fr/public/mistral/jocond e\_fr?ACTION=CHERCHER&FIELD\_3=AUTR& VALUE 3=PERELLE GABRIEL). To the extent that the data concerning these pictorializations are accompanied by images (8 situations of 19, i. e. 42.10 % of the total), it is noted that by their less vivid but also more fluid colours, they are recalling rather the coloured lithographs and the watercolour paintings, differing thus radically from the two works painted on copper from the Brukenthal National Museum's collection, although excepting the latter no image of any other painting currently still assigned to Gabriel Pérelle (much less signed by him) is known to Alexandru Gh. Sonoc. The colours of the two faience plates mentioned above as decorated after the artist's cartoons are not too relevant in this context, especially because one of them (inv. NF 219) is a monochrome landscape in navy blue, imitating thus the colour of the Chinese porcelain of the Ming dynasty's age.

Regarding the style of Gabriel Pérelle, Joseph Strutt noted: "His works prove the fertility of his genius, rather than his attention to nature. They are composed in a very pleasant style, and the distances especially are executed with great taste, and enriched with ruins and other embellishments, which are very happily introduced to vary the objects, and give a lightness and elegance to the design. His fault is the want of masses. The lights are too powerfully, and to equally diffused, and that in spots; so that the eye is fatigued, and the effect totally destroyed. The foliage of his trees is heavy, and so very unlike nature, that even the warmth of imagination, which we discover in them, will hardly be thought of sufficient excuse" (Strutt 1786, 216). Later Sherajashub Spooner shared also these opinions (Spooner 1853, 674). Nowadays, when 1300 landscapes engraved by the Pérelle family are known, it is often difficult to distinguish the individual style of each of the three artists, with the remark that Adam Pérelle's style is a little more robust and dense than that of his father (Garnier-Pelle 2001, 62-63). As a result, the view of Shearjashub Spooner, that the works by Gabriel Pérelle's sons would be inferior to his own ones (Spooner 1853, 674), although accepted by later biographers too (Bryan 1904, 94), should be considered with caution. On the contrary, to a certain extent (in terms of the trees' foliage depiction and perhaps even of the lighting) the remarks of Joseph Strutt on Gabriel Pérelle's prints could be a clue for the attribution of the two paintings on copper from Sibiu, although a stylistic comparison between prints and paintings is often quite risky. But curiously enough, right his allegations about the foliage of the trees are not confirmed in respect of these paintings, and the light is neither too strong nor equally widespread. In 1987, almost two centuries after the quoted opinion of Joseph Strutt on the engravings by Gabriel Pérelle, Mariana Lisan stated that in his paintings this artist "uses a personal way of distributing the effects of shadow and light, which leads us to consider him as a sensitive colourist" (Lisan 1987, 216), although without to mention any other such works by him or at least assigned to him besides the two paintings from the collection of the Brukenthal National Museum, perhaps because she did not know any one. As her opinion seems to be based only on the knowledge of these two works, it should be considered only in this context. Knowing these views about the printed or painted works by Gabriel Pérelle or, respectively, only assigned to him and considering as well the current state of research on the works by his artist and by his family, there are good reasons to question the traditional opinion that Gabriel Pérelle would be the author of the two paintings from the museum in Sibiu.

Assisted by his two sons Nicolas Pérelle (1631-1695) and Adam Pérelle (1640-1695) and by two other engravers, Israël Sylvestre the Younger (1621-1691) and Jacobus van Merlen (1570-1660), who was known also as a printer, publisher and art dealer, Gabriel Pérelle made the undated album Veües des plus beaux lieux de France et d'Italie (Paris: N. Langlois), which is believed to have been published c. 1688 and illustrates not only the French royal family's palaces and castles with their gardens, as well as various cityscapes from Paris, but also sights from Italy, traditionally considered to be inspired by Gabriel Pérelle's travel memories from an early period. According to more recent views (Herbert 2008, 180, n. 28), the engravings in this album, attributed to Gabriel Pérelle, helped by Nicolas Pérelle, Adam Pérelle, Israël Silvestre and Pierre Aveline (1656-1722), would have been made actually during a longer period (1640-1700).

An examination of this album led immediately Alexandru Gh. Sonoc to the conclusion that, irrespective of the identity of the artists who made the mentioned engravings and of their date and despite some similarities in composition and drawing with the two paintings on copper from the Brukenthal National Museum's collection, the latter cannot be considered pictorializations or even interpretations of some prints from the mentioned album, but could be original works, by an artist whose manner of drawing is extremely close to the style of the album, imposed of course by Gabriel Pérelle. It cannot be denied, however, that regarding the structure of the composition, the perspective and the proportions, the drawing of the two paintings on copper from Sibiu shows some similarities also with some prints by Gabriel Pérelle which are not included in the mentioned album or even with some early drawings.

Thus, a first impression could be that they might be pictorializations of some prints by the mentioned artist which have not been preserved till now. As in this regard any other deduction becomes extremely speculative, it seems more prudent to consider the two paintings from Sibiu as capricci which borrow some elements of landscape architecture from the drawings and prints by Gabriel Pérelle (including from the mentioned album), to which were added, according to the painter's or the commissioner's desire, various other secondary elements, like the statues and the artesian fountains, resulting thus two landscapes which belong however to two different categories, as only Italian Park with Ruins (inv. 882) can be considered to be an Italianate landscape, contrary to the opinion expressed by Mariana Lisan (Lisan 1987, 216).

The Italianate landscape, with ancient ruins and statues or with artesian fountain, with bucolic or idyllic scenes or with figures rendered in various other circumstances (as travellers, fishermen, hunters, beggars, brigands, treasure seekers, hermits etc.), very appreciated at that time, has been popularized by many works of the "northern" artists, i. e. from the Low Countries, from France and from Germany (about the Flemish and Dutch Italianate landscape in the Brukenthal National Museum's collection of European painting, but with some questionable views: Marta 2011).

However, *View with Italian Garden* (inv. 883) does not belong to this category, because of the evident intention of a panoramic view, claiming a high precision in depicting the garden of an aristocratic residence, like in the prints of the above mentioned album, and no way of a conventional rendering of Italy's nature and people, according to the already established canons of the Italianate landscape. In this painting (Fig. 14) the artist borrowed some elements from the architecture of the gardens in Versailles, but without any intention to reproduce accurately the reality. Thus, the two statues recall the statues arranged around the pool of Apollo and on the both alleys parallel with the length of the lawn called *Le Tapis Vert* (which is missing in the painting form Sibiu), but cannot be identified with any of them (for the sculptures in Versailles: Francastel 1930; Girard 1983). The two artesian fountains placed each in the centre of a small round decorative pool would recall, by their place in the composition, the two fountains of the Lizards, with sculptures due to the brothers Gaspard and Balthazar Marsy, situated between the fountains of Apollo and Latona, but in the most remote plan cannot be seen the western façade of the Versailles Palace, nor the fountain of Latona and the facilities between it and the palace, and even the perspective is different, if considering the downward direction of the stairways in relation to the building in the most remote plan (Fig. 17-18). The Parterre of Latona, to which the two pools of the Lizards are linked in terms of the assembly's general concept, was designed by André Le Nôtre c. 1663 (Fig. 19), and the initial arrangement of the statues of the fountain of Latona before the changes made in 1687 and 1689 by Jules Hardouin-Mansart is kept in some prints, among which the most relevant ones (Fig. 22, respectively Fig. 23) are due to Jean Le Pautre (1678) and respectively Gabriel Pérelle (before 1687) (for the history of the arrangement of the Parterre of Latona: Jacquet 2011, 149). The fountain of Latona is rendered as well in an etching (20 x 29 cm) by Adam Pérelle from the Metropolitan Museum of Art in New York (accession number 20.41(126)). This print (Fig. 24) is dated 1680s, due to the fact that the garden facade of the Palace's Enveloppe is shown as completed around 1674 to the designs of Louis Le Vau and especially because of the fact the facade was changed beginning around 1680, when the Hall of Mirrors was constructed, although according to Franklin Hamilton Hazlehurst the design of the *Parterre d'Eau* shown in the print by Adam Pérelle is likely a project that was never executed (Hazlehurst 1980, 81).

Obviously, due to its relative resemblance to the reality in Versailles, the painting cannot be dated previously this area of the garden was designed, respectively before c. 1663. Considering both that in the current state of research the information about the paintings by Gabriel Pérelle are so unreliable and few and that, as already mentioned, after 1665, Gabriel Pérelle, appointed Director of the Royal Cabinet's Plans and Maps, leaves his engraving studio to his sons Nicolas and Adam and that it seems that the true author of the two paintings on copper from Sibiu could be, most likely, one of the two sons of the artist, respectively either Nicolas Pérelle (as it may result right from the information existing during the lifetime of Baron Samuel von Brukenthal, recorded in the handwritten catalogue of his gallery) or Adam Pérelle. (For the biography and works of Gabriel Pérelle and of his sons Nicolas Pérelle and Adam Pérelle: Strutt 1786, 216; Bellier de la Chavignerie, Auvray 1885, 233; Vollmer 1932, 401-402; Avel 1973). Unfortunately, it cannot be expected to solve easily the problem of the two paintings' attribution by the discovery or rediscovery of any signature after their cleaning, as its existence was neither indicated in the older literature nor seems possible to be supposed following the optical examination of the works, before and during the conservation.

Nicolas Pérelle, who studied both under his father and under Simon Vouet, is known also as a painter who enjoyed a certain success, which eventually led him to abandon the engraving, although previously he had important commissions, as some of the prints showing the conquests of King Louis XIV or that commissioned by Count Eric Jönsson Dahlbergh (1625-1703) in order to illustrate the history of King Charles X Gustav of Sweden (De rebus a Carolo Gustavo Sueciae rege gestis com*mentariorum*) published by Samuel von Pufendorf in Stockholm in 1679 and later for his own collection Suecia antiqua et hodierna, which was printed posthumously. In the Joconde public data base, where Nicolas Pérelle is mentioned with only 7 works in the museum collections from France (http://www2.culture.gouv.fr/public/mistral/jocond e\_fr?ACTION=CHERCHER&FIELD\_3=AUTR& VALUE\_3=PERELLE NICOLAS), there are only 2 paintings whose author he is, but which unfortunately are not accompanied by sufficient information on technique, support and size, nor by photographic reproductions, that the assessment of their artistic quality and the stylistic comparison is impossible. However, to a certain extent, they are relevant by their themes: Architectural ruins (oil on canvas, 62 x 82 cm) in the Musée des beauxarts in Marseille (inv. 202), which shows a figure in moonlight and St. Francis de Paula Bringing Back to Life a Child (i. e. his own nephew) in the Musée des beaux-arts of Orléans (oil on canvas, 155 x 106 cm, inv. D76; 1; 3), which is signed and dated 1683 and, according to the devise of the Order of the Minims occurring on a phylactery, may have been painted for a convent of this order (O'Neill 1981, 108). Both paintings were nationalized during the French Revolution and the latter is the single work of Nicolas Pérelle still existing in Orléans, although the artist worked much for the local churches and monasteries. The latter work's theme occurs as well in a painting by Simon Vouet, now lost, commissioned by the Minims' monastery from Place Royale in Paris and which is known only by a print made in 1655 by François Tortebat and Jean Boulanger.

To these two paintings by Nicolas Pérelle was added also as an own work an altar painting said to depict the Nativity, from the church of Batilly (Vollmer 1932, 402), but without to be clear whether it is Batilly-en-Gâtinais or Batilly-en-Puisaye, both in the Loiret department, like Orléans, the city where the artist seems to have settled in the last years of his life and where he also died (1695). Following the correspondence of Alexandru Gh. Sonoc with the Diocese of Orléans, it turned out to be the St. Martin's Church in Batillyen-Gâtinais, with an altar painting (on panels) of 1688, depicting actually the Adoration of the Shepherds, indeed attributed sometimes to Nicolas Pérelle (https://fr.wikipedia.org/wiki/Batilly-en-Gâtinais). Although previously considered to be a copy after Carracci, this work is in fact, according to the latest research, recorded in the mentioned Joconde database, a copy after a painting by Pierre Mignard (1612-1695), identified only in 2014 by R. Benoît-Cattin and previously known only thanks to its reproduction in an engraving by François Poilly de (http://www2.culture.gouv.fr/public/mistral/palsri fr?ACTION=RETROUVER&FIELD 98=LOCA &VALUE 98=%20Batilly%2den%2dG%e2tinais &NUMBER=1&GRP=0&REQ=%28%28Batilly% 2den%2dG%e2tinais%29%20%3aLOCA%20%29 &USRNAME=nobody&USRPWD=4%24%2534P &SPEC=3&SYN=1&IMLY=&MAX1=1&MAX2 =200&MAX3=200&DOM=Tous). It is hard to say if Nicolas Pérelle could be or not the author of this copy.

As mentioned above, the activity of the former engraving studio of Gabriel Pérelle (who died in 1677) seems actually to have been continued, already after 1665, by the artist's two sons, Nicolas and Adam. It did not cease even after the first settled in Orléans (c. 1683) and it continued for some years (although on a smaller scale) under the direction of Adam Pérelle, who died in 1695, like his brother too, but in Paris. In the Joconde data base, where Adam Pérelle is known through 134 works, no painting of this artist is mentioned or reproduced. There, 13 of these 134 works are actually illustrations after his engravings, made for a treaty of practical (applied) geometry, published by Allain Manesson-Mallet. Although appointed Royal Engraver, he became interested rather in painting, as his brother too, but unlike him he earned a living not as a painter, but mainly by teaching paint-

ing and drawing in high society families, among his students being even Duke Louis III of Bourbon-Condé (1689-1709) and maybe Moyse-Jean-Baptiste Fouard and Pierre Aveline. Therefore, from the later period of his activity there are fewer works. Apart from some prints in the mentioned album with landscapes from France and Italy, among the works known to be made by Adam Pérelle there are also some prints depicting castles from Sweden, as well as one showing a stag hunt. His prints inspired by the recent history of Sweden or depicting castles from Sweden are the result of an agreement signed in 1667 with Eric Dahlbergh, according to which he had to make engravings to illustrate the mentioned history of King Charles X Gustav (1654-1660) and for the commissioner's own collection Suecia antiqua et hodierna. The artist is also the author of an album of engravings in 3 volumes, titled Lecons de paysage.

A more rigorous research on the drawings, prints and paintings made by various members of the Pérelle family becomes more difficult due to the fact that for a long time, both in the gallery guides of the Brukenthal Museum as well as in the prestigious biographical lexicon begun by Ulrich Thieme and Felix Becker, other two landscapes with figures (but painted on canvas and stylistically completely dissimilar both to the two paintings on copper and to the prints in the mentioned album with landscapes from France and Italy) were assigned to another, even less known member of the same family, also from the 17<sup>th</sup> c.

About the two paintings, namely On the Mountain Pasture (oil on canvas, 146 x 905 cm, inv. 880) and Fishermen on the River (oil on canvas, 146 x 910 cm, inv. 881), is known that both have been restored in 1897. These two works come also from the former collection of Baron Samuel von Brukenthal, who seems to have purchased them as due to an Italian anonymous. However, in the Brukenthal Museum's gallery guide printed in 1844 they were assigned (with doubts) to an artist from the Pérelle family (spelled as Perelle), but without to mention his first name (Die Gemälde-Galerie 1844, 5, cat. 4-5). Only in the 1893 edition of the gallery guide these works were attributed to Antonius Perelle, considered however to be an Italian artist (Führer 1892, 2, cat. 23 and 22). With the same attribution, but without any reference to the ethnicity of the artist, about whom is said only to have lived in the 17<sup>th</sup> c., the paintings are mentioned by Michael Csaki in the gallery guide's editions of 1901 (Csaki 1901, 241, cat. 865 and 866), 1909 (Csaki 1909, 263, cat. 880 and 881) and

1926 (Csaki 1926, 23, cat. 880 and 881). Neither the 1941 edition of the gallery's guide published by Rudolf Spek brought a change in how the name of the works' author is mentioned (Spek 1941, 5, cat. 880 and 881), although abroad it was already stated (in 1932) that the two works are due to a French artist, a disciple of Simon Vouet, identified as a Gabriel Pérelle's brother of previously unknown first name, about whom is said that he worked in Orléans both as a painter of churches and as a painter of landscapes (Vollmer 1932, 401). Obviously, certain common biographical data suggest the risk of a confusion with Nicolas Pérelle, who also died in Orléans (where he seems to have settled toward the end of his life) and who was known not only as an engraver, disciple and collaborator of his father, but also as a student of Simon Vouet and as a painter of altars and of landscapes with ruins (Vollmer 1932, 401-402). Perhaps for this reason (and not only because formerly Antonius Perelle, respectively Antoine Pérelle has been considered as an Italian painter), in her study dedicated to the French paintings from the Brukenthal Museum's collection (Lisan 1987) Mariana Lisan did not refer at all to the two works previously attributed to this almost mysterious artist from the Pérelle family, although the hypothesis that in the meantime the two paintings received already a new attribution (to which we shall return below) should not be ruled out. Of course, the fact that Antoine Pérelle is unknown also in the Joconde data base is not a sufficient argument for his inexistence or to suppose that he could be a fictional artist, "created" in late 19th c. (most likely during c. 1870-c. 1890), at a time when due to the lack of sufficiently exploited archive sources, the information about the Pérelle family artists was little and confusing, that the engraver and painter A(dam) Pérelle could be mistakenly identified as A(ntoine) Pérelle, who obviously seems to have "acquired" as well some elements from Nicolas Pérelle's biography. Therefore, the question of Antoine Pérelle's existence still remains a theme of debates.

At the present state of research, the most known and strongest evidence in favour of Antoine Pérelle's real existence seems to be a series of 24 etchings of very close sizes (among which one work is coloured), which are kept at the Rijksmuseum in Amsterdam. According to the information from the museum's data base, they were made by Gillis van Scheyndell the Elder (1595-1653/1660) after Antoine Pérelle (https://www.rijksmuseum.nl/en/search?p=2&ps=1 2&involvedMaker=Antoine%20Perelle&st=Object

s&ii=6). The most of these prints were acquired already in the late 19<sup>th</sup> c. and during the 20<sup>th</sup> c. the largest lot was purchased in 1991. Excluding the identical items, results a number of 17 different works, which are landscapes with ruins, landscapes with farms, landscapes with forts or mountain landscapes. Among them, only one work (etching, 96 x 170 mm), published in Amsterdam by Frederik de Wit and bearing the legend Divers Paisages au Naturel, of which in the mentioned Dutch museum's collection there are actually 2 items, one purchased in 1878 (inv. RP-P-1878-A-1551) and the other in 1991 (inv. RP-P-OB-15.099), mentions expressly Pérelle (but without first name) as inventor, therefore as the author of the drawing after which was made this print called Hilly Country with Ruined Wall and Gate in the museum's data base, where the identification of the draughtsman with Antoine Pérelle is considered only possible, not as certain. The role of his drawings in the making of the other prints engraved by Gillis van Scheyndell the Elder was certainly assumed due right to this work, by stylistic comparison. However, these prints are dated in two different periods: 1605-1653, respectively 1640-1706, covering thus a duration of 101 years, which is completely incredible for the worktime of an artist (if possible different editions, including posthumous ones, would not be taken into account), as Gillis van Scheyndell the Elder's lifespan is relatively well known and therefore, in order to inspire this artist, the works of Antoine Pérelle should necessarily be at least contemporary, if not older. Thus, an (even inaccurate) attempt to date all these works before Gillis van Scheyndell the Elder's imprecisely known death year (1653/1660) could indicate a relative terminus post quem non of Antoine Pérelle's activity, which taking into account the biographical data of Gabriel Pérelle and of his sons Nicolas and Adam would suggest rather that, if it is not a simple coincidence of surnames, Antoine Pérelle could be indeed either an elder relative of Gabriel Pérelle or closer to his age, rather to that of the latter's two sons Nicolas and Adam. From here came maybe the conclusion that he would be a brother of Gabriel Pérelle (Vollmer 1932, 401), who seems to have not be influenced at all in his drawings by the latter's style, but maybe (according rather to his biographical data) by Simon Vouet (who died in 1649).

Considering that the mentioned prints by Gillis van Scheyndell the Elder show a drawing of lower artistic quality in comparison to the works by Gabriel Pérelle and by his sons, but also the differences in the structure of the composition and especially in terms of the perspective (which in these works by Gillis van Scheyndell the Elder after drawings by Antoine Pérelle recall rather the landscapes by some artists from the Netherlands and from southern Germany), it seems that between Antoine Pérelle and Gabriel Pérelle or the latter's studio there is no artistic relation, being thus quite difficult to see Antoine Pérelle even as a mere imitator of Gabriel Pérelle. Stylistically, there is no connection between the prints made by Gillis van Scheyndell the Elder after the drawings assigned (whether rightly or not) to Antoine Pérelle and the two paintings from the Brukenthal National Museum's collection erroneously attributed formerly to the latter, as neither between these paintings and the two Italianate landscapes of copper there is not any.

Moreover, in the current museum's inventory register the two landscapes painted on canvas are no more assigned to Antoine Pérelle, but to Marco Ricci (1676-1730). At the current state of research, it is harder to say who made this new attribution. which is proven to be the right one. Its recording in the inventory register is certainly due to the efforts made in this respect by Maria Olimpia Tudoran Ciungan, although in the catalogue of the works of 16<sup>th</sup>-18<sup>th</sup> c. Italian art which she published (Tudoran Ciungan 2007) these two paintings are not mentioned at all. In my opinion, they should be dated c. 1700-1720, considering the landscapes from Museo del Settecento Veneziano in Ca' Rezzonico of Venice (dated c. 1700), but especially Southern Landscape at Twilight (oil on canvas, 94 x 108 cm), dated in the first half of the 18<sup>th</sup> c., from the Gemäldegalerie in Berlin and Landscape with River and Figures (oil on canvas, 136 x 197 cm), dated c. 1720, from Galleria dell'Accademia in Venice and also there Landscape with Laundrywomen.

Since obviously Antoine Pérelle cannot be considered at all as the true author of the two paintings on copper previously assigned to Gabriel Pérelle, it seems very likely that at the present state of the research the most likely attribution of these works remains that they had when they were acquired by Baron Samuel von Brukenthal, more than two centuries ago. The hypothesis that they are not works made by Gabriel Pérelle, than by his son Nicolas Pérelle is supported especially by the absence of certain stylistic peculiarities of the former, despite the obvious common preference of the two artists both for the Italianate landscape with ruins and figures and for a similar structure of the composition: the different treatment of the foliage in the

prints engraved by Gabriel Pérelle and his preferences for the use of the lighting, insofar as these specific details, already noted in 1786 as such by Joseph Strutt, can be used as well at the examination of a painting, knowing also that meanwhile there are only few and uncertain evidences that Gabriel Pérelle would have worked as a painter too. Although there are very few works that are certainly known to have been made by Nicolas Pérelle or which are attributed with sufficient certainty to him, we consider that it seems less likely that his works were simply copied or imitated or that under his names were even sold works of another artist, whose manner was totally different (and this only after more a century after his death and especially knowing that the posterity remembered him primarily as an engraver and not as a painter!). Lacking more precise clues than the arrangement of the Parterre of Latona in the gardens of Versailles by André Le Nôtre (c. 1663) in an anonymous plan of the gardens of Versailles (Fig. 20) kept at the Bibliothèque de l'Institut de France, Paris (ms. 1307-54), the return to the initial assignment of the two paintings from Sibiu to Nicolas Pérelle implies that they should be dated in the second half of the 17<sup>th</sup> century, more precisely during the period c. 1663-1695, if not around the time when the artist settled in Orléans and afterwards, that is approximatively during 1683-1695. The date of the mentioned plan results considering that is shows Louis Le Vau's 1662 widened forecourt with new service wings for stables and kitchens and his orangery, built in 1663 (Hazlehurst 1980, 62-64).

The date proposed for the painting View with Italian Garden from the Brukenthal National Museum's collection (and therefore for its pendant as well) is well supported if considering not only the mentioned engravings by Jean Le Pautre, Gabriel Pérelle and Adam Pérelle (fig. 8-10) showing the fountain of Latona in various arrangements from 1678 till before 1687, but also the changes suffered by the Parterre of Latona during 1662-1700, as recorded by the manuscript plan of the domain of Versailles and its environs (Fig. 19), generally known as the Du Bus plan, dated 1662 and kept in Paris, at the Bibliothèque nationale de France, Département Cartes et plans (GE DD-2987 (833 B); Collection d'Anville 00833 B) and respectively by the general plan of Versailles (Fig. 21) by Nicolas de Fer (engraved by Charles Inselin), dated 1700 and kept as well at the Bibliothèque nationale de France in Paris.

# **3.** The conservation works and some remarks on the technique of painting on copper.

The both works painted in the oil on copper technique entered the laboratory on January 22, 2019 for conservation, although they were in a quite good condition, even after almost 120 years since the last conservation of one of them. This situation is due to the fairly high endurance of the rigid support: the metallic copper sheets, manufactured (in most situations) by hammering. Besides few and mostly minor losses of the paint layer, the two works show as well some specific deteriorations of the copper support. However, the protection provided by this kind of support to the paint layer is excellent, if compared with a painting on canvas, because it should not be forgotten that after drying the paste mixed with oil becomes brittle, completely devoid of elasticity and flexibility, so that any movement of the support (bending, stretching or relieving from the stretcher) will produce cracks (Lăzărescu 1996, 18). Thus, paintings on copper will not show aging cracks, unlike the paintings on canvas or on wood and so the choice of copper as a support may have been a conscious choice made by the artists, either they were eager to experiment a new technique of painting or they wished to create a durable, practically everlasting work, as they believed that the paintings on stone (so fashionable during the 16<sup>th</sup> c.) would be. Right for this reason, many artists experimented both the painting on stone and the painting on copper.

As noted by Hana Seifertová, the paintings on copper are most common during the 16<sup>th</sup>-18<sup>th</sup> c. (but mainly in the  $16^{th}$ - $17^{th}$  c.), although there are records that the technique of painting on copper was already known in the 15<sup>th</sup> c. and even in the 12<sup>th</sup> c. (Malarstwo 2003, 1). Excepting huge works like one of the paintings of the cycle of St. Januarius, which is higher than 3.5 m (but consisting actually of several joined copper plates) and was made in 1632 by Domenico Zampieri called il Domenichino (1581-1641) for the Treasury Chapel of the Naples cathedral (Malarstwo 2003, 9; Hill Stoner, Rushfield 2012, 104), the paintings on copper are, generally, rather small and therefore they were mostly cabinet paintings, sometimes in the most proper sense of the expression: many of them (especially with religious or mythological themes) were created to decorate the front side of cabinets in which precious things were kept. A particular kind of paintings on copper in Silesia and Poland are, from late 16<sup>th</sup> till late 17<sup>th</sup> c., the epitaphs with the coat of arms and vanity symbols and later also with the portrait of the deceased,

sometimes even collective portraits, with a family forming a prayer group (Malarstwo 2003, 24-25).

The thin copper plates used as support are believed to be more expensive than canvas or wood, although the newer research relativized this supposition, showing that in Antwerp, according to archive records, the price of copper sheets for painting did not exceed in fact the price of an oak panel support (Hill Stoner, Rushfield 2012, 101). The copper sheets have a good endurance to normal conditions of temperature and relative humidity, and this property allowed them to be transported quite far, in order to be completed by painters specialized in a certain type of themes (landscapes, animals, figures, still lifes etc.) or to be fixed on furniture items, including not only doors and drawers for jewel boxes or cabinets, but also sacred tabernacles and small altars for personal devotion, which easily could accompany their owner on the battle field and on travels, both by land and sea. At the same time, this property favoured a mass production and especially their export even overseas, at first from the Low Countries to Spain and from there to the New World. However, due to a higher humidity, often the copper sheet used as painting support is largely oxidized, and thus coloured in shades of green and brown. Another advantage of this rigid support is that it allows extraordinarily controlled brushwork, therefore intricately fine details and subtle blending of colours, as well as crisp, well-defined effects. Its smoothness was variously exploited by the artists: from smoothly blended paint with soft contours, to precise handling or to unexpectedly sketchy brushwork. Because oil-based grounds on copper are non-absorbent, oil paints did not sink in to the ground, so they retained intensely saturated colours even in thin layers, obviating the need for a varnish. The vivid and luminous colouring of the paintings on copper was particularly suited to religious works commissioned for personal devotion, but also to impressive portraits and other profane depictions, as colourful landscapes and still lifes or various dynamic scenes and at least, but not at last, to reduced reproductions of larger paintings and even to pictorializations of original or reproduction prints.

It is thought that the developing of etching and engraving during the  $16^{th}$  c. may have contributed to the use of copper plates as supports for painting, particularly as many painters also produced intaglio prints, but the use of plates previously used for etching or engraving seems to be fairly uncommon (Kirby 1999, 27; cf. Malarstwo 2003, 8; Hill Stoner, Rushfield 2012, 101). It should be noted that the copper plates produced by the copperbeaters to be used as supports by the painters were generally thinner and less refined or finished compared to printing plates (Hill Stoner, Rushfield 2012, 101). By contrary, the recycling of copper plates from old epitaphs as support for new paintings was quite popular on the actual territories of Poland and the Czech Republic, as pointed by Łucja Wojtasik-Seredyszyn (Malarstwo 2003, 25). The painting on copper technique was used especially in Italy, in Germany and in the Low Countries, in the latter area being so frequent, that Carel van Mander seems to have considered it as a national Dutch art (Lăzărescu 1996, 23). Its origin can be found actually in Florence, in the third quarter of the 16<sup>th</sup> c. (where the Grand Dukes Francesco I, Ferdinando I and Cosimo II were dedicated collectors) and was taken up as a speciality in Rome, by the circle of Paul Brill in the 1590's. In the 17<sup>th</sup> c. the copper panels were quite widely used, but especially in Italy and generally in the Low Countries (Kirby 1999, 26), where at least in Antwerp, according to a letter of Peter Paul Rubens to Johann Faber (January 14, 1611), there was a public interested in such small works (Kirby 1999, 27; cf. Malarstwo 2003, 10), although from the aforementioned artist himself only 4 paintings on copper are known (Kirby 1999, 26). Soon, the most important European centres of painting on copper became Prague, Antwerp and Utrecht, but after 1650 the popularity of this technique waned, although much slowly in southern Germany, Switzerland, Austria and Bohemia, as in some of these areas it was connected not only with the production of religious paintings for personal devotion, but during the first half of the 19<sup>th</sup> c. also with the local production of clocks fitted in paintings (especially in landscapes, cityscapes and interior scenes, but not only). During the 17<sup>th</sup>-18<sup>th</sup> c., paintings on copper made in the Low Countries were very sought-after by German collectors, in Berlin, Düsseldorf and Würzburg. As a consequence of the 16<sup>th</sup>-17<sup>th</sup> c. Spanish exports of paintings on copper from the Low Countries (especially from Antwerp) and from Italy to the New World, a local (and still less known) production rose there as well, favoured rather by the availability of metal than by aesthetic concerns, but this technique, although dominant in 18<sup>th</sup> c. New Spain, remained rare in Peru. In the Spanish colonies the use of copper plates continued to flourish under the influence of 17<sup>th</sup> c. artists from Peru and New Spain as Matteo Pérez de Alesio, Alonso López de Herrera and Cristóbal de Villalpando. Although on a smaller

sale, the technique of painting on copper continued from late 18<sup>th</sup> till 20<sup>th</sup> c., as seen in the works of various artists like Maria Anna Angelika Kaufmann, William Blake, Francisco José Resende, Joan Miró and Lucian Michael Freud (Hill Stoner, Rushfield 2012, 102-104).

Despite the popularity which the paintings on copper enjoyed since the 16<sup>th</sup> c., both the cultural and historical approach in the research of the paintings on copper and the interest for a worldwide comparative study of the technique of painting on copper using both written records and physical and chemical investigations are rather only some decades old, but they spread fast and reached Central Europe as well. (The most authoritative work for the cultural and historical context of the painting on copper and its techniques: Komanecky 1998. The most recent exhibition of paintings on copper from Central European collections: Malarstwo 2003).

Besides paintings on copper, during the 16<sup>th</sup>-18<sup>th</sup> c. are known as well paintings on tin, zinc, brass and since the 16<sup>th</sup> c. even miniatures (especially portraits and religious scenes) on silver plate. From the 18<sup>th</sup> c. till the second half of the 19<sup>th</sup> c. are known as well paintings on iron sheet and since late 18th c. on tinned iron sheet (Hill Stoner, Rushfield 2012, 106-107). Sometimes the copper was also coated with tin or lead, respectively with silver or gold leaf, either due to the belief that a coating would ensure good adhesion of the paint film to the support or would offer resistance to corrosion, respectively for aesthetic reasons (Hill Stoner, Rushfield 2012, 104-105). Since the  $19^{\text{th}}$  c. the artists experimented again the painting on zinc and steel and in 20<sup>th</sup> c. as well the painting on aluminium, on magnesium and on stainless steel (Hill Stoner, Rushfield 2012, 107-110). At first, the painting on aluminium was, generally, a disappointing experiment, because after several years the paint layer was destroyed, especially if lead colours were used and the works were kept in humid conditions. This led to attempts of transferring into the artistic use techniques and materials previously used for industrial (or even naval) painting, with a good endurance even in harsher conditions of temperature and humidity. Besides the interest for the industrial achievement to produce larger, but much thinner sheets, most obvious is the use of more stable colours, on a different ground, apparently more appropriate to these metals.

A research on the paintings on copper from the National Museum of Art of Romania in Bucharest (where are kept some precious 16<sup>th</sup>-17<sup>th</sup> c. works)

shows that although the lengths of the sides oscillate between 15-35 cm, there is a work from the early 17<sup>th</sup> c. (*Apollo and Daphne*, by a Flemish anonymous painter) which has a side whose length exceeds one meter, showing therefore that, although rarely, the painters worked also on larger copper sheets (Lăzărescu 1996, 23).

In the European paintings collection of the Brukenthal National Museum there are 110 paintings on copper, the most of them dated during the  $17^{th}$ - $18^{th}$ c. (but especially, it seems, in the 17<sup>th</sup> c.). Their authors are mainly painters from the Low Countries (as Pieter Stevens the Younger, Frans Franken the Elder, Jan Brueghel the Elder, Hendrik van Balen the Elder, Andries van Eertvelt, Jan Brueghel the Younger, Pieter van Lint, Herman Saftleven the Younger, David Teniers the Younger, Andries Both, Peeter Gijsels, Jan van Kessel the Elder, Nicolaus van Hoye, Adam Frans van der Meulen, Jacob Toorenvliet, Jan Griffier the Elder, Alexander van Bredael, Adriaen de Grijef, Frans van Stampart etc.), from Germany (as Hans Rottenhammer, Johann Heinrich Roos and F. von Deckler), Austria (as Franz Thomas Canton, Franz de Paula Ferg, Maximilian Joseph Handel, Martin van Meytens the Younger, Max Joseph Schinnagel and Franz Christoph Janneck), Switzerland (Johann Rudolf Byss) and Italy (as Giovanni Francesco Caroto, Giovanni Francesco Romanelli and Paolo Alboni), but also some French painters (among whose works there are also two anonymous life-size busts on dished oval plates, which are the single ones of this kind). Besides the works whose authors are known and besides original works by anonymous painters, there are as well several anonymous works inspired by paintings of some Italian, German or Swiss artists and a copy of a self-portrait of. Often, the true origin of the authors of the latter category of paintings on copper can be only supposed or will continue to remain unknown, especially if keeping a rigorous research method. To them can be added, in the collection of national paintings, 6 portraits on copper by the Transylvanian Saxon painter Johann Martin Stock (1747-1818), a former student of Martin van Meytens the Younger in Vienna. One of the paintings on copper recorded in the collection of European Art, The Portrait of a Youngster (oil on copper, 14.5 x 13 cm, inv. 969) is actually a copy after the portrait by Johann Heinrich Roos from the same museum's collection (oil on copper, 14.5 x 13 cm, inv. 965) and therefore it should be made, most likely, during late 18<sup>th</sup> c. or during 19<sup>th</sup> c., by an unknown local artist. It is not mentioned at all among the 22 paintings purchased by the museum on December 23, 1834 from Franz Neuhauser the Younger (1763-1836), an Austrian painter settled in Sibiu (Bielz 1960, 91, n. 27; cf. Mesea 2007, 77, n. 11).

In respect of their themes, the 110 paintings on copper of the Brukenthal National Museums collection of European paintings can be divided into following categories: 30 portraits (27.27 %), 29 landscapes, cityscapes and seascapes (26.36 %), 23 religious themes (20.90 %), 19 genre scenes, battle scenes, hunting scenes and historical scenes (17.27 %), 7 mythological themes (6.36 %) and 3 still lifes (2.72 %). As far as are considered only the works whose attribution is undoubted or some anonymous ones which can be precisely dated, this collections is of a particular interest for the history of painting on copper, not only for the works by some famous earlier artists, but also because there are many works of painters who worked after 1650, even in late 18<sup>th</sup> c. Considering the fact that Johann Martin Stock was a Transylvanian artist educated in Vienna, as well as that his paintings on copper are dated during the last decade of the 18<sup>th</sup> c., they are an evidence that this technique (already outdated in many regions of Europe) arrived in Transylvania rather late, in 18<sup>th</sup> c. Despite its copper resources, Transylvania seems therefore to show a totally different situation than other regions of Central Europe (Switzerland, Austria, Bohemia, Silesia and Poland) where the painting on copper has a much longer tradition, although in Poland, where much copper was imported from Hungary and Sweden (Malarstwo 2003, 23), the earliest known portrait painted on copper, from late 16<sup>th</sup> c., is believed to be that of King Stephen Báthory, who was also Prince of Transylvania (Malarstwo 2003, 24).

If compared to the most common dimensions of the paintings on copper, considering only the paintings having the longest side (or the longest diameter) of at least 51 cm as large paintings, in the collection of European paintings there are 14 items of this kind, the biggest being two works having the longest side exceeding 70 cm: Vir dolorum by Pieter van Lint (78 x 62.3 cm, inv. 328) and The Holy Virgin Mary's Birth by Giovanni Francesco Caroto (72 x 61 cm, inv. 369). They show that large paintings on copper were made already in the early or mid-16<sup>th</sup> c. Thus, in respect of this remark, further on should be considered as miniatures the paintings having the longest side (or the longest diameter) smaller than 15 cm, as small paintings those whose longest side (or diameter) is

of 16-20 cm and as *medium paintings* those whose longest side (or diameter) is of 21-50 cm.

In this respect, in the collection of European paintings there are 19 miniatures, 13 small paintings, 63 medium paintings and 15 large paintings, while in the collection of national paintings among the aforementioned portraits by Johann Martin Stock besides 5 medium size works there is only 1 large painting. In order to make possible a comparison with the remarks on the size of the paintings on copper from the National Museum of Art of Romania's collection, where the longest side of a painting is mostly 15-35 cm (Lăzărescu 1996, 23), the statistics will show that in the Brukenthal National Museum's collections of European painting and of National painting there are 34 works belonging to these category (of which only 1 in the collection of national painting), which means 29.31 % of the total number of 116 paintings on copper from the both mentioned collections of the Brukenthal National Museum. Thus, although in the collection of the Brukenthal National Museum the most paintings on copper are small and of medium size (73 works), the paintings whose longest side or diameter is of 15-35 cm represent only less as a third of the total number of paintings on copper.

In the collection of European paintings there are as well a religious miniature after Cristofano Allori painted allegedly on tin, 2 medium size still lifes painted on tin and dated in the  $17^{\text{th}}$  c. (maybe by Giovanni Stanchi), 2 mid- $18^{\text{th}}$  c. Austrian miniature portraits painted on zinc sheet, 2 late  $17^{\text{th}}$  c. Austrian miniature portraits painted on brass and 6 paintings on iron sheet. The paintings on iron sheet show various themes: 2 landscapes, 1 portrait, 1 animalistic theme, 1 genre scene, 1 religious theme. To these  $17^{\text{th}}$ - $18^{\text{th}}$  c. works on other metallic support than copper can be added 3 paintings on iron sheet by  $19^{\text{th}}$  c. Transylvanian painters (namely 2 large Greek-Catholic icons by I. Körösy and 1 anonymous miniature portrait).

Unfortunately, a more in-depth study of the old paintings on metal fund in Romanian museums and collections (and particularly of paintings on copper) remains meanwhile only a desideratum and, therefore, other possibilities for comparison are quite limited now. However, in respect of the size of the paintings on copper, here should be mentioned that Jo Kirby considered as *quite small* paintings of 21.9 x 16 cm - 25 x 19.4 cm (which for the Brukenthal National Museum's collection would be of medium size, although in the lower part of this category) and noted that many paint-

ings on copper support are larger (Kirby 1999, 27). In respect of this remark, if as *small paintings* would be considered those whose longest side (or diameter) is of 16-25 cm and as *medium paintings* those whose longest side (or diameter) is of 26-50 cm, the classification by their size of the paintings on copper in the collection of the Brukenthal National Museum would be changed to 27 small works, respectively 49 medium size works of the total number of 116 paintings on copper (counting together the 110 European paintings and the 6 Transylvanian paintings).

Thus, by their sizes (32 x 38 cm, respectively 32 x 38.5 cm) the two French paintings on copper from the Brukenthal National Museum's collection discussed on this occasion are small only if compared with the dimensions of the paintings on canvas or even of the paintings on panel. Considering the dimensions of the paintings on copper in the same collection, they would be obviously of medium size (even without to consider the remarks of Jo Kirby on the dimensions of the paintings on copper).

On both paintings the colour film is smoothly applied in overlapping layers, which in patches show abrasions. Gaps there are especially in the perimeter zones and in the areas where irreversible mechanical blows inflicted from the work's backside led to the loss of the paint layers.

According to the examination in natural light and in UV light, the varnish film is evenly distributed, but in a very thick layer. The UV lamp with mercury vapours (also known as Wood's lamp) emits ultraviolet radiations, whose maximum emission is of 365 nm. This high quality technology was invented in 1903 by the American physicist Robert William Wood (hence the name of the lamp) and nowadays is used in many fields (dermatology and forensic medicine, non-destructive tests of various nature, reading of erased texts on various soft and hard materials, non-harming marking of animals and humans, attracting of insects, theatre effects, curing of plastic resins etc.), as well as in conservation (Giannini, Roani 2003, 192). In conservation, the photographic documentation made with UV rays is important to highlight the chemical alterations produced in the varnish layer or in the colour film and so can be noted both the degradation process and the previous interventions (Nicolescu 1975, 64).

The altered varnish forms a film of yellow-brown colour, which impedes the reading of the works. The varnish has a double role, both protective and optical (Istudor 2007, 175). Its main role is to

protect, by isolating the colour layers from the surrounding atmosphere, in which the painting is exposed to humidity, oxygen, pollutant gases (sulphur dioxide, carbon dioxide etc.), dust particles and smoke. These factors act destructively on art works, either they are exhibited outside or inside. The varnish impedes, therefore, the intrusion of these harmful factors into the constituent elements of the painting. Its optic role is to provide a greater degree of depth and saturation, to give brightness and uniformity to the colour layer.

An important problem which still remains less known is the preparation of the copper plate in order to be painted, as the investigation technique currently available in the Brukenthal National Museum's laboratory for oil paintings conservation does not allow to verify entirely the information on some proceedings known from old painting treaties and handbooks. Although it is generally believed that during the 16<sup>th</sup>-18<sup>th</sup> c. the materials and techniques were similar to those used on wood on canvas, a deeper research on this kind of sources, as done by Maartje Stols-Witlox in her doctoral thesis at the University of Amsterdam (Stols-Witlox 2014) would bring more information about the old masters' technique of painting on copper, which during the last two decades aroused worldwide more and more interest. Recent researches evidenced that the most modern physical examination methods on some Portuguese and Flemish paintings on copper confirm the information from 17<sup>th</sup>-18<sup>th</sup> c. painting treaties and handbooks (Vega et al. 2018).

Considering that the two paintings on copper due to the French artist Nicolas Pérelle from the Brukenthal National Museum's collection should be dated, most likely, c. 1683-1695 it seems very likely that the painter may have been aware of the method to prepare a copper plate in order to be painted, described in 1679 by Jean-Henry de La Fontaine, a Royal Engineer, in his handbook of painting dedicated to Charles de Sainte Maure (1610-1690), Marquis de Salles and Duke de Montausier, who during 1668-1680 was the Governor of the Grand Dauphin, the eldest son of King Louis XIV of France and Navarre: "Take a well-polished copper plate after you will take wellground white lead with umber and carbon black mixed with them, with a brush you will rub over the well-bonded plate and with a line or cotton in between you will hit over it, in order to make them to join better, and when the colour will be dry you will take a knife and will pass over to join them

more, after this you will load it once again and do again the same; letting them to dry, you can work in order to paint on a stone or plaster, having to prime and make the primer (*l'impression*) very clear at first, when everything will by dried it has to be primed for the second time, then to paint, that if you would overpaint, the colour will flow out continuously and will be thick, and the plaster will drink the oil" (De La Fontaine 1679, 28-29; cf. Massing 1995, 28, n. 9, with a partial and wrong quotation from the work by J-H. de La Fontaine).

Despite Jean-Henry de La Fontaine's description of the proceeding how to prepare the copper support and even to some errors which are due most likely to the fact that he was not a painter (which can be easily remarked by comparison with accurate descriptions in other old more professional works for painters), it contains one of the oldest known receipts for primer used in painting on copper, excepting the mention of white lead and umber with oil (Pacheco 1649, 385), mentioned by Francisco Pacheco (1564-1644) and a less clear statement of Vincencio Carducho (1576/1578-1638), that the primer used to paint on plates is the same as for paintings on canvas or panel and some other materials (Carducho 1633, 131-132). New physical investigations on the aglutinants used on the painting on copper evidenced the use of siccative oils or of a protein material (as yolk, maybe) or of the former both (Vega et al. 2018, 34), confirming thus the unclear information from Vincencio Carducho's work.

According to Ann Massing, the methods of preparing supports for painting described by Jean-Henry de La Fontaine were used well into 18<sup>th</sup> c. (Massing 1995, 21). Indeed, the same substances used for the preparation of the ground which has to be applied on the copper plate are mentioned later both by Philippe de la Hire (1730) and by Roger de Piles and Charles-Antoine Jombert (1766), although in respect of some details the latter two's descriptions of the method to apply it on the plate differs of that by Jean-Henry de La Fontaine (1679), being presented by them more clearly and with additional elements (Vega et al. 2018, 26-28, tab. 2 and 4), which previously were rather neglected (as being self-understood or less important) than unknown. However, there are treaties or handbooks of painting (especially of a later date and from different countries) which state clearly that no ground is necessary and that the artist will paint directly on the copper support, which could be treated in another way (as mentioned below) and even that no treatment of the metallic plate is required. In mid-19<sup>th</sup> c., Hampel describes a similar primer, bound in linseed oil varnish, consisting of lead white and a little dark ochre, which he recommends to be used on copper, zinc and iron plates (Hampel 1846, 14-15).

According to Philippe de La Hire (1730) and Antoine-Joseph Pernety (1757), the reason why the fresh layers of ground which are applied on the copper plate (and eventually covered with a cloth) should be hit by the hand is that they are too smooth and so they will cause the colour to drain out and to slide and proceeding in the previously described way the layer will have a small grain which snaps better the colour used to paint (De La Hire 1730, 474; cf. Pernety 1757, LXXXIX). Regarding how to apply the layers of primer, the old professional literature for painters shows different opinions: by hand, according to the most sources (Vega et al. 2018, 29, tab. 5), respectively by fingers (Pacheco 1649, 345) or more precisely by the thumb or by the heel of the hand (Palomino 1724, 34). Here should be remarked that Francisco Pacheco states clearly that this proceeding should be done by hand and not by brush (Pacheco 1649, 385), as described by Jean-Henry de La Fontaine, who recommended however to hit the ground layer (by hand, of course!) after it is applied and to dab it with a piece of linen or cotton cloth (or with a cotton tampon), then to scrap the primer with a knife, in order to equalise it, before applying a second coat of primer (De La Fontaine 1679, 28-29). A similar proceeding (but without to mention the piece of cloth or a tampon) is described by the Spanish painter Acisclo Antonio de Palomino Castro y Velasco (1653-1726), who recommended to equalise the primer player by using a very soft brush or better a feather, from a dove or from any other domestic fowl (Palomino 1724, 34). Robert Dossie recommended that the primer should be equalised by rubbing with pumice (Dossie 1758, 204), while in late  $18^{th}$  c. the German painters seem to have used for this proceeding a pumice or a glass ball (Encyclopädie 1795, 134) and in 19<sup>th</sup> c. a pumice or cuttlebone (ossa sepia) (Hampel 1846, 14). Optic investigations evidenced the finger prints of Bartholomaeus Spranger on the painting Allegory of the Emperor Rudolf II (1592) from the Kunsthistorisches Museum from Vienna (Hill Stoner, Rushfield 2012, 100, fig. 4.30), showing therefore that in this situation the primer was equalised by the use of the fingers.

The ground described by Jean-Henry de La Fontaine was used not only to paint on copper

plates, but also on stone, as resulting as well from other works, but because he considered this detail as obvious, he mentioned this use right in the description of the method to prepare the ground for painting on copper, which makes his text somewhat confusing. Some confusion for the uninformed modern reader of the old treaties and handbooks of painting comes from the habitude of their writers to call "colour" this ground, obviously due to its composition, as not only Jean-Henry de La Fontaine and Antoine-Joseph Pernety, but also many others used to do. Specifically, Antoine-Joseph Pernety (1716-1796) mentioned this ground even as "oil colour" (couleur d'huile), which means that oil (respectively, linseed oil) was added to the composition of the mentioned mixture, as already evidenced by the old professional literature research (Vega et al. 2018, 29). In order to prevent the colour to drain out and to slide, instead to mix oil in the ground, late 18th c. authors recommended to mix turpentine in the ground (Watin 1774, 88) or even in the first layer of oil paint (Encyclopädie 1795, 134). In 19<sup>th</sup> c. French authors like François-Léonor Mérimée (1757-1836) and Louis-Charles Arsenne (1780-1855) recommend that, if painting on copper, to add copal varnish into the colours, in order to rise the adhesive qualities of the ground (Arsenne, Denis 1833, 338), which thus will become more solid (Mérimée 1830, 246-247). It is not easy at all to say, at the actual state of research, if these two substances, turpentine and copal varnish, were used for painting on copper only since late 18<sup>th</sup> c., respectively since early 19<sup>th</sup> c. or even earlier, at least some decades.

The composition of the mineral mixture used (according to Jean-Henry de La Fontaine's description) as ground and which is only tangentially mentioned by Jo Kirby, without any details (Kirby 1999, 27) is, indeed, very appropriate for painting in oil. White lead, as usually the basic lead carbonate 2PbCO<sub>3</sub>·Pb(OH)<sub>2</sub> is known, was used for its opacity and for the satiny smooth mixture it makes with dryable oils as the linseed oil used in painting. Umber dries more quickly than other browns, and therefore it is often used as a ground, in order to work more quickly, or is mixed with other pigments (as in the proceeding described by Jean-Henry de La Fontaine) to speed up the drying process. In umber, like in other earth pigments (ochre and sienna), the limonite (respectively the hydrated iron oxide  $FeO(OH) \cdot nH_2O$  is the basic ingredient, besides some amounts of silicon dioxide SiO<sub>2</sub> and aluminium oxide Al<sub>2</sub>O<sub>3</sub>. However, the shade of umber depends upon the amount of both iron oxide

and manganese oxide in the clay. Umber earth pigments contain 5-20 % manganese dioxide MnO<sub>2</sub>, which accounts for their being a darker colour than yellow ochre or sienna (Roelofs, Petillion 2012, 30). In this context, carbon black is used rather as reinforcing filler than as an usual and highly stable pigment, which reflects very little light in the visible part of the spectrum, but absorbs UV radiation (For the properties and uses of carbon black: Bansal *et al.* 1993).

The ground used at the preparation of copper plates mentioned by Jean-Henry de La Fontaine is not the single one known in the 17<sup>th</sup>-18<sup>th</sup> c. and a French painter working in the second half of the 17<sup>th</sup> c., as Nicolas Pérelle, may have been informed about other recipes, which can be found by the old professional literature researchers, as following: lead and burnt umber; white lead, burnt umber and bole; green ash, vermillion and yellow ochre; white lead and yellow ochre or just white lead and the desired colour, if the artist did not choice to paint directly in colours, with or without a previous treatment of the support (Vega et al. 2018, 28). Only few years before published Jean-Henry de La Fontaine his book, the French architect and historiographer André Félibien (1619-1695) mentioned the possibility to paint directly over a thin layer of colour as sole preparation of the copper support (Félibien 1676, 410). Recent physical investigations confirmed the information on the various ingredients of the primer's composition known from the old professional literature for painters, but evidenced as well the presence of calcium carbonate CaCO<sub>3</sub> in the composition of the primer (Vega et al. 2018, 31-32, although it is not mentioned in this category of written sources (Vega et al. 2018, 33).

Therefore, in the absence of more advanced physical and chemical investigations, it is difficult to ascertain how the support of the two paintings from the Brukenthal National Museum's collection may have been prepared, especially if considering that generally there is very few information about the painting technique of Nicolas Pérelle.

Until the 18<sup>th</sup> c., most plates were produced from hammered copper sheets, though occasionally from early 17<sup>th</sup> c., the sheets may have been rolled as well, but the rolling machines became more widespread only in the 1770s, when sheet copper was produced for sheathing ships (Hill Stoner, Rushfield 2012, 101). X-radiography can show varying densities in the copper plates caused by uneven thickness, producing identifiable patterns of manufacture and preparation and may reveal properties such as mottling of the sheet, which indicates hammering and a thorough metallurgical investigation might indicate, by studying the crystalline structure of the metal, whether rolling, hammering or recent annealing had taken place (Hill Stoner, Rushfield 2012, 105). Unfortunately, such an examination could not be performed on these two paintings by Nicolas Pérelle.

As mentioned, in order that the paint adhere better to the smooth metal surface, before to apply the ground (or even instead of any ground, according to certain opinions), other treatments of the copper plate were required as well. Recommended was the abrasion of the plate (Kirby 1999, 27), which usually is believed that it should be very well polished. As this proceeding was actually the responsibility of the coppersmith and not of the painter, it is mentioned in only 8 of 12 old works of professional literature (encyclopaedias, treaties and handbooks of painting) studied by Daniel Vega, Isabel Pombo Cardoso and Leslie Carlyle which are dealing with the copper support (Vega et al. 2018, 28). The mention that the plate should be rubbed with pumice is the only specific information about this proceeding (De La Hire 1730, 474; Dossie 1758, 204; De Piles, Jombert 1766, 137), which was evidenced for first time (Vega et al. 2018, 33) by recent physical investigations and seems to have been intended to favour a better grip of the primer to the surface of the support (Vega et al. 2018, 31), although according to Johann Samuel Halle (1727-1810) the support should not be polished at all (Halle 1761, 322). Recent physical investigations evidenced as well that the copper plates were made of very pure metal, by hammering (Vega et al. 2018, 31). Only quite late, in 19<sup>th</sup> c., is mentioned the necessity to clear the rubbed copper plates with clear water and to let them dry before to apply the primer (Hampel 1846, 14), as moisture and acid leads to the formation of verdigris on copper, respectively to the delamination of the colour layer, affecting therefore its stability (Hampel 1846, 12-13).

One of the methods to prepare the copper support to be painted, obviously by the artist, consists in rubbing it with garlic juice (Kirby 1999, 27; cf. Vega *et al.* 2018, 28), which is sticky when first applied and acts as a wetting agent, preventing surface tension effects between smooth shiny metal and oil paint (Kirby 1999, 27). Acisclo Antonio de Palomino Castro y Velasco, mentioning twice this proceeding (Palomino 1724, 30 and 33-34), stated that it is necessary to apply it, in order to avoid the drying of the primer (made of white lead, umber and some bole) in the small cavities of the copper support (Palomino 1724, 33-34). According to Roger de Piles (1635-1709) and Charles-Antoine Jombert (1712-1784) and to Michel-François Dutens, the rubbing of the copper plate with garlic is an alternative proceeding, if no primer is applied at all (De Piles, Jombert 1766, 137-138; Dutens 1779, 62).

Another method was to wipe the plate over with linseed oil (Kirby 1999, 27). This proceeding is not described in the old professional literature for painters, in which however several times is mentioned the possibility to paint directly on the support, in oil colours, sometimes with the remark that the oil should be very fat (Dossie 1758, 204; Encyclopädie 1795, 134). Surely, this proceeding shows some risks for the long time conservation of the paint layer, as the use of a fat oil may lead to the formation of copper soaps between the support and the paint layer and, finally, to delamination (Vega et al. 2018, 32-33), but obviously they can be reduced if following the already mentioned recommendation of late 18th c. authors, to mix turpentine in the ground (Watin 1774, 88) or even in the first layer of oil paint (Encyclopädie 1795, 134), in order to prevent the colour to drain out and to slide, instead to mix oil in the composition of the primer.

As already mentioned, sometimes the copper plates were coated with other metals, as tin or zinc (Kirby 1999, 27) and even (although less frequently) silver, as many copper plates previously believed to be silvered are in fact coated in tin or a tin-lead alloy, maybe (as on copper kitchenware) in order to prevent the formation of green corrosion products (the so-called verdigris). Paintings on silvered, respectively gilded copper plates were very sought-after by the connoisseurs, due to the delightfully brilliant color effect, noticeable especially on transparent blues, as well as to the symbolic value of these noble metals. It is well known that in some paintings the effects of coating are not obvious and that the presence of a coating is evidenced only during detailed examination (Hill Stoner, Rushfield 2012, 104). However, on works from the Brukenthal National Museum's collection the coating of the copper support with other metals was never noted, despite the limited investigation possibilities in its laboratory.

Considering these results of the verification of the divergent or even contradictory information resulting from the research on the old professional literature for painters by using the most modern physic investigation (Vega *et al.* 2018), which

cannot be however performed in every laboratory, the conservator of paintings on copper should be aware that the properties of this metal limit the choice of solvents, reagents, consolidants and filling media and affect the use of heat and that sometimes may be necessary as well to inhibit the corrosion of the painting's metallic support.

After the photographic documentation (Fig. 1-6) of the two paintings on copper from the Brukenthal National Museum's collection was finished and the works were examined under different lights (as other physical research on the layers of the two paintings on copper are not possible in the current conditions of work in the museum's laboratory), the next necessary step in order to proceed with the conservation work was to make cleaning tests (Fig. 7-11). Both paintings reacted positively at the cleaning of the varnish by using ethanol. On some areas with layers of adhering dirt the surface was cleaned with a solution of 4 % ammonia water.

The next step was to fill the gaps with putty (Fig. 12). Because the support is a copper plate, the most compatible putty is a thermoplastic one, based on BEVA 371 (BEVA gel and mountain chalk) and applied at c. 68 °C, using a thermic spatula. The BEVA 371 gel is a sealing adhesive developed in 1969 by Gustav A. Berger from New York. Already in the mid-1980s it became internationally the most widely used adhesive for lining the oil paintings. Among its most important properties are, besides a good adherence and elasticity, the reversibility and the possibility to be overpainted to match the tone of the original. After fusion, this material of milky white colour, soluble in aliphatic and aromatic solvents (as gasoline, turpentine, xylene and toluene), becomes transparent and thus eventual mistakes can be easily corrected even after the heat sealing.

Recently, in order to identify the most appropriate consolidant for the conservation of paintings on copper, Maria Leonor Oliveira from the University of Lisbon tested several well-known synthetic resins (Paraloid B72, Mowilith 20, BEVA 371b and Laropal A81), chosen for their exclusion of water-based components. The adhesion of the polymers to copper surfaces was tested through coating small pieces of copper with the various resins, as well as attaching paint flakes to a copper surface. Based on the results of these tests, both BEVA 371b and Laropal A81 were excluded as possible consolidants due to their undesirable physical properties upon drying (BEVA 371b formed a very thick, soft coating, whilst Laropal A81 formed a very thin and brittle film). Out of the

remaining polymers tested, Paraloid B72 was preferred over Mowilith 20, as it formed a film with greater hardness and tenacity. In future, these results (presented at a conference hold at the Polytechnich University of Valencia, January 27-28, 2017), about we were informed only after the conservation of the two paintigs by Nicolas Pérelle was finished, may be very useful in future for the conservation of the paintings on copper from the Brukenthal National Museum, although the BEVA 371 still remains suitable, due to its transparency, if the layer's thickness does not disturb.

Before applying the varnish, the work has to be placed on a flat and clean surface. Afterwards, the varnish is applied by a wide soft-haired brush over the entire surface, in a thin layer. The varnish used on this occasion was obtained by mixing homogenously three parts of shiny dammar varnish with one part of opaque wax varnish.

The next step in the conservation of the two paintings was the chromatic integration, by using varnish colours, which have the property of maintaining a constant tonality before and after drying, as they change into an elastic film and they have the advantage of keeping their freshness and softness as long as it is necessary for the conservator to use them for his work (Piva 2005, 191). For the integration in imitative style were used Maimeri Restauro colours, specially produced for this conservation work: they are stable, but respect the principle of reversibility, they are applied over the varnish layer and are interacting less with the original colour layer.

After the corrosion products on the backside of the work were cleaned with ammonia water, the whole surface of the both copper plates was treated with a solution of 5 % shiny dammar varnish dissolved in turpentine, which after drying forms a transparent protective film.

## 4. Conclusions.

In our opinion, the two late 17<sup>th</sup> c. French paintings on copper from the Brukenthal National Museum's collection should be attributed to Nicolas Pérelle, as they were purchased in late 18<sup>th</sup> c. by Baron Samuel von Brukenthal, although the mentioned artist is known mainly as an engraver and his paintings on copper (as his paintings, generally) are scarce. At the current state of research there is not any strong reason which could support their attribution to Gabriel Pérelle.

According to Łucja Wojtasik-Seredyszyn, the French paintings on copper are very scarce in the Czech Republic and Poland and the most of them are very late, from the 19th c. (Malarstwo 2003, 17-18). This situation seems quite curious, as in early 19th c. France, according to a statement of Jean-François-Léonor Mérimée, "since a very long time one does not paint on copper any more", which he seemed even to regret, as he continued to say that the preparation of copper is not difficult at all (Mérimée 1830, 246-247). Apparently, in other regions of Central Europe the French paintings on copper might be rare as well. In Romania are known two early 19<sup>th</sup> c. portraits on copper, both supposed to be by French painters, one in the National Museum of Art of Romania in Bucharest (Antonescu 1999, 53, cat. 78) and one in the Art Museum in Timișoara (Cornea 2012, 239, cat. 349). French paintings on copper are lacking completely in the collection of the Art Museum from Jassy (Paradais 1972, 313-335). In other museums of art from Romania the situation could be, most likely, similar.

Considering both the scarcity of the paintings by Nicolas Pérelle and particularly of the paintings on copper by Nicolas Pérelle, as well as the scarcity of French paintings on copper in Central Europe (and particularly of 17<sup>th</sup>-18<sup>th</sup> c. French paintings on

copper), the two mentioned works from the former collection of Baron Samuel von Brukenthal are of a great interest. Also from its founder's collection the Brukenthal National Museum has two 18<sup>th</sup> c. anonymous life-size pendant male bust portraits on dished oval copper plates (inv. 401, respectively inv. 402), unfortunately still less studied. Unlike the Czech and Polish museums, the Brukenthal National Museum has not any 19th c. French painting on copper. This situation can be explained only partially by the particular conditions how the museum's collection of European Paintings was formed: its core remained the collection of Baron Samuel von Brukenthal (1721-1803), to which during the 19<sup>th</sup> c. and especially during 1956-1971 were added several works by European painters (among whom there are some French artists as well). Undoubtedly, in a certain measure it reflects as well the general rarity of French paintings on copper in Central European museum collections.

Our work emphasizes, once again, the utility of the restoration of the paintings on copper and of the few French paintings from the museum's collection, as well as of their thorough study.
#### REFERENCES

Antonescu 1999	Antonescu, Eugenia. Muzeul Național de Artă al României. Secția de Arte Decorative. Miniaturi europene din secolele XVIII-XX, București (1999).
Arsenne, Denis 1833	Arsenne, LC Manuel du peintre et du sculpteur; ouvrage dans lequel on traite de la philosophie de l'art et des moyens pratiques avec Une notice sur les manuscrits à miniatures de l'Orient et du moyen-âge, et sur les voyages à figures, dans leurs rapports avec la peinture moderne par Ferdinand Denis, 2 <sup>nd</sup> vol., Paris (1833).
Avel 1973	Avel, Noëlle. Les Pérelle graveurs de paysage du XVIIe siècle, Paris (1973).
Bansal et al. 1993	Bansal, Roop Chand; Donnet, Jean-Baptiste; Wang Meng-Jiao. <i>Carbon Black: Science and Technology</i> , 2 <sup>nd</sup> edition, New York (1993).
Bellier de la Chavignerie, Auvray 1885	Bellier de la Chevignerie, Émile; Auvray, Louis. Dictionnaire général des artistes de l'école française depuis l'origine des arts du dessin jusque'à nos jours. Architects, peintres, sculpteurs, graveurs et lithographes, vol. 2, Paris (1885).
Bielz 1960	Bielz, Julius. Die Wiener Malerfamilie Neuhauser in Siebenbürgen. In: Wiener Jahrbuch für Kunstgeschichte XVIII (XXII), Wien (1960), p. 87-102.
Carducho 1633	Carducho, Vincencio. <i>Dialogos de la pintura. Su defensa, origen, es-</i> sencia, definicion, modos y diferencias, Madrid (1633).
Cornea 2012	Cornea, Marius. Pictura europeană din secolele XV-XX în Muzeul de Artă din Timișoara. Catalog general ilustrat / European Painting from the 15 <sup>th</sup> to the 20 <sup>th</sup> Century in the Art Museum of Timișoara. Illustrated General Catalogue, Timișoara (2012).
Csaki 1901	Csaki, M. Baron Brukenthal'sches Museum in Hermannstadt. Führer durch die Gemäldegalerie, 5 <sup>th</sup> edition, Hermannstadt (1901).
Csaki 1909	Csaki, M. Baron Brukenthalisches Museum in Hermannstadt. Führer durch die Gemäldegalerie, 6 <sup>th</sup> edition, Hermannstadt (1909).
Csaki 1926	Csaki, M. Baron Brukenthalisches Museum. Führer durch die Gemäldegalerie, 8 <sup>th</sup> edition, Hermannstadt (1926).
De La Fontaine 1679	De La Fontaine, Jean-Henry. <i>L'Académie de la peinture. Nouvellement mis au jour pour instruire la jeunesse à bien peindre en huile et en mignature</i> , vol. 2, Paris (1679).
De La Hire 1730	De La Hire, Philippe. <i>Oeuvres diverses de M<sup>r</sup> De la Hire, de l'Academie Royale des Sciences</i> , vol. 9, Paris (1730).
De Piles, Jombert 1766	De Piles, [Roger]. <i>Eléments de la peinture pratique</i> , new edition com- pletely revised and considerably enlarged by Charles-Antoine Jombert, Amsterdam – Léipsick (1766).
Die Gemälde- Galerie 1844	* * *, Die Gemälde- Galerie des freiherrlichen v. Brukenthalischen Museums in Hermannstadt, Hermannstadt (1844).
Dossie 1758	Dossie, Robert, The Handmaid to the Arts, London (1758).

Dutens 1779	Dutens, Mich. Fr., Principes abrégés de peinture, Tours (1779).
Encyclopädie 1795	* * *, Encyclopädie für Künstler. Vollständige Anleitung alle Arten Gold, Silber und andere Metallarbeiten zu verfertigen, Firnisse, Lack u. a. zu den Künsten erforderl. Chemische Produkte zu bereiten, Schildplatt, Horn, Stroh, Leder, Holz u. dgl. zu verfertigen. Nebst einer einer prakt. Anweis. Zur Oel- und Pastellmalerey, zum Emailliren, Bronziren, Lackiren und zu Vergold. und Versilberung auf Metalle, Marmor, Holz, Leder, Porzellan, Fayence u. s. w. Aus den vorzüglichen Schriften verschied. Sprachen gesammelt und zu einem allgemeinen Handbuch für Künstler, Fabrikanten und Oekonommen bestimmt, vol. 2, Berlin (1795).
Félibien 1676	Félibien, André. Des principes de l'architecture, de la sculpture; de la peinture, et des autres arts qui en dependent, Paris (1676).
Francastel 1930	Francastel, Pierre. La sculpture de Versailles. Essai sur les origines et l'évolution du goût français, Paris (1930).
Führer 1893	* * *, <i>Freiherr Samuel von Brukenthal'sches Museum in Hermannstadt.</i> <i>Führer durch die Gemäldegalerie</i> , 4 <sup>th</sup> edition, Hermannstadt (1893).
Garnier-Pelle 2001	Garnier-Pelle, Nicole. Paysages: chefs-d'œuvre du cabinet des dessins du musée Condé, Paris (2001).
Giannini, Roani 2003	Giannini, Cristina; Roani, Roberta. Dizionario del restauro e della diagnostica, Firenze (2003).
Girard 1983	Girard, Jacques. Versailles Gardens: Sculpture and Mythology, New York (1983).
Halle 1761	Halle, Johann Samuel. Werkstäte der Heutigen Künste, Oder die Neue Kunsthistorie, vol. 1, Brandenburg – Leipzig (1761).
Hampel 1846	Hampel, J. C. G. Die Restauration alter und schadhaft gewordener Gemälde in ihrem ganzen Umfange: nebst Anleitung zur Frescomalerei, Weimar (1846).
Hazlehurst 1980	Hazlehurst, Franklin Hamilton. Gardens of Illusion: The Genius of André Le Nostre, Nashville (1980).).
Herbert 2008	Herbert, James D. Our Distance from God: Studies of the Divine and the Mundane in Western Art and Music, Oakland (2008).
Hill Stoner, Rushfield 2012	Hill Stoner, Joyce; Rushfield, Rebecca. <i>The Conservation of Easel Painting</i> , London – New York (2012).
Hoffmann, Koppe 1986	Hoffmann, Volker; Koppe, Konrad. Martin von Wagner Museum der Universität Würzburg. Gemäldekatalog, Würzburg (1986).
Istudor 2007	Istudor, Ioan. Noțiuni de chimia picturii, 2 <sup>nd</sup> edition, București (2007).
Jacquet 2011	Jacquet, Nicolas. Versailles secret et insolite: le château, ses jardins et la ville, Paris (2011).
Kirby 1999	Kirby, Jo. <i>The painter's trade in the Seventeenth Century: theory and practice</i> . In: National Gallery Technical Bulletin 20, London (1999), p. 5-49.
Komanecky 1998	Komanecky, Michael K. Copper as Canvas: Two Centuries of Master- piece Paintings on Copper, 1575–1775, Oxford – Phoenix (1998).
Lăzărescu 1996	Lăzărescu, Liviu. Pictura în ulei, Deva (1996).

Lisan 1987	Lisan, Mariana. Date privind colecția de pictură franceză din Galeria de Artă Brukenthal. In: Complexul Muzeal Brukenthal – Anuar 1, Sibiu (1987), p. 213-223.
Malarstwo 2003	* * *. Malarstwo na miedzi / Painting on copper, Legnica (2003).
Marta 2011	Marta, Sanda. <i>Et in Italia ego: peisagiști flamanzi și olandezi din colecția Muzeului Național Brukenthal.</i> In: <i>Sargetia. Acta Musei Devensis</i> 2 (28), Deva (2011), p. 207-219.
Massing 1995	Massing, Ann. From books of secrets to encyclopedias: painting tech- niques in France between 1600 and 1800. In: Wallert, Arie; Hermens, Erma; Peek, Marja (ed.). Historical Painting Techniques, Materials, and Studio Practice: Preprints of a Symposium. University of Leiden, 26-29 June 1995, second printing, Los Angeles (1995), p. 20-29.
Mérimée 1830	Mérimée, JFL. De la peinture à l'huile, ou des procédés matériels employés dans ce genre de peintures, de Hubert et Jean van-Eyck jusqu'à nos jours, Paris (1830).
Mesea 2007	Mesea, Iulia. <i>Model / Interpretation. Samuel von Brukenthal / Franz Neuhauser.</i> In: <i>Brukenthal. Acta Musei</i> II.2, Sibiu (2007), p. 71-87.
Nicolescu 1975	Nicolescu, Corina. Muzeologie generală, București (1975).
O'Neill 1981	O'Neill, Mary. Les peintures de l'école française des XVIIe et XVIIIe siècles. Catalogue critique, vol. II, Orléans (1981).
Pacheco 1649	Pacheco, Francisco. Tractado de la pintura, su antiguedad y grandeza, descrivense los hombres eminentes que ha avidoen ella, assi antiguos como modernos, del dibujo y colorido: del pintar al temple, al olio, de la iluminacion, y estofado, del pintar al fresco, de las encarnaciones, de polimento, y de mate, del dorado, bruñido y mate. Y enseña el modo de pintar todas las pinturas sagradas, Sevilla (1649).
Palomino 1724	Palomino de Castro y Velasco, Antonio, <i>El Museo pictorico y escala optica. Practica de la pintura, en que se trata del modo del pintar à el Olio, Temple, y Fresco, con la resolucion de todas las dudas que en su manipulacion pueden occurir. Y de la Perspectiva comun, la de Techos, Angulos, Teatros y Monumentos de Perspectiva, y otras cosas muy especiales, con la direccion y documentos para las ideas o Assumptos de las Obras de que se ponen algunos exemplares</i> , vol. 2, Madrid (1724).
Paradais 1972	Paradais, Claudiu. Valori ale picturii universale în Muzeul de Artă din Iași, Iași (1972).
Pernety 1757	Pernety, Antoine-Joseph. Dictionnaire portatif de peinture, sculpture et gravure avec un traité pratique des différentes manières de peindre, Dont la Théorie est développée dans les articles qui en sont suscep- tibles. Ouvrage utile aux Artistes, aux Élèves & aux Amateurs, Paris (1757).
Piva 2005	Piva, Gino. <i>La tecnica della pittura ad olio e del disegno artistico</i> , 2 <sup>nd</sup> edition, Milano (2005).
Roelofs, Petillion 2012	Roelofs, Isabelle; Petillion, Fabien. La couleur expliquée aux artistes, Paris (2012).
Spek 1941	Spek, Rudolf. <i>Muzeul Brukenthal Sibiu. Ghidul pinacotecei</i> , 5 <sup>th</sup> edition, Sibiu (1941).

	Brukenthal. ActaMusei, XIII. 4, 2018 Alexandru Gh. Sonoc; Celestina Albișor
Spooner 1853	Spooner, Shearjashub. Biographical and Critical Dictionary of Painters, Engravers, Sculptors and Architects, from Ancient to Modern Times with the Monograms, Ciphers, and Marks Used by Distinguished Artists, New York (1853).
Stols-Witlox 2014	Stols-Witlox, Maartje. <i>Historical Recipes for Preparatory Layers for</i> <i>Oil Paintings in Manuals, Manuscripts and Handbooks in North West</i> <i>Europe, 1550-1900: Analysis and Reconstructions</i> (Doctoral Thesis, University of Amsterdam), Amsterdam (2014).
Strutt 1786	Strutt, Joseph. Biographical Dictionary; Containing an Historical Account of All the Engravers, from the Earliest Period of the Art of Engraving to the Present Time; and a Short List of Their Most Esteemed Works. With the Cyphers, Monograms, and Particular Marks, Used by Each Master, Accurately Copied from the Originals, and Properly Explained. To Which Is Prefixed, an Essay on the Rise and Progress of the Art of Engraving, Both on Copper and on Wood. With Several Curious Specimens of the Performances of the Most Ancient Artists, vol. II, London (1786).
Tudoran Ciungan 2007	Tudoran Ciungan, Maria Olimpia. Arta italiană sec. XVI-XVIII în Pinacoteca Brukenthal, Sibiu (2007).
Vega <i>et al.</i> 2018	Vega, Daniel; Pombo Cardoso, Isabel; Carlyle, Leslie. <i>Pintura sobre cobre: investigación sobre materiales y técnicas de aplicación de la capa de preparación a través de los tratados tradicionales y estudio analítico de dos obras atribuidas a las escuelas portuguesa y flamenca.</i> In: Conservar Património 27, Lisboa (2018), p. 23-35.
Vollmer 1932	Vollmer, Hans (ed.). Allgemeines Lexikon der bildenden Künstler von der Antike bis zur Gegenwart, vol. XXVI, Leipzig (1932).
Watin 1774	Watin, [Jean-Félix]. L'Art du Peintre, Doreur, Vernisseur, Ouvrage utile aux Artistes & aux Amateurs qui veulent entreprendre de Peindre, Do- rer & Vernir toutes sortes de sujets en Bâtimens, Meubles, Bijoux, Équipages, &c., 2 <sup>nd</sup> revised, corrected and considerably enlarged edi- tion, Paris (1774).

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- 20. Plan anonim al grădinilor de la Versailles după proiectul lui André Le Nôtre (c. 1663). Bibliothèque de l'Institut de France, Paris.
- 21. Versailles. Plan general cu parcul său, Louvre-ul său, grădinile, fântânile, boscheții săi și orașul său, de Nicolas de Fer (1700). Bibliothèque nationale de France, Paris.
- 22. Jean Le Pautre (1618-1682), Vedere a Bazinului Latonei din Grădinile de la Versailles (1678). Colecție privată.
- 23. Gabriel Pérelle (1604-1677), Bazinul Latonei (înainte de 1687). Colecție privată.
- 24. Adam Pérelle (1640-1695), *Vedere a Castelului de la Versailles dinspre Parterre d'Eau* (1674). Metropolitan Museum of Art, New York.



- 1. Nicolas Pérelle (1631-1695), *Italian Park with Ruins*. Brukenthal National Museum, Sibiu. General view of the framed work, before restoration.
- 2. Nicolas Pérelle, Italian Park with Ruins. General view of the framed work, before restoration (backside).



- 3. Nicolas Pérelle, *View with Italian Garden*. Brukenthal National Museum, Sibiu. General view of the framed work, framed, before restoration.
- 4. Nicolas Pérelle, *View with Italian Garden*. General view of the framed work, before restoration (back-side).



- 5. Nicolas Pérelle, *Italian Park with Ruins*. Brukenthal National Museum, Sibiu. General view of the unframed work, before restoration.
- 6. Nicolas Pérelle, View with Italian Garden. General view of the unframed work, before restoration.
- 7. Nicolas Pérelle, Italian Park with Ruins. Making of cleaning tests.



Nicolas Pérelle, *View with Italian Garden*. Making of cleaning tests.
Nicolas Pérelle, *Italian Park with Ruins*. Cleaning tests in UV light.
Nicolas Pérelle, *View with Italian Garden*. Cleaning tests in UV light.



11. Nicolas Pérelle, *View with Italian* Garden. Detail during the cleaning work

12. Nicolas Pérelle, *Italian Park with Ruins*. During the puttying work.





13. Nicolas Pérelle, Italian Park with Ruins. General view of the unframed work, after restoration.

14. Nicolas Pérelle, View with Italian Garden. General view of the unframed work, after restoration.

15. Nicolas Pérelle Italian Park with Ruins. General view of the framed work, after restoration.

16. Nicolas Pérelle, View with Italian Garden. General view of the framed work, after restoration.



- 17. Aerial view of the domain of Versailles (as seen from the Palace towards the Grand Canal). Toucan Wings.
- 18. Versailles and its promenades by Maurice Thiébaut (c. 1925).



19. Manuscript plan of the domain of Versailles and its environs (1662). Bibliothèque nationale de France, Département Cartes et plans.

20. Anonymous plan of the gardens of Versailles as designed by André Le Nôtre (c. 1663). Bibliothèque de l'Institut de France, Paris.

21. General plan of Versailles, its park, its Louvre, its gardens, fountains, bosquets and its town by Nicolas de Fer (1700). Bibliothèque nationale de France, Paris.



22. Jean Le Pautre (1618-1682), *View of the Bassin de Latone in the Gardens of Versailles* (1678). Private collection.



23. Gabriel Pérelle (1604-1677), The Bassin de Latone (before 1687). Private collection.



24. Adam Pérelle (1640-1695), *View of the Versailles Castle from the Side of the Parterre d'Eau* (1674). Metropolitan Museum of Art, New York.

#### THE CONSERVATION OF A WORLD WAR II "TIME CAPSULE" FOUND IN A NICHE OF THE BRUKENTHAL PALACE IN SIBIU

#### Radu SCHULLER\* Alexandru Gh. SONOC\*\*

Abstract: The discovery of three paper items walled in a niche with two pipes in a room on the ground floor of the Brukenthal Palace in Sibiu has a particular importance, because it documents both a stage in the history of the palace and the existence of a building tradition in mid-20th c. Transylvania which until now was known mainly from oral sources, but less clearly attested by published finds or even by short notes in newspapers. This "time capsule" documents as well the use of the revenue stamps of the series issued on April 1, 1941 in order to collect the 4 % exceptional tax for the country's defence even after December 5, 1942, when this tax was increased to 5 %. Therefore, this "time capsule" was walled sometime during December 5, 1942 – April 23, 1944, most likely however during July 2 – July 31, 1943, when natural gas pipes were for first time installed in the building and several rooms were set to natural gas heating. Another new is that in July 1943 the owner of the music instruments shop (previously belonging to Babós Béla) which used to function in this room was already Babós Gusty and that at that time the shop was actually the Sibiu subsidiary of Denés Béla's company. For all this reasons, the conserved documents entered the documentary archive within the Brukenthal Library, and the niche was also conserved, but under a framed glass plate, decorated by painting.

*Keywords:* paper conservation, music instruments, Romanian national defence revenue stamp, Brukenthal Palace in Sibiu, "time capsule".

**Rezumat:** : Descoperirea celor trei piese din material papetar zidite într-o nişă cu două conducte a unei săli de la parterul Palatului Brukenthal din Sibiu are o însemnătate aparte, atât pentru că documentează atât o etapă din istoria palatului, cât și existența în Transilvania, la mijlocul sec. XX, a unei tradiții de construcție care până acum era cunoscută mai ales din surse orale, dar mai puțin clar atestată prin descoperiri publicate sau chiar prin scurte note în ziare. Această "capsulă a timpului" atestă de asemenea folosirea timbrelor fiscale ale seriei emise la 1 aprilie 1941 în vederea colectării taxei excepționale de 4 % pentru apărarea țării chiar și după 5 decembrie 1942, când această taxă a fost majorată la 5 %. Ca urmare, această "capsulă a timpului" ar fi fost zidită cândva în perioada 5 decembrie 1942 – 23 aprilie 1944, cel mai probabil totuși între 2 iulie – 31 iulie 1943, când în clădire au fost instalate pentru prima oară conducte de gaz natural și mai multe încăperi au trecut la încălzirea cu gaz natural. Altă noutate este că în iulie 1943 proprietara magazinului de instrumente muzicale (aparținând anterior lui Babós Béla) care funcționa în această încăpere era deja Babós Gusty și că în această vreme magazinul era de fapt sucursala din Sibiu a firmei lui Denés Béla. Pentru toate aceste motive, documentele restaurate au intrat în arhiva documentară din cadrul Bibliotecii Brukenthal, iar nişa a fost și ea conservată, dar sub o placă înrămată din sticlă cu decor pictat.

*Cuvinte-cheie:* restaurare hârtie, instrumente muzicale, timbru fiscal românesc pentru apărarea națională, Palatul Brukenthal din Sibiu, "capsulă a timpului".

In 2017, during the painting works in room no. 3 at the ground floor of the Brukenthal Palace (where the tickets desk had to be relocated), the museum's painter and mason Dorel Popa discovered a niche with two pipes (Fig. 1a). In this niche were deposited a piece of thin white cardboard with printed German texts, a foil of waxed wrapping paper with printed texts in various foreign languages (English, French, Spanish and Portuguese) and a piece of paper with a fragment of a National Defence revenue mobile stamp, a purple ink stamp in Romanian and cursive and stamped texts, consisting of digits

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and German words written in blue colour pencil (Fig. 2). After they were studied by Alexandru Gh. Sonoc, PhD, the Head of the Brukenthal Art Museum, these items (described below) were handed to Radu Schuller from the Brukenthal National Museum's Laboratory for Conservation in order to be restored, due to the documentary importance of this discovery. For the same reason, it was decided to conserve as well the niche were these documents were found (Fig. 1b), but unfortunately without to allow, for aesthetic reasons, that its original aspect, with the old pipes and the debris, be seen kept after a glass window, under appropriate light conditions, by the visitors who would enter the room. The chosen solution was to preserve the cleaned niche (keeping however the old pipes) under a framed glass plate, decorated by painting (Fig. 1c). This decorative motif is inspired by an original one, discovered some years ago painted on the ceiling of another room (no. 10) on the ground floor of the Brukenthal Palace in Sibiu (Fig. 1d), which later was used for the decoration of the ceiling in several ground floor rooms of the same palace, in which no rests of their original ceiling decoration were found.

#### **1.** The description of the items.

# A. The sleeve label of a pack of violin strings (Fig. 3-4, 6-7).

The item is made of thin white duplex cardboard and measures  $77 \times 34$  mm.

On the recto it shows, printed in black on white, a cartouche of octagonal shape, made by cutting the corners of a square, in the field of which there is the black-and-white picture of a c. 40 years old man, rendered as a bust. The character has a short haircut and wears glasses, a shirt of light colour, a light-coloured necktie with light-coloured decorative patterns and a dark vest. On the left and on the right the medallion is flanked by a pair of triangles whose vertices are oriented in two opposed directions: down, those at the top and up, those at the bottom. The portrait medallion is flanked, up and down, by a short inscription in German, printed in white on a black background: E. KUENZEL'S (with the second E smaller, inside the letter U), respectively Silberstahl -E-. The height of the letters is the same on both rows. The octagonal cartouche is flanked by a decorative frieze, consisting of a wide horizontal band bordered on its both sides by a line, above and below of which runs a motif consisting of three rows of circles whose diameters decrease from the line to the outermost and placed so that the centre of each circle on the same row lays on the bisector of the line segment

between two consecutive circles on the previous row of circles.

The same decorative frieze continues as well on the verso, flanking an octagonal cartouche, similar to the one previously described on the recto, but emphasized by a decorative motif composed of three rows of circles (similar to those in the composition of the decorative frieze described above), which is doubling all its sides. In the cartouche's white field there is the following text printed in black ink on 7 rows, in German (1<sup>st</sup>-6<sup>th</sup> rows) and English (7<sup>th</sup> row):

E. KUENZEL'S Violin-Silberstahl--E-MIT WEICHER STEGAUFLAGE.

MADE IN GERMANY

In English, this text means: *E. Kuenzel's violin* silver steel *E* with soft bridge saddle. Made in Germany.

As on the recto, in the  $1^{st}$  row on the verso (which can be seen also as a logo of the producing company), the second E is smaller and placed inside the letter U. The letters on the  $1^{st}-4^{th}$  row are of the same size and are the largest, the letters on the  $5^{th}-6^{th}$  rows are as well of equal size, but smaller and the letters on the  $7^{th}$  row are the smallest.

The examination of the text shows that the sleeve label belongs to a pack of E (Mi in Do Major scale) violin strings for soft bridge saddle. They are of German production and were made of the so-called "silver steel". The "silver steel" is, actually, a kind of steel for tools, whose composition does not include silver at all, but chrome and vanadium, its name coming from the silver-like sheen of the bars.

According to Dr. Wilhelm Geipel from Markneukirchen (Germany), the curator of the exhibition Saiten- und Catgutherstellung in und um Markneukirchen (i. e. "The Production of Strings and Catgut in and around Markneukirchen") at the Vogtlandian Open Air Museum in Landwüst (Vogtländisches Freilichtsmuseum Landwüst) and the author of a pamphlet presenting the mentioned exhibition (2012; enlarged and revised 2014; updated 2015), the local family company E. Kuenzel & Co. was the largest German producer of strings for music instruments and catgut (made actually of sheep intestines!), which in 1929 had 330 workers and employees only in its factory and 100 homeworkers. Daily, according to its own records, the company needed the intestines of c. 5 000 sheep to

produce its various types of strings (especially for music instruments and for tennis rackets) or catgut and the yearly needed quantity of guts would reach the length of 60 000 km. It followed a local tradition dating back to 1677, which c. 1800 was practiced as well in several places in the neighbourhood of this town of the Saxon region Vogtsland. In the 1820s developed here as well the so-called "spanned gut strings" (i. e. gut strings which were winded round with silver wire, respectively silvered copper wire or gilded silver wire) and in late  $19^{th}$  c. and early  $20^{th}$  c. the local production of strings became more and more internationally acknowledged both for its quality and quantity. Undoubtedly, the silver steel strings mentioned by the sleeve label found in the niche had a core of steel wire, winded round with silver steel wire and not a core of gut, as in such a situation the gut was winded round with silk garnished silver wire.

#### **B.** Wrapping paper for a harmonica (Fig. 8-9).

The wrapping paper with texts printed in black ink is made of waxed paper foil, in order to prevent the oxidation of the harmonica (which after wrapping was packed in a wooden box). It has the following dimensions: 251 x 186 mm.

The wrapping shows three registers, of which two (the upper and the lower) with texts in 4 languages (English, French, Spanish, Portuguese).

The upper register is divided in 3 columns, with the following content (from left to right, with the numerals written vertically in the left side of each column, having the upper part of the digits oriented to left, perpendicular to the direction of writing on each column):

#### 1<sup>st</sup> column:

- 000 Instruments yearly
- Instruments par an
- 000 Instrumentos por año
- 20 Instrumentos por ano
- 2<sup>nd</sup> column:
  - Workmen
- **Ouvriers** t500
  - Obreros Operarios

3<sup>rd</sup> column:

Branch factories Succursales de fabriques

20 Sucursales de fábrica Sucursais de fábrica

The middle register, divided in two sub-registers shows three stacked industrial landscapes, depicting factories of the company Matthias Hohner A. G.: up, the main factory, from Trossingen (nowadays in the Baden-Württemberg state of Germany), having below the legend HAUPTWERK, and in the lower sub-register the factory in Cologne and, respectively, the former Württ. Harmonikafabrik Ch. Weiss in Trossingen (acquired in 1928), having written below the legends WERK KÖLN, respectively WERK WEISS, and between the latter two images, on two rows, the company's logo: Matth. Hohner / A. G.

The lower register is divided in 4 columns with the following content (from left to right):

# 1<sup>st</sup> column:

LARGEST Harmonica and Accordion FACTORY in the World where the worldfamous high grade HOHNER Instruments are made

## 2<sup>nd</sup> column:

LA PLUS GRANDE FABRIQUE d'accordeons et d'harmonicas DU MONDE où se fabriquent les fameux instruments HOHNER

### 3<sup>rd</sup> column:

LA MAYOR **FABRICA** de armónicas de boca y acordeones

#### EN EL MUNDO

donde se fabrican los acreditados instrumentos HOHNER

#### 4<sup>th</sup> column:

A MAIOR FABRICA DO MUNDO de gaitas de boca e harmonicas de mão onde se fabricam os famosos instrumentos HOHNER

Below these columns is written the English text *Printed in Germany*.

The company Matthias Hohner A. G., known especially for the production of harmonicas, but also of accordions, recorders, guitars etc. was established in 1857 and had its most successful age during the first half of the 20<sup>th</sup> c. Its founder was Matthias Hohner (1833-1902), a clockmaker in Trossingen, who produced his first harmonica in the very house where he lived, although the first producer of harmonicas in Trossingen (already in 1832) was actually a local clothier named Christian Messner (1805-1874). Until 1860, the harmonicas were made in pure craftsmanship without any mechanical assistance and each instrument was manufactured by one person from the very beginning to completion. (For Matthias Hohner's biography, his company and his products, see: Lämmle 1957; Berghoff 1997; Häffner, Wenzel 2007).

The most common product of Matthias Hohner AG in the mid to late 1940s was the M. Hohner 64 Chromonica Model 280 harmonica in the Key of C (Do Major), sold in a veneered pear wood box (Fig. 20-21). The instrument itself was made of the following materials: chromium steel, pear wood, brass plates and brass reeds (Fig. 22). Originally developed in 1938, this Model 280 has all of the features that made it an instant classic including 16 ports, 64 brass reeds, 4 full octaves, pear wood comb, and heavy chromium treatment on the mouthpiece and top and bottom plates. During World War II (and especially after Germany issued a war declaration on the United States of America on December 11, 1941, respectively after Romania declared war on the U.S.A. on December 12, 1941 and the Congress of the U.S.A. declared war on Germany on December 11, 1941 and later, but only on June 2, 1942 also on Romania) the models made in the U.S.A. (under licence) since late 19th c., as Marine Band (registered with the German Trademark Office as DRWZ 14708 in 1896, according to the application made on January 30 and granted on March 13) and Up to Date (registered with the German Trademark Office as DRWZ 16213 in 1896, according to the application made on March 28 and granted on May 13) were less available on the Romanian market. In a certain measure, the situation may have changed after 1945, despite the ravages caused by the war, as harmonicas were very sought-after, both by military and by civilians and were very appreciated gifts for boys and men.

Of the two aforementioned harmonica models made under licence in the U.S.A. by M. Hohner Inc., Successors in New York, Marine Band (Fig. 23-27) was the most famous, as the German original model won medals in Ulm (1871), Vienna (1873), Philadelphia (1876) and Stuttgart (1881), which are depicted on the instrument's upper cover. In the U. S. A. it was produced according to an U. S. A. Patent from August 24, 1897, always mentioned in an inscription on the upper cover till mid to late 1930s, when several notable changes were made to it. One of the most obvious was, besides the lack of the U.S.A. Patent's mention and certain changes in the shape, the replacement of the inscription MADE BY GERMANY on the upper cover with the inscriptions MADE IN GERMANY and FABRIQUÉ EN ALLEMAGNE (Fig. 25). Besides different labels in the box, postwar models show specific features of the inscriptions and renderings on the instrument itself, among which the most obvious are the full expression GESETZLICH GESCHÜTZT (i. e. "legally protected", in German) instead of the previous abbreviations GESETZL. GESCH.

Although the wrapping paper found in the niche has only a limited dating power, after 1928 (the year when the Württ. Harmonikafabrik Ch. Weiss in Trossingen mentioned on it as a production branch belonging to Matthias Hohner AG was acquired) and can be dated more precisely only in correlation with the date of the other two paper items found in the same niche, respectively with the general date of their discovery context, the words *Printed in Germany* on the wrapping paper found in the niche would suggest rather a German production for export, than that the harmonica for which it was made would have been produced under licence in the U. S. A.

# C. Hand receipt with national defence revenue stamp (Fig. 12-15).

On the recto of an irregularly shaped piece of teared newspaper paper ( $110 \times 92 \text{ mm}$ ), yellowed by age, there is a fragment of the purple-brown Romanian national defence revenue mobile stamp of 16 lei (for the exceptional 4 % tax for the country's defence), obliterated with a rubber stamp using purple ink, with Romanian text (Fig. 17), having the following text:

Denés Béla/ Instrumente muzicale SUCC. Babós Gusty SIBIU

In English, this means: Denés Béla / Musical instruments / Subsidiary Babós Gusty / Sibiu.

Between the  $2^{nd}$  and the  $3^{rd}$  row, in upside down reversed position, there is the number 378. Its first two digits are printed with a rubber stamp using black ink, but the last digit is added in blue colour pencil. This is, most likely, the number of the transaction for which the hand receipt was issued, which should have been recorded as well in the shop's cash register, in which the shop's owner or his employees had to glue the lower part of the National Defence revenue mobile stamp (called in Romanian *matcă* or *cotor*, i. e. "bottom" or "stub"), teared along its perforated line, in order to document the collection of the 4 % exceptional tax for the country's defence.

On the verso, there is the following handwritten text in blue colour pencil:

E 16 A ob 45 D " 48 2 Wirbel 120-229 5 % 15 244-

In the  $2^{nd}$  row the initial digit 6 was modified into 5. The cursive letters are harder to read. It may be, most likely, the archaic preposition *ob*, meaning "for", "because" or "due to"). In this context, of a musical instruments shop, the word *Wirbel* means "tuning pegs" (called also "pins").

As we already mentioned, only a half of the revenue stamp is preserved. A fully preserved purplebrown revenue stamp of 16 lei would show a fully equipped Romanian soldier, standing (as seen in the stamp's lower part) with his legs apart across a road and holding with both lowered hands a bayonet riffle (whose type cannot be precisely determined), pointing with the bayonet to right, in order to stop the passage of an unseen enemy. On his head he is wearing the M1934 Dutch helmet newly adopted in 1939 by the Romanian army instead of the previous M15 Adrian helmet of French origin introduced during World War I (for the helmets used by the Romanian army during World War I and World War II: Marzetti 2003, 326-328; for details concerning the acquisition of Dutch helmets for the Romanian army since the negotiations with the Amsterdam company Vereenigde Bliekfabriken in 1938 till 1942: Marzetti 2003, 328; De Joode 2007, 129-131). Behind the soldier, in the stamp's upper half, there is the crowned eagle of Romania, bearing a cross in its beak and on its breast the royal monogram of King Michael I (1927-1930; 1940-1947). At left, near the eagle's wing, is written the value of the revenue mobile stamp: 16 / LEI. On the missing (lower) part of this stamp, at the soldier's feet, in a far plane, at left there are two factories with smoking chimneys and at right, also in a far plan, some (at least two) oil rigs, in a closer plan a ploughman in traditional Romanian peasant costume moving to the background while working the land with his oxen, and in the closest plan, right in the low corner, a sitting woman (also in traditional Romanian peasant costume) oriented to left, who is spinning. In capital letters, on top of the image, is written the country's name (ROMANIA) and on its lower part the legend IMPOZITUL EXCEPTIONAL / 4 % PENTRU / APARAREA TARII (i. e. "The exceptional 4 % tax for the country's defence") and the revenue stamp's value (LEI 16). Undoubtedly, this 16 lei revenue stamp belongs to the series issued on April 1, 1941. This series con-

the series issued on April 1, 1941. This series contains 15 values (4, 6, 8, 12, 16, 20, 30, 40, 60, 80, 100, 200, 400, 600 and 800 lei) printed on linear background, on white velvety paper, generally without watermark (although some showing the MF monogram of the Ministry of Finance are known as well). The series shows three kinds of design, for small (4, 6, 8, 12 and 16 lei), middle (20, 30, 40, 60, 80 and 100 lei) and big values (200, 400, 600 and 800 lei). The dimension of the stamps is 26 x 42 mm (with the image measuring 22 x 38 mm). The perforation is 14:141/2. All the values till 100 lei are perforated on the middle of their length. The big values (200, 400, 600 and 800 lei) are not perforated, but marked with series and number (Cojocar 2000a, 7-8, cat. 34-48).

The record on the verso of this document refers to the price of various music materials: E strings (for Mi in Do Major scale) in value of 16 lei, A strings (for La in Do Major scale) in value of 45 lei, D strings (for Re in Do Major scale) in value of 48 lei, 2 tuning pegs (pins) in value of 120 lei. Their total price, as resulting both from our own calculation and from the record itself, is 229 lei. According to this record, by adding the exceptional 5 % tax for the country's defence (calculated by the merchant at 15 lei instead of 11.45 lei) the customer had to pay the amount of 244 lei. An exceptional 5 % tax of 15 lei would correspond actually to a price of 300 lei, so with 71 lei higher, a sum which was not at all negligible in that difficult time for the lower and the middle class people, due to the social and economic consequences of the war. The exceptional 5 % tax for the country's defence was established according to the Decree Law no. 3572/5.12.1942, which increased the previous exceptional 4 % tax established according to the Decree Law no. 875/30.03.1941. According to the Decision of the Ministry of Finance no. 473028/5.04.1943, a new series of revenue stamps (in value of 5, 10, 15, 20, 30, 40, 60, 80, 500 and 1000 lei) was issued in order to collect the increased tax (Cojocar 2000a, 8). Its values of 5 and 10 lei were withdrawn from circulation on April 1, 1947 according to the Decision of the Ministry of Finance no. 540282/3.04.1947 and the others only on April 15, 1947 according to the Decision of the Ministry of Finance no. 562171/20.08.1947 (Cojocar 2000a, 8), although the exceptional tax was increased to 6 % according to Law no. 273/23.04.1944 and a new series of revenue stamps was issued on August 1, 1944 according to the Decision of the Ministry of Finance no. 474037/28.07.1944, and once again to 12 % according to Law no. 246/31.03.1945 (Cojocar 2000a, 8) and new series of revenue stamps were issued, the first on June 1, 1945 according to the Decision of the Ministry of Finance no. 543918/6.06.1945 (Cojocar 2000a, 8; Cojocar 2000b).

Consequently, due to the amount of the exceptional tax clearly mentioned on the hand receipt, the document can be dated from December 5, 1942 to April 23, 1944, although the document could have been deposited in the niche even later (although not too much, as we believe). By contrary, the date when the revenue stamps issue of April 1, 1941 was withdrawn is unknown. It seems that it may have been used so long during the wartime, until the entire printout was exhausted, even after the increasing of the exceptional tax for the country's defence to 5 %. It does not seems possible that the series remained in use even after the end of the war, in 1947, as its withdrawal is not mentioned by the Decisions of the Ministry of Finance no. 540282/3.04.1947, respectively no. 562171/20.08.1947.

Indeed, the discovered document shows that the merchant calculated the 5 % exceptional tax, but used for its collection the 16 lei value of the series of revenue stamps for the 4 % exceptional tax, issued on April 1, 1941 by the government of the military dictator General Ion Antonescu, which obviously remained in circulation for a while, due to the lack of the new issue during the next weeks or even months, when the smaller values of the previous series lacked to the merchant for unknown reasons or maybe were already quite less available. This would explain why he used the purple-brown stamp in value of 16 lei of the above mentioned issue of April 1, 1941 (Cojocar 2000a, 8, cat. 38) instead of the red stamp in value of 15 lei of the new issue (Cojocar 2000a, 8, cat. 51) or, at least, the purple-reddish stamp in value of 12 lei of the issue of April 1, 1941 (Cojocar 2000a, 8, cat. 37), which would have matched more correctly the 5 % exceptional tax calculated to be, actually, 11.45 lei. Thus, paying a tax of 16 lei instead of 11.45 lei, the customer was taxed in benefit of the country's defence, actually, with 6.98 % instead of 5 %, respectively (considering the round values of 12 lei of the existing revenue stamps), with 6.66 % instead of 5 %. The real difference of 1.98 % (respectively, of 4.55 lei), corresponds to 39.6 % of the current 5% exceptional tax. This difference of 1.98 % is very close to 2 %, otherwise said right to the initial level of taxation for the country's defence, as it was some years ago, when World War II was already under way, but much time before Romania entered it.

Indeed, for first time, an exceptional 2 % tax for national defence was established under King Charles II, according to the Law on the Establishment of an Exceptional National Contribution for the Country's Defence, promulgated by Royal Decree no. 1118/31.03.1940 and the first series of revenue stamps was issued on April 1, 1940 (Cojocar 2000a, 7). The mentioned law required actually the taxation of all exceptional benefits obtained in 1939, the 2 % taxation of the amounts resulting from sales and consumptions of any kind and in any form and the increase of the additional quota of the direct taxes (Cojocar 2000a, 7). Three designs of the stamps of the series issued on April 1, 1940 under King Charles II continued to be used, only with small changes, not only in the second series issued as well the same year and under the same king (whose first day of circulation remains although unknown), but also in the later series of April 1, 1941 issued under King Michael I by the military dictatorship of General Ion Antonescu (Cojocar 2000a, 7-8). Among these three designs there is one (Fig. 19) which can be seen as well on the revenue stamp of 16 lei which is applied on the hand receipt found in the niche in room no. 3 of the Brukenthal Palace in Sibiu. When these designs were reused on the later revenue stamp series issued under King Michael I, on the breast of the Romanian eagle is always rendered the new king's royal monogram (instead of the royal monogram of his father, King Charles II, who abdicated on September 6, 1940), although the soldier (Fig. 17) continues to recall the physiognomic features of King Charles II (Fig. 18). The latter kingbecame increasingly unpopular after the territorial losses in benefit of the Soviet Union (June 26, 1940), of Hungary (August 30, 1940) and of Bulgaria (September 7, 1940) and was hated both by the people who demonstrated all over the country and asked for his abdication and by General Ion Antonescu and his far-right political ally, the Iron Guard, which until its rebellion in January 21-23, 1941 supported the military dictatorship. It is also very important to mention that no revenue stamp of the both series issued under King Charles II was perforated.

Thus, the information about prices and taxes recorded by the hand receipt of Babós Gusty's shop is quite important for the local economy's history and particularly for the history of taxation in mid-20<sup>th</sup> c. Romania, as the prices refers to a kind of ware believed to be less sought-after in wartime and as the revenue stamp used to collect the 5% exceptional tax for the country's defence gives solid clues about a series of revenue stamps whose circulation is still less known.

# 2. The date of the paper items deposit and its cultural and historical meaning.

The exceptional tax for the country's defence was insidious, as it began in 1940 in the form of an exceptional contribution, which was collected according to the Romanian interwar practice of imposing on the population and on the entrepreneurs the subsidization of certain projects of national importance, and became during the wartime (i. e. June 22, 1941 - May 9, 1945) a continuously increasing exceptional tax, which was still levied

long time after the end of World War II, until March 31, 1948 (Cojocar 2000a, 7). But just the continuous increasing of this tax and the corresponding issue of new series of revenue stamps makes, obviously, the hand receipt bearing such a stamp the most important element which can be used to date this deposit of paper items found in 2017 in a niche with pipes in a room at the ground floor of the Brukenthal Palace in Sibiu.

However, this hand receipt is only a quite approximate and too wide terminus ad quem, as the 5 % tax was collected from December 5, 1942 till April 23, 1944. At this state of research a more precise date cannot be specified, as the revenue stamp belongs to an older series serving actually to collect the previous 4 % exceptional tax for the country's defence, but which seems to have been used till its whole printout was exhausted, as it does not seem to have been officially withdrawn. A more precise date could result only from an archive research, if it would lead to the discovery of a document mentioning the installation of pipes in the building during the period December 5, 1942 -April 23, 1944. This is not necessarily, however, as in 1944 Director Rudolf Spek stated that from 2 to 31 July 1943 the natural gas pipes were for first time installed in the building and all the museum's offices as well as the banquet hall were set to natural gas heating (Spek 1944, 115).

During such works these documents may have been walled in the niche, most likely as a "time capsule", according sooner rather to a practice which previously was less attested in Transylvania (and especially in mid-20<sup>th</sup> c.) than as a simple superstition of the workers (respectively, of the plumbers and of the masons) or of Babós Gusty, the owner of the music instruments and supplies shop which functioned in this place, actually as the Sibiu subsidiary of Denés Béla's company (on "time capsules", see: Reinhold 2000; Jarvis 2003; Clark 2010).

A music instruments shop of Babós Béla, who was as well, as he used to advertise, "the first sole producer of music instruments in Sibiu" (*erster und alleiniger Muikinstrumenten- Erzeuger*) and a repairer of music instruments, is known to have been established in 1908 and functioned on the Small Square no. 24, wherefrom it moved on the actual Avram Iancu street (formerly Reispergasse) in 1925 (Bozdog *et al.* 2014, 38) and from there, on June 1, 1930, to the Large Square no. 4, i. e. in the Brukenthal Palace, where it operated till after World War II (Bozdog *et al.* 2014, 60), maybe till the nationalization of the means of production (1948). Therefore, Babós Gusty must be the heir of Babós Béla, most likely a relative (although at the current state of research it was difficult to specify exactly of which kind he was). The information for the history of the Brukenthal Palace during World War II brought by this "time capsule" is very interesting for the local economy's history, as until now Babós Gusty was not known to the museum's researchers as owning during World War II the music instrument shop previously operated by Babós Béla, although Denés Béla seems to have a share of the business, as the shop in Sibiu is only a subsidiary of his company. At first, we believed that Babós Gusty was a male relative of Babós Béla, as Gusty are, usually (but not necessarily), diminutives of two male names: Gustav and, although less often, August.

According to the burial records of the city's cemetery, Babós Béla, "music instruments master", buried on November 25, 1935, was 54 years old. Therefore, he was born in 1881, at a date which was not recorded. Babós Gusty could be, actually, Babós Auguste, who was buried on November 3, 1968 at the age of 74. Therefore, she would have been born in 1894. She may be rather the widow of Babós Béla than his younger (unmarried) sister or another unmarried female relative, as they are buried in the sector A43 / a 2 respectively 3, on a family owned places large enough to host 3 tombs. As resulting from their name, Babós Béla was Hungarian and Babós Auguste was German (more precisely, of Transylvanian Saxon origin), most likely of Evangelical (Lutheran) faith, as they are buried in the Lutheran part of the Protestant sector. Indeed, their family tomb could be retrieved during a terrain research on August 28, 2018. Their funerary inscriptions are written in German, according to the German tradition of name writing (beginning with the first name followed by the mid-name, respectively by the family name) and not according to the Hungarian one (in which would be at first the family name, as observed only for Babós Béla), but keeping the Hungarian spelling of the family name and of the Hungarian first names. As resulting from the main inscription, Béla Babós (mentioned as *Geigenbaumeister*, i.e. "master luthier") was born on December 12, 1881 and died on November, 23, 1935 and Auguste Ch. Babós née Schebesch was born on July 24, 1894 and died on November 1, 1968 and they seem to have had a son, mentioned only by his first name and midname, Artur Béla, born on March 6, 1915 and died on August 19, 1932. On three separate funerary inscriptions are mentioned other three relatives of them, buried much later in the same family tomb: Edith Maria Babós née Schuster (born on April 12,

1927 and died on December 3, 1979), her husband Erwin Otto Babós (born on February 22 1932 and died on October 15, 1989) and maybe the latter's sister Hedda Augusta Keul-Babós (born on August 21, 1928 and died on August 31, 1991). Thus, during the 20<sup>th</sup> c., after Transylvania ceased to be a territory of Hungary, deprived of autonomy, as it was during 1867-1918, as shown by the names of this mixt family's children, the German tradition (more precisely, Transylvanian Saxon) became more and more strong, due to the city's cultural context and particularly to the family's field of relations, within the Transylvanian Saxon community of Evangelical faith, but in a certain measure also concerning its business relations. However, the family kept important relations in the Hungarian community of Transylvania, as its shop was in 1943 a subsidiary of Denés Béla's company and as the name of Auguste Babós is written in official documents according to the Hungarian custom, as Babós Gusty.

The space where the mentioned shop operated was, actually, rented from the Evangelical Church in Sibiu, which administrated it at that time, as in 1872, by the death of Baron Hermann Karl Josef von Brukenthal (1843-1872), the male line in the von Brukenthal family became extinct and under this condition the Brukenthal Palace was bequeathed to the local Evangelical Gymnasium, according to a codicil to the last will (1867) of Baron Franz Josef von Brukenthal (1803-1867), the father of the aforementioned last representative of the von Brukenthal family's male line (Csaki 1921, 5; cf. Ittu 2003, 49). Of course, the Evangelical Gymnasium was owned and by the Evangelical Church in Sibiu. However, the inheritance rights of the Evangelical Church were recognized only in 1878, after the end of a trial which challenged them (Ittu 2003, 50). Thus, it seems most likely that the owner of the building and not the tenant commissioned the mentioned plumbing works, which undoubtedly must have been surveyed by the shopkeeper Babós Gusty when they reached the room where his shop functioned, as evidenced by the very nature of these finds.

The deposit had, therefore, to keep for the future some information about this music instruments shop functioning at that time in the Brukenthal Palace, about the shop's owner and about prices and taxes at the end of World War II, when common people became more and more aware about how difficult it was to believe in a final victory of Germany and of its allies, about the ravages they will have to face and when the inhabitants of Sibiu, irrespective of their religion and ethnic origin, feared more and more for their survival. Indeed, in 1943 the museum took various preventive measures for the eventuality of bombings and of fires caused by them, of which the most important was the changing of its basements into shelters and the replacement of the most precious collection items with less important ones in the exhibition (Spek 1944, 115), resulting therefore a "war gallery" (*Kriegsgalerie*), for which even a catalogue was printed (Ittu 2003, 67).

This "time capsule" shows as well the hope of Babós Gusty that the Brukenthal Palace, which was known to house an old and important museum, will be spared during the alleged future bombings and that the hidden documents will be found long time after the end of the war, when people could show interest for the past of this "temple of arts and sciences", inside of which langsyne his small business used to flourish.

#### **3.** The conservation of the items.

Over time, the three documents were affected both by physical factors (temperature, humidity, light) and by various chemical agent in the improper environment in which they stayed (mainly resulting from the decomposition of building materials), as well as by the way in which they were handled (Fig. 3-4, 8, 12-13), both before they were walled in the niche and after their discovery (Fig. 1-2). Traces of adherent dirt, grease stains, dust deposits and various mechanical damages (bending, folding, marginal tears, even material losses) are visible (Fig. 5, 10 and 13). The paper of the hand receipt (item C) has a slightly rough, yellowed appearance (Fig. 12). Neither the black printing ink on them nor the notes in blue colour pencil on item C and the colour of the revenue stamp on the same item are soluble in water and in hydroalcoholic solution.

The conservation works began with a dry cleaning (brushing), using a brush with soft natural hair and an artificial rubber to remove the layer of dust and of adherent dirt. The next step was the wet cleaning, using a cotton tampon and a hydroalcoholic solution in a 1:1 concentration. After this the cracked and fragile areas were reinforced with Japanese veil, using as adhesive carboxymethyl-

cellulose in proportion of 1-1.5 % in water. The conservation continued by "doubling", i. e. completing the gaps with Japanese paper, using carboxymethylcellulose in proportion of 2 % in water (Fig. 11). The holes in the paper structure were filled using Japanese paper fuzz, after which all the surplus of paper was cleaned using a scalpel and the borders were reinforced with the same adhesive (carboxymethylcellulose in proportion of 2 % in water), pressed with a bone folder. After the adhesive dried, the documents were hardly pressed in a paper press.

After their conservation, the three documents (Fig. 6-7, 9, 14-15) will be kept in the documentary archive within the Brukenthal Library, under appropriate conditions, namely in a space that will protect them against various degradation factors (pollutant emissions from the atmosphere, excessive heat, intense light and moisture), in a portfolio specially made of neutral pH cardboard.

#### 4. Conclusions.

The discovery of this "time capsule" walled at the occasion when for first time natural gas pipes were installed in the Brukenthal Palace and several rooms were set to natural gas heating has a particular importance, because it documents both a stage in the history of the main building of the actual Brukenthal National Museum and the existence of this building tradition (to wall a "time capsule") in mid-20<sup>th</sup> c. Transylvania which until now was known mainly from oral sources, but less clearly attested by published finds or even by research in newspaper records. The "time capsule" documents as well the use of the revenue stamps of the series issued on April 1, 1941 in order to collect the 4 % exceptional tax for the country's defence even after April 5, 1943, when this tax was increased to 5 %. Another new is that in July 1943 the owner of this music instruments shop (previously belonging to Babós Béla) was already his widow Babós Gusty (Auguste) and that at that time the shop was actually the subsidiary of Denés Béla's company. For this reason, after their conservation the finds entered the documentary archive within the Brukenthal Library.

#### REFERENCES

Berghoff 1997	Berghoff, Hartmut. Zwischen Kleinstadt und Weltmarkt: Hohner und die Harmonika 1857-1961, Paderborn (1997).
Bozdog et al. 2014	Bozdog, Marian; Teodorescu, Raluca Maria; Ivănuş, Dănuț Nicuşor. Spațiile comerciale din centrul istoric al Sibiului. Piața Mare, Piața Mică și strada Nicolae Bălcescu, Sibiu (2014).
Clark 2010	Clark, Larry Richard. <i>Time Capsules: The Why, the How, the Where</i> , Scotts Valley (2010).
Cojocar 2000a	Cojocar, Mihai. <i>Timbru fiscal pentru impozitul excepțional pentru apărarea țării</i> . In: <i>Filatelia</i> an L nr. 9 (533), Bucuresti (2000), p. 7-8.
Cojocar 2000b	Cojocar, Mihai. <i>Timbru fiscal Impozitul excepțional pentru apărarea țării</i> . In: <i>Filatelia</i> an L nr. 11 (535), București (2000), p. 4.
Csaki 1921	Csaki, M. Einiges aus der Geschichte der Stifterfamilie. In: * * *, Das Baron Brukenthalsche Museum. Festschrift zur Erinnerung an den 200. Geburtstag seines Stifters Samuel Baron von Brukenthal, Hermannstadt (1941), p. 4-5.
De Joode 2007	De Joode, Kevin. The Dutch Steel Helmet 1916-1946, Amsterdam (2007)
Häffner, Wenzel 2007	Häffner, Martin; Wenzel, Haik. Legende Harmonika, Mundharmonika und Akkordeon in der Welt der Musik, Burgkirchen (2007).
Ittu 2003	Ittu, Gudrun-Liane. Geschichte des Brukenthalmuseums von den Anfängen bis 1948, Sibiu/Hermannstadt (2003).
Jarvis 2003	Jarvis, William. Time Capsules: A Cultural History, Jefferson (2003).
Lämmle 1957	Lämmle, August. Matthias Hohner – Leben und Werk, Stuttgart (1957).
Marzetti 2003	Marzetti, Paolo, <i>Elmetti / Helmets</i> , Parma (2003).
Reinhold 2000	Reinhold, Janet. A Sampling of Time Capsules Content, Covina (2000).
Spek 1944	Spek, Dr. [Rudolf]. Das Baron Brukenthalische Museum in den Jahren 1941 bis 1943. In: Mitteilungen aus dem Baron Brukenthalischen Museum. Jahrbuch der Gesellschaft der Freunde des Baron Brukenthalischen Museum 9-10, Sibiu (1944), p. 114-121.

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- 1a. The place where the "time capsule" was found.
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- 1d. The reconstructed version of a motif of the painted decoration on the ceiling of room no. 10 on the Brukenthal Palaces's ground floor.



2. The preservation condition of the three items at their discovery.



- 3. Item A before conservation (recto).
- 4. Item A before conservation (verso).



5. Item A before conservation (verso). Detail: mechanical degradations.



6. Item A after conservation (recto).

7. Item A after conservation (verso).



8. Item B before conservation.



9. Item B after conservation.



10. Item B before conservation. Detail: mechanical degradations.

11. Item B after conservation. Detail: area completed with Japanese paper.



12. Item C before conservation (recto).



14. Piesa C după restaurare (recto).







13. Item C before conservation (verso).



15. Item C after conservation (verso).



17.

16. Item C before conservation (recto). Detail: degradations of the revenue stamp and of the paper support. 17. Item C after conservation (recto). Detaliu.



- 18. King Charles II.
- 19. The 2, 4 and 6 lei values of the revenue stamp series The Exceptional National Contribution to the Country's Defence 1<sup>st</sup> issue (April 1, 1940). Private collection.





20-22. – M. Hohner 64 Chromonica Model 280 harmonica in the Key of C (Do Major), made in Germany (c. 1943-1949). Private collection.



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28. The headstone and the tombs of the Babós family in the City's Cemetery (Sibiu, August 28, 2018)

#### CLEANING THE VERSO OF AN OIL PAINTING. MECHANICAL REDUCTION OF PAINT TROUGH MICROABRASION - CASE STUDY

Radu Constantin TĂTARU\*

**Abstract:** Solving the conservation issues raised by a painting, itself an example of direct verso protection: a coat of red paint has been applied on the back of the oil painting in an attempt to protect the textile support. This caused considerable distortions and cracking, hence its removal was critical. A case study is presented that describes the mechanical 'reduction' treatment on the work: "Oltul la Cârlige" by Heinrich Trenk - oil on canvas. The content comprises the preparation for the interventions, the required materials and tools, the reasons for their selection, and the techniques of their use.

*Keywords:* restoration, oil painting, textile support, mechanical cleaning, mechanical reduction, lining, Beva 371, Polvammide.

**Rezumat:** : Rezolvarea problemelor de conservare ridicate de o pictură, în sine un exemplu de protecție directă a versoului: pe spatele picturii în ulei a fost aplicat un strat de vopsea roșie, în încercarea de a proteja suportul textil. Acest lucru a cauzat deformări considerabile și cracluri, prin urmare îndepărtarea sa era critică. Este prezentat un studiu de caz ce descrie tratamentul mecanic de "reducere" aplicat lucrării: "Oltul la Cârlige" de Heinrich Trenk - ulei pe pânză. Conținutul cuprinde pregătirea pentru intervenții, materialele și instrumentele necesare, motivarea selectării acestora și tehnicile lor de utilizare.

*Cuvinte-cheie:* restaurare, pictură în ulei, suport pictural textil, curățare mecanică, reducere mecanică, dublarea pânzei, Beva 371, Polvamidă

#### Introduction

In 1882, William Muckley (1829-1905), in his "Handbook For Painters And Art Students (...)", advised the application of a coat of white lead, presumably bounded in oil, on the back of the canvases for protection against humidity and harmful fumes: "In rooms where gas is used for lighting, any textile fabric which may be in them greatly suffers (...). The backs of oil-pictures on canvas are subject to the same influence. It must therefore be seen that unless they are protected, destruction must ensue" (Muckley 1882, 64). This was in fact the author's solution regarding the conservation concerns encountered on the paintings of that era, deducing that if the reverse of paintings lacked protection, the canvas was likely to absorb humidity and pollutant vapors from the environment, thus increasing the textile fibers deterioration and unwanted physico-chemical reactions with the hydrophilic and lipophilic substances contained within the paint layer. The impregnation coating applied to the reverse of the Heinrich Trenk's canvas support consisted of a thick red paint (of unknown origin - possibly a drying oil paint). This might have been an attempt to protect the verso. Unfortunately, it created more problems than solving them, because, with the passing of time, it became very rigid, generating significant structural tensions that lead to major cracks in the paint layer, the deepest ones, wide-meshed in appearance, reaching even through the picture ground.

#### The case study

The oeuvre (Fig. 1, Fig. 2) is a painting by Heinrich Trenk (1818 - Zug, Switzerland - 1892 Bucharest), an active academic painter in Transylvania (1845-1856) later settled in Bucharest (1856-1892). His work is largely fixed on documentary art, often in a classicist grid, permeated with romantic suggestions. In his landscapes, he places miniature genre like scenes, which remind of 17thcentury Flemish landscape paintings in which the painters used to emphasize the contrast between the magnificence and eternity of nature and the daily ephemerality of the human group. It is important to note that the Swiss painter described the spectacular and nostalgic aspects of the mountain scenery, in fact a reminder of his native Austria

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(Mesea 2010, 33-35).

According to the inscriptions found on a label from the old stretcher (Fig. 3), it seems that the work was part of the "Toma Stelian Museum" collection, and was once borrowed by the State Pinacoteque (Soroceanu 1930, 203-216). Established in 1926 and subordinated to the "The House of Schools" ("Casa Scoalelor"), the "Toma Stelian Museum" collection (Oprescu 1931, 338), comprised an impressive number of prints, paintings and sculptures (Catalog, 1939); after the establishment of the communist regime, in the year 1949 the museum's collection enriched the patrimony of the "Romanian People's Republic Museum of Art" ("Muzeul de Artă al Republicii Populare Române"). Once the Art Department of the "Braşov Regional Museum" ("Muzeul Regional Braşov") was created in 1949 (Buta 1976, 186), many of the works from the "Romanian People's Republic Museum of Art" were distributed during the following years, in order to create the permanent exhibition within the "Council House" ("Casa Sfatului") building; to these lots belonged the work that makes the subject of this Case Study.

#### The mechanical reduction

Once the canvas was taken down from the stretcher, it was clear that the thick coat of red paint was covering it altogether, margins included (Fig. 4). This had to be mechanically removed. Nevertheless, in order to avoid any negative effect of the induced vibrations, total 'facing' was necessary (Fig. 5). After the latter was applied, the painting was put face down onto successive layers of spunbonded non-woven fabric; these where then covered with mono-silicone polyester film. This setup would act as a cushion for later probing tests and the actual reducing. All the inventory numbers were copied on tracing paper, so that a full scale replica would be available for the restoration documentation (Fig. 6). The first probing tests were done by scraping with a scalpel on a regular shaped area (Fig.7). The process was time consuming, but by doing so, the optimal control over the cleaning area could be achieved. The in-depth intervention revealed the true layer thickness, and the nature of the fabric underneath. However, scraping will usually remove paint from the surface of the canvas, seldom from the interstices, and would put pressure on the verso of the painting and inevitably on the picture layer. It was decided that complete removal of the back coating was both impossible and unsafe for the artwork. The uniform reducing in thickness would suffice. Further tests proved that the most efficient instrument to

perform this, was a precision micro drill with an extension flexible shaft, for better engaging angles (Fig. 8, Fig. 9). The drill tip of choice was a highgrade corundum grinding cone shaped bit (Fig. 10). The variable speed control ensured at all times the ideal ratio between the material removal rate and the rotational speed of the tool (Fig. 11). With the material removal rate being higher at bigger revolutions per minute than that at lower ones, the grinding was done at the lower range of the tool's dial (between 8000-9000 rpm), bringing it to its minimum when closer to the emerging weave (5000 rpm). The residues where removed simultaneously by vacuuming. The reducing was done by predefined 20 by 20 cm grids (Fig. 12). During the operation, the picture layer was checked constantly.

### The original canvas

Often, what lurks behind a painting coat can often be surprising. During procedures, the underlying layers where constantly checked by means of infrared camera. It was this way that the branding stamp of the canvas producer was slowly revealed (Fig. 13). This was identified as being a product of the Austrian company "W. Koller & Cie" (the complete inscription was: "W. Koller & Cie in Wien Silberne Medaille").

After the 'reduction' process, the textile support was prepared for lining by welding the small tears present on the corners, with Polvammide, a powder of copolyamide - a thermoplastic polymer with high elasticity. The binding was done using the heated spatula, in this case mounted with a needle tip (Fig. 14).

### The lining

The special linen fabric (Fig. 15) was cut with a surplus, larger than the painting all around. The actual lining was done by using a technique similar to the "hot-seal" method (Berger 1968-70, 67), in which the fabric receives a coating of thermoplastic artificial resin based adhesive (in this case BEVA 371), which is then made tacky by warming and bonding together with the original and the lining canvas. The choice of BEVA 371 was made because of the easy reversibility in low-aromatic petroleum solvents (Berger, Russell 2000, 25). Firstly the adhesive was applied by spatula onto the original verso (Fig. 16), through a fiber glass grid (Fig. 17), so to create an even thickness of the laminating layer. When dry, the layer was flattened to an even surface by ironing. Secondly, the lining canvas was prepared using the "transfer method" (Nicolaus 1999, 130), in which a thin adhesive film of BEVA 371 was transferred from a silicone carrier sheet onto the lining fabric (Fig. 18). Both canvases where then sealed together by thermal reactivation. It has been done so to firmly fasten the original textile support.

Following the lining, the canvas was mounted on a newly crafted cross brace wedged stretcher (Fig. 16). The painting received two coats of varnish: the first one consisting of a retouching varnish and a final glossy picture varnish, both synthetic. The retouching was done by using mastic resin based restoration paints.

#### Conclusion

The 'reduction' by mechanical methods must be done with a great deal of attention, as the approach is invasive. By carefully preparing the support on which it is operated, and careful checkings during cleaning, the restorer can avoid any negative effect derived from it. In this case, the main intention was to unrigidise the textile support by eliminating the main factor that led to the deformation of the whole structure. Due to the hardness of the backing laver, no workable treatment could be applied that would have rerendered the flatness of the work without jeopardizing the integrity of the painting laver. The heavy creasing created with plasticization of the paint coat from the back, have amplified the already existing net crackings, creating the premises for the gradual loss of color, especially on the creased areas. In fact, both structures were quite rigid, their materiality resembling to the one of a cardbord. The gradual strain relief of the work by reducig restored it's elasticity and allowed for an active retrievement treatment, transferring the remaining tensions to the lining support (Fig. 19, Fig. 20). The lining adhesive will also absorb vibrations and its reversibility will not endanger the work in case of future interventions.

#### REFERENCES

Berger, 1968-70	G.A. Berger, <i>The testing of adhesives for the consolidation of paintings</i> , in IIC Bulletin of the American Group, 1968-70,
Berger, Russel, 2000	Gustav A. Berger with William H. Russell, <i>Conservation of paintings, Research and Innovations</i> , Archetype Publications Ltd, 2000)
Buta, 1976	Sanda Maria Buta, Vechi colecții care stau la baza muzeului din Brașov, în "Cumidava", IX (partea 1), 1976
Catalog, 1939	Catalog (Pictură, Sculptură și Desen), Casa Școalelor, Muzeul Toma Stelian, Editura Cultura Națională, București, 1939
Mesea, 2010	Iulia Mesea, Galeria de Artă Românească, Alba Iulia, Altip, 2010
Muckley, 1882	MUCKLEY, W., Handbook For Painters And Art Students On The Character And Use Of Colours, Their Permanent Or Fugitive Qualities, And The Vehicles Proper To Employ, London, 1882
Nicolaus, 1999	Knut Nicolaus, <i>The Restoration of paintings</i> , Konemann Verlagsgesellschaft mbH, Cologne, 1999
Oprescu, 1931	G. Oprescu - <i>Muzeul Toma Stelian</i> , Boabe de grâu, An II, Nr. 8-9, august-septembrie 1931, Editura București: Librăria de Stat
Soroceanu, 1930	Tache Soroceanu - <i>Pinacoteca Statului</i> în Boabe de Grâu 1 Nr. 1 1930, Editura București: Librăria de Stat

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19. Heinrich Trenk, "Oltul la Cârlige" - following restoration



20. Heinrich Trenk, "Oltul la Cârlige"; verso - following restoration
# RESTORING EIGHT WALL CLOCKS FROM THE COLLECTION OF THE BRUKENTHAL NA-TIONAL MUSEUM

#### Ioan BRAI\*

**Abstract:** The restoration process is an activity meant to bring back the remnants of time to a more proximate form to the original and in the same time to prolong its existence. It's in the human nature to be aware of the ephemeral matter, precisely in the respect that we can catalogue restoration as a work against nature, against time. I use this aphorism precisely to point out the uniqueness of the restoration processes, which is the subject of this article.

Keywords: pendulum, clock, mechanism, restoration, conservation

**Rezumat:** Procesul de restaurare este o activitate menită să readucă vestigiile timpului la o formă apropiată originalului și să le prelungească în același timp existența. Este în natura umană să conștientizeze efemeritatea materiei, tocmai din această privință putem cataloga restaurarea ca o muncă împotriva firii, împotriva timpului. Mă folosesc de acest aforism tocmai pentru a puncta unicitatea proceselor de restaurare ce fac subiectul acestui articol.

Cuvinte-cheie: pendul, ceas, mecanism, conservare, restaurare

#### The restoration of time

Composed of different, often incompatible materials, the 8 clocks are part of the collection of the Museum of History, the Altemberger House, part of the Brukenthal National Museum in Sibiu. The restored and proposed pieces of study belong to several historical and stylistic periods, with a variety of materials that have become antagonistic over time.

Both in museum collections and in private collectors' collections, the correct assessment of the conservation status is very important. Achieving an anamnesis helps us make the right decisions regarding the preservation and capitalization of the object, by adjusting the environmental parameters and reducing the risk of mechanical deterioration that may occur due to improper manipulations, improper storage or display.

The restoration process is necessary when the state of preservation of the parts is poor, their integrity has been compromised and the aesthetic message damaged, making it difficult to valorise the cultural object in the exhibition space. The first stage of intervention consists of curatorial conservation action, meant to stabilize the workpiece, to overcome and to stop the effects of physical, mechanical, chemical or biological degradation. In order to facilitate the understanding of the restoration process and the differentiated approach for each object, I will give a brief description of the different component materials and the state of conservation at the time of entering the laboratory.

## Wall clocks

MC 297 Pendulum wall clock (Fig. 1) consisting of a veneered fir wood carcass with carved and travertine ornaments. The clock mechanism is flanked by two brass plates, between which the toothed gears of the mechanism are located. The dial, the pendulum base and the pendulum plate are made of brass. The forefingers are made of iron, by stamping. In terms of the state of conservation, the wood presents cracked and dusty deposits, it is fragile and shows an inactive xylophage insect attack. Mechanical degradations are also present: cracks and loss of material, parts of the casing profile are detached, caused by the aging of the glue in the joints. The finishing of the casing, polished with rosin, is eroded in some parts caused by functional wear.

The brass elements exhibit copper-specific metal oxides, the oxidation being continuous and uniform. The clock support element and its gong exhibit iron-specific metal oxides. The glass, framed on the door of the dial, is covered with a layer of

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dirt and adhering dirt. Cracks and flying holes of xylophage insects are visible on the surface of the door. The mechanism (along with the pendulum) was detached from the housing by lifting it from the carriage support. The pendulum support bar was broken. The restoration approach chosen is to address the mechanism and the wooden housing differentiated. Thus, the brass elements of the mechanism, the pendulum, the spacer bolt, the brass dial and the pendulum base plate were degreased with acetone and chemically cleansed in orthophosphoric acid (20% concentration). The brass ornaments on the casing also benefited from the same treatment. For protection, all mechanical parts have been polished with a clean cloth and polish paste<sup>1</sup>, the final polish being given with an Exquisit cotton cloth<sup>2</sup> impregnated with substances that clean and protect.

Interventions were made on the mechanism as well: it was dusted with a fine brush and cleaned with extraction gasoline. After the evaporation of the solvent, it was lubricated with special oil for fine mechanisms. The wooden casing was mechanically cleaned with a glass fiber brush, and the rosin layer was thinned with ethyl alcohol and partly removed with a clean cloth, the adherent dirt being removed at the same time. The wood, fragile following the attack of xylophage insects, was treated with Perxil 10 to prevent recurrence of the attack and then strengthened by injection with Paraloid B 72 (5%) in ethyl acetate. After consolidation, the flight holes were topped with Domostuk wood putty. The cracks on the front of the casing were glued and grouted. After the rosin layer was thinned and equalized, the finish consisted of polishing inside and out with the same type of resin and polished wax. The glass access door was cleaned with alcohol. The mechanism, together with the pendulum, was added to the wood casing, thus completing the piece. (Fig. 2)

**MC 492** (Fig. 3) The clock casing is made of veneered, turned and carved fir wood with incised and pierced decor. The wood presents deposits of adhering dirt, dust and different types of remains. It is clogged and brittle causing mechanical degradation: cracks and material loss. Parts of the housing profile are detached caused by the aging of the glue used for the joints. The casing is finished with

a substantial shellac layer that has marooned over time, and in some areas it is missing, as a result of functional wear. The mechanical part is composed of two brass plates, among which are the wheels of the engagement mechanism. Copper-specific metal oxides are present on the brass elements, the oxidation being continuous and uniform. The brass dial has dust deposits and specific metal oxides. The mechanism (along with the pendulum) was detached from the housing by lifting it from the casing support. The hand sawed wooden door has visible cracks in the wood and it has a glass that does not have any cracks or crevices. The glass is covered with a layer of dust and adhering dirt. To restore the integrity of the workpiece, a pendulum block clamp was made. We were able to identify in the warehouse where the piece was taken, pointers similar to the original. Taking into consideration the desire to display the piece, the restoration committee has decided to attach the hands for the complete appearance and usefulness of the clock. The pendulum, the spacing screws, the brass dial bracket, were degreased with acetone and chemically cleaned in orthophosphoric acid (20% concentration). For protection, they were polished with a clean cloth and polish paste. A final polish was given with an Exquisit cloth. The mechanism was dusted with a fine brush and cleaned with extraction gasoline. After the evaporation of the solvent, it was lubricated with special oil for fine mechanisms.

Finally, the mechanism, the pendulum and the weights were reattached to the wooden casing, thus completing the piece. The wood casing was mechanically cleaned with a glass fiber brush and the cracks on the front of the casing were glued and grouted. The shellac layer was thinned with ethyl alcohol and cleaned with a clean cloth, at the same time removing the adherent dirt, then being polished on the outside and inside with shellac. Among the wooden decorative elements, the fronton resting on the carcass had the most to suffer. It was re-joined and subsequently added to the casing, the fragments being reattached with wood glue. (fig.4)

**M 1031** (Fig. 5) A unique look for a clock, which seems to be the mechanical part of a column clock that no longer keeps the wooden casing (Bremer-David 1993, .82). It is made of metal only: steel and brass. The metal was machined by turning, stamping and casting. (Wilson, et al. 1996, 2-9)

The entire surface of the piece had a continuous and uniform layer of corrosion products specific to

<sup>&</sup>lt;sup>1</sup> Autosol- metal polish, ingredients: 15-30% aliphatic hydrocarbons, 5-15% aromatic hydrocarbons, <5% aniotic surfactans

<sup>&</sup>lt;sup>2</sup> SILBO: 100% cotton cloth, ingredients: <5% nonionic surfactants, ,5% aniotic surfactanti

the iron and copper alloy. The following parts are missing: the weights, the pendulum with the rod and the front bearing where the pendulum is caught. Also missing is the hand that shows the minutes. Due to functional wear, mechanical deformations are present in the metal case.

The mechanism has been dismantled into its component parts. Each component was micro sandblasted with glass beads. After being micro sandblasted, the components were polished with rotary brushes made of iron or brass, tools usually used by jewellers. After mechanical cleaning and polishing, the mechanism was passivated with Balistol. (White 1995, 5) The pendulum, dial and pointer were cleaned in 20% orthophosphoric acid and brushed mechanically with a brass brush, polished with Autosol and wiped with a clean cloth, a final polish given with an Exquisit cloth, made especially for jewellery.

To complete the mechanism and its operation and to stabilize the clock, I have made and added: the pendulum, its rod, the bearing of the pendulum against the clock. I have also bended the metal dial as necessary in order to bring it back to its original form, removing the plastic deformations. I found and added weights similar to this type of clock. After the whole process of reuniting the mechanical parts and restoring, the clock is functional again (Fig. 6).

MC 500 (Fig. 7) As components, we can find veneered fir wood, turned and carved, incised and hand sawed on the level of the casing. The decor of the casing is enhanced by applied ornaments made of brass. Wood has deposits of adhering dirt, and dust deposits, also it is fragile. It presents degradations caused by xylophage insects, the characteristics of the flight holes and their incidence can be attributed to be Anobium punctatum attack. The piece was carefully watched during the quarantine period, without any noticeable change, establishing the inactivity of the attack. It presents mechanical degradation: cracks and missing pieces of wood. The decorative profiles on the left upper registry are missing. The gable is detached, wood ornaments have also lost adhesion to the casing. The brass ornaments have also come loose. On the surface of the casing there are visible degradations of the veneer, the shellac layer has marooned over time, and in some areas it is missing. The wood was mechanically cleaned with a glass fiber brush, and the shellac layer was thinned with ethyl alcohol and wiped with a clean cloth, at the same time removing the adhering dirt. The fragile areas following the xylophage insect attack were strengthened by injection with Paraloid B 72 (5%) in ethyl acetate. After consolidation, the holes were grouted with Domostuk wood putty. The gable was reattached by gluing it with bone glue. The lower part, between the two consoles, was glued with bone glue and grouted with Domostuk putty. The clock case was polished on the outside and on the inside with shellac. The brass decorative applications were reattached using brass nails.

The dial with the pendulum base plate is made of enamelled copper the base plate has approx. 50% of the missing enamel, which is why I used Devcon epoxy resin mixed with white pigment to fill the missing area, and in doing so, simulate the colour of the email and make the dial look complete. After completing the enamel, the left-side ornaments were also restored using the aesthetic witness. One hand is made of stamped iron (the original) the other one is made out of brass and it is hand sawed and is painted black.

The mechanism consists of two brass plates, among which are the springs and the clock wheels. Missing pieces are: the key, a spacer bolt and the weights. The pendulum is also detached. Copperspecific metal oxides are present on the brass parts; the oxidation is continuous and uniform. The mechanism was dusted with a fine brush and cleaned with extraction gasoline. After evaporation of the solvent, it was lubricated with special oil for fine mechanisms. I resorted to making the missing elements and completing the mechanism. A spacer bolt was made and added to the casing. The weights were made of brass plate and filled with lead. Their shape, thickness and weight were established from the original weights of a similar clock. The scribes, the pendulum, the spacer bolt, the brass dial, and the pendulum base plate, as well as the brass ornaments on the casing, were degreased with acetone and chemically cleaned in orthophosphoric acid (20% concentration). For protection, they were polished with a clean cloth and with polish paste, a final polish was given with an Exquisit cloth.

The mechanism, along with the pendulum and weights, were added to the casing, thus completing the piece. (Fig. 8)

**MC 504** (Fig. 9) The clock features a small sized, stained, carved, incised and hand sawed wood casing. The wood has deposits of adhering dirt, dust and debris. The dial is made of brass and has a discontinuous and uneven layer of mechanical and

copper-specific corrosion products. The paint with which the numbers have been painted on the dial is scratched and is missing in some places. The hands are made of stamped iron and painted in black. The dial is protected by a thick, intact glass. Due to inappropriate handling and wear, the mechanism and the pendulum were detached from the housing by lifting it from the casing support. This disassembly led to the loss of the pendulum and a spacer bolt. In regards to the intervention on wooden housing it was resorted to minimal approach: mechanical cleaning with a fiberglass brush, and with a clean cloth in alcohol. For protection, the casing was polished with polish wax. As far as the metal components are concerned, the brass dial was degreased with acetone and chemically cleaned in orthophosphoric acid (20% concentration). For protection, it was polished with a clean cloth and Poliboy polish paste, a final polishing was done with the Exquisit cloth. The mechanism was cleaned with a fine brush and degreased with extraction gasoline. After evaporation of the solvent, it was lubricated with a special oil for fine mechanisms. To fill in the missing parts, I have built and added the housing, a spacer screw. This was followed by the pendulum, and in order to reintegrate the aesthetics, the numbers and hands on the dial were imitatively integrated using reversible varnish colours. The mechanism, along with the pendulum, was mounted in the casing, bringing the clock to its original appearance. (Fig. 10)

MC 498 (Fig. 11) Wall clock, Austrian Frame Clock (Bidermier Frame Clock) mounted in the specific frame. The edges of the frame are gilded and profiled with stucco motifs applied around the dial. The state of conservation of the piece before restoration: it was missing the stucco decoration on the door frame and on the clock casing, it has deposits of dust and dirt, a very high layer of repainting with gold paint, the fine stucco elements are hard to read. It presents cracks due to the internal stress of the wood. This piece shows traces of previous inappropriate restoration interventions, the cracks being grouted with a very hard putty, not respecting the edges of the gap. The enamel on the dial is scratched. The clock's decoration on the dial is missing. Copper-specific metal oxides are present on the brass elements, the oxidation being continuous and uniform. Because of the aesthetic features of the casing, the interdisciplinary approach was implemented in this matter: oil painting restorer Celestina Albisor removed the old gold paint with DEC 2000 paint thinner, within a twostep operation. The wood was cleaned with water, alcohol and ammonia-based cleaning solution. Because there were many stucco losses, moulds of the original elements that existed were taken and the whole image was rebuilt, the pieces that were added were made with plaster. Additionally, Balsite, a two-component epoxy putty was added to the areas where it was needed. A schlagmetal sheet was applied to the profiled edges, and then the sheet was protected with shellac. For the rest of the clock, gold paint was applied. These aesthetic reintegrations were followed by the intervention on the mechanical parts.

In the first phase I found that the base plate of the clock is cracked, the mechanism is complete but inoperative, the pendulum and its rod are missing. The brass parts have a discontinuous and uneven layer of mechanical products and copper-specific corrosion products. The glass of the dial has gold paint traces resulting from previous inadequate interventions but also adherent deposits of protein based and oily material. During the restoration process, the mechanism was disassembled and cleaned with extraction gasoline, reassembled and lubricated with special oil for fine mechanisms. The brass pieces were degreased with acetone, immersed in 20% orthophosphoric acid, mechanically cleaned with a brass brush, polished with Autosol paste. The enamel copper sheet dial was degreased with ethyl alcohol, then the missing areas were filled with epoxy resin in which white pigment was added to bring the resin to the colour of the dial. The steel gong was mechanically cleaned with a rotating brush and passivated with Ballistol. The pendulum was made by imprinting a similar pendulum in silicone rubber and poured from Sintolit resin. The new pendulum has been integrated with gold paint and attached to a metal rod on which a brass knob has been fitted in advance to bring the weight of the pendulum to the right level. New brass housing clamp bolts have been added. The mechanism is now operational due to cleaning and the adjustments that were made (Fig. 12).

**MC 502** is a clock similar to M.C. 498. Both of them were made in Austrian style, with presumed dating around 1840. (Fig. 13) The materials used are similar, as well as the execution techniques. State of preservation being relatively the same: the decorative stucco has gaps on the framed door, and also extensive re-paintings, on the ornaments and the interior. There are also deposits of dust and adherent dirt. The glass exhibits uneven brushed gold paint. From the basic components of the ob-

ject, the key, the pendulum, the rod are missing and the base plate of the clock is cracked. The lid covering the mechanism behind the casing is missing. The mechanism is complete but not functional, the dial has enamel loses. The metal parts exhibit a discontinuous and uneven layer of mechanical and copper-specific corrosion products and ironspecific metal oxides. The mechanism was disassembled and cleaned with extraction gasoline, then reassembled and lubricated with special oil for fine mechanisms. The brass pieces were degreased with acetone, immersed in 20% orthophosphoric acid, mechanically cleaned with a brass brush, polished with Autosol paste, protected with the special Exquisit cloth. The gold paint on the glass dial was cleaned with ethyl alcohol. The enamelled copper sheet was degreased with ethyl alcohol; then the missing areas were filled with epoxy resin in which white pigment was added to bring the resin to the colour of the dial, however, varnish colours were also used for chromatic reintegration. The reconstructed items were made in the same way as the previous clock and the missing lid of the casing was made of fir wood. After reassembling the elements, the mechanism is complete and functional. From case the gold paint was removed, the approach being the same as that used in the M.C. 498 piece. (Fig. 14)

M 501. Clock with integrated pendulum in a painting. (Fig. 15) Its casing has dust and dirt deposits and dirt on the surface of the casing and inside of it, there are areas with scratches, bumps and areas where the shellac has thinned or no longer exists caused by functional wear. The back cover of the mechanism is fractured and a repair has been done on it by reinforcing it with iron wire. The glass in front of the dial is missing. The golden frame of the painting, including the dial, shows scratches, bumps, dirt and dust deposits on the edges and joints. In terms of the painting there are present: vellowish varnish, colour and primer layers, scratches and cracks, dust and loose dirt and adherent dirt. The mechanism is incomplete and nonfunctional, the pendulum and its rod, the weights and the chains that engage the mechanism are

missing. The mechanism has adhering and anchoring dirt deposits, iron and copper specific corrosion products are also present. In the centre of the dial you can see enamel loss. A pin from the catch of the casing is missing.

To begin with, all parts of the casing have been dusted and cleaned with brushes of different hardness, the casing components have been reworked with shellac, the joining areas have been cleaned of old glue and the nails have been removed. The gilded frame was cleaned with a solution of a mixture of ammonia, Solvanol, (2% ammonia, 98% Solvanol), the loose areas were re-glued with fish glue and mountain chalk and chromatically reintegrated. The whole casing was re-glued with bone glue. The mechanism was disassembled and cleaned with extraction gasoline. The missing areas on the dial were filled with Devcon epoxy resin mixed with white pigment to simulate the colour of the enamel. The brass pieces (dial frame, the window frame covering the pendulum, the pendulum and rod and the gong support) were chemically cleared in 20% orthophosphoric acid. The gong and iron pointers were mechanically cleaned, then passivated with Ballistol (before the passivation the clocks were cold-blued with Ballistol cold blue solution). The missing glass was replaced with a 2 mm sized glass and degreased with ethyl alcohol. A brass pendulum was made using a similar clock as a model. Weights and chains have been found, that are suitable for this type of clock and have been added to it. The fastening pin of the dial was made out of a copper wire and fixed with epoxy resin. The mechanism is now operational due to cleaning and adjustment. In the case of the painting the operations were done by oil painting restorer Cristina Fău. Removal of dust from the painted surface was accomplished with ammoniac water, 2% concentration. The yellowish varnish layer was thinned and equalized with a mixture of turpentine essence 60% and 40% ethyl alcohol. Beva 371 and mountain chalk were used to fill the gaps in the painting layers. When applying the putty, a thermostatic spatula was used. The varnishing was done with retouching varnish and chromatic integration of the varnish-based colour gaps (Fig. 16).

## REFERENCES

Wilson, et al. 1996	Gillian Wilson, et al., <i>Catalogue of European Clocks in the J. Paul Getty Museum</i> , [PDF file] The J. Paul Getty Museum Trust Publication Services, 1996. Retrieved from <u>http://www.getty.edu/publication</u>
Bremer-David 1993	Charissa Bremer-David, <i>Decorative Arts, An illustrated summary cata-</i> <i>logue of the collection of J. Paul Getty Museum</i> , J. Paul Getty Trust Publication Services, 1993
White 1995	White, Philip R, `The care and preservation of firearms` <i>Technical Bulletin</i> , no.16, Canadian Conservation Institute, Ontario, 1995

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- 11. Ansamblu înainte de restaurare
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- 13. Ansamblu înainte de restaurare
- 14. Ansamblu după restaurare
- 15. Ansamblu înainte de restaurare
- 16. Ansamblu după restaurare



1. Assembly before restoration



2. Assembly after restoration



3. Assembly before restoration



4. Assembly after restoration



5. Assembly before restoration



6.Assembly after restoration



7. Assembly before restoration



8. Assembly after restoration



9. Assembly before restoration



10. Assembly after restoration



11. Assembly before restoration



12. Assembly after restoration



13. Assembly before restoration



14. Assembly after restoration



15. Assembly before restoration



16. Assembly after restoration

## APPLIED METHODS IN THE RESTORATION OF MALACOLOGICAL MATERIAL

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Abstract: The collections in the museums of natural science have documentary-scientific and historical value by keeping remarkable specimens in a large number of species, collected and prepared long time ago. The paper presents a synthesis of restoration works of fossil and current malacological preparations that are part of the collections of Paleontology and Malacology of the Museum of Natural History from Sibiu. The material chosen is part of three classes of Phylum Mollusca: Gastropoda, Lamellibranchiata and Cephalopoda. The specimens are made up of organic materials (animal tissues, paper) or inorganic (shells, limestone), which in time become fragile and vulnerable due to the various degradation factors that influence their integrity - biological (mold, insect), chemical (Byne disease, formaldehyde deposits), physical (deformation, cracks, fragmentation). Dry and wet cleaning, disinfection, fragments fixation, complete of lacunas, chromatic integration, hydration, replacement of the preservative liquid has been carried out. The methods of conservation and the variety of identified deteriorations require various restoration methods that must be appropriate to each specimen.

Keywords: collection, natural history, molluscs, heritage, conservation, palaentology

**Rezumat:** Colecțiile din muzeele de științele naturii au valoare documentar-științifică, cât și istorică prin faptul că păstrează specimene deosebite, într-un număr mare de specii, colecționate și preparate cu mult timp în urmă. Lucrarea prezintă o sinteză din lucrări de restaurare ale unor preparate malacologice fosile și actuale care fac parte din colecțiile Paleontologie și Malacologie ale Muzeului de Istorie Naturală din Sibiu. Materialul ales face parte din trei clase ale Încrengăturii Mollusca: Gastropoda, Lamellibranchiata și Cephalopoda. Specimenele sunt constituite din materiale organice (țesuturi animale, hârtie) sau anorganice (cochilii, calcar), care in timp devin fragile si vulnerabile în fața diverșilor factori de degradare care le influențează integritatea – biologici (mucegaiuri, insecte), chimici (degradarea Byne, depuneri datorate formaldehidei), fizici (deformări, fisuri, fragmentări). Au fost realizate lucrări de curățare uscată și umedă, dezinfecție, fixare a fragmentelor, completare și integrare cromatică, hidratare, înlocuire a lichidului conservant. Metodele de conservare și varietarea deteriorărilor identificate impun diverse metode de restaurare care trebuie să fie adecvate fiecărui specimen.

Cuvinte-cheie: colecție, istorie naturală, moluște, patrimoniu, conservare, paleontologie

## Introduction

Nowadays, the Museum of Natural History from Sibiu is part of the complex of the first museum open to the public in Romania, Brukenthal National Museum, dating from 1817. Here are preserved malacological preparations of historical and documentary-scientific value. In 1852 Johann Ludwig Neugeboren donated 210 species of molluscs (Corocleanu 1998, 165) to the Transylvanian Society of Natural Sciences of Sibiu (Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt), established in 1849. His donation put the base of the malacological collection. Over time, the number of specimens has increased significantly by various means: excursions funded by the Society in areas rich in fossils, acquisitions, donations and exchanges with major universities, museums and institutes from Romania and abroad (Ciobanu 1998, 56). The rapid increase of collections was naturally followed by the need of storage space. After frequent relocations (the site was changed for nine times in 45 years) the collections arrived in their "home" in 1895 (Catalog Drumul Colecțiilor,

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2014, 14) when the Museum becomes a public institution. The malacological material of the museum's patrimony is of a great diversity and abundance of species. This material in this study is included in two collections - Palaeontology and Malacology. Taking into consideration the great variety of malacological material, the best storage conditions must be ensured according to the specificity of each element in the collection. Unfortunately, every move of the collection and human interaction with the specimens could cause some imbalance, having consequences on the conservation state.

The Malacological Collection includes a large number of specimens - over 500.000 specimens belonging to over 10.000 species. The main specialists who contributed to the gathering of the collection are Carl Friedrich Jickeli, Julius Bielz and Richard Winnicki von Kimakowicz. They donated collections of great value to the museum. The impressive proportions of the collections as well as their historical and scientific significance, are well known to specialists. For instance, the Bielz Collection comprises approximately 200.000 specimens of land and water molluscs a number of which represent type specimens of Romanian fauna (Corocleanu, 1998, 166). We can now discuss the fact that the museum is the institution that shelters and preserves these patrimony values of our country. One of the most important functions of the museum is administration, preservation and restoration of the museum heritage. Considering the age and fragility of specimens, the vulnerability of constituent materials, it is obvious that different problems arise in keeping the collections, which raises some difficulties in choosing the appropriate methods of restoration.

## Materials and methods

The present paper describes the restoration work for specimens from two museum collections: The Paleontological Collection - objects preserved by fossilization (mineralization, internal molding) (Anastasiu et al. 2007, 121) and the Malacological Collection - shells preserved by drying, boiling and drying and specimens prepared in preservative liquids. Chemically, the materials in the structure of the objects are on the one hand inorganic - shells (strongly impregnated with different inorganic salts), stone (limestone) and inks and, on the other hand, organic of animal origin (leather, bone) and vegetable origin (paper).

In the Museum deposits, the malacological specimens are kept in cabinets and they are individually arranged in cardboard or in wooden boxes placed in drawers or on wooden shelves.

The first step towards the restoration of the specimens is the evaluation of their conservation state. The specimens are evaluated by the collection curator or by the conservator and they are proposed for restoration according to the priorities. After their arrival to the restoration laboratory, the conservation status of the specimens is evaluated in detail by different methods of investigation: microscopy, overall measurements, photographic documentation with overall and detail images and chemical analysis. Afterwards, a diagnose is established and proposals for the intervention on the specimen are made. Subsequently, the restoration process can proceed. Specimens were determined by the curator museographers which offered various data about the origin of the samples.

Macro-photographic documentation has been accomplished using a Nikon D5300 digital camera with Nikkor 18-55 mm and Sigma 105 mm lenses and micro-photographic using a Celestron portable digital microscope. Below there are listed some of the substances and instruments used during our work: magnifying glass, tweezers, needles, vacuum cleaner, distilled water, ethyl alcohol, glycerin, Petri dishes, absorbent paper, transparent adhesive (vinyl polyacetate), sand, analytical balance, fastening pliers, synthetic clay paste, Dremel engraver and rotary tools.

Further on, the species considered in the study will be described according to Systematics and age, with an emphasis on their conservation status, and on their eligibility for restoration.

Specimens belonging to the Palaeontological Collection

1. Cypraeidae (2 species) – inv. no. 40.808-40.818, 40.829-40.842, 41.284-41.286 - 11, 14, respectively 3 shells preserved in boxes made of cardboard. Specimens originate from Badenian (Middle Miocene) and are collected from Lăpugiu de Sus (Neugeboren 1854, 196), Hunedoara County. The pieces are small in size (length 12-32 mm, width 8-20 mm, weight 0.52-6.31 g) are preserved by fossilization and have a white, yellowish, or gray color (Fig.1 A). The color is due to the mineralization and the substrate they come from.

*Conservation status and proposals*: The pieces have white crystalline deposits and traces of the substrate (clays, sand) on the inside and on the outside of the shells (Fig.3 B). Some are more fragile and have cracks (Fig.3 A), lacunas and orifices (Fig.1 B). The white crystalline deposits (calcium salts) (Fig.2 A-B) were observed using the portable microscope. The specimens and the storage boxes

require cleaning and chemical stabilization. The fragile specimens require consolidation (impregnation).

2. Strombidae indet. – inv. no. 32284 - The specimen is a fossil gastropod shell that originates from Badenian, from Lăpugiu de Sus, Hunedoara County. A series of dimensional measurements were performed: length 100 mm, maximum width 62 mm, weight 128.46 g.

Conservation status and proposals: The specimen has a non-specific brown color, adherent material spots with a relatively rough consistency, dust deposits, substrate traces, missing parts of the outer layer of the shell and fragility, numerous orifices due to some marine organisms (Fig.5 A-B). The brown color may be due to exposure of the specimen to high temperatures (burning). The exemplar requires cleaning.

3. Strombidae (cf. *Persististrombus* sp.) – inv. no. 40844 - The shell is collected from Lăpugiu de Sus, Hunedoara County. It has a robust and smooth appearance (Harzhauser, Kronenberg 2013, 794), with the following dimensions: 90 mm long, 70 mm wide, 158.52 g weight. The two last anfracts display spines; on the last anfract five spines are larger and longer in size (the species is characterized by six spines on the two last anfracts; in this case there is missing spine on the last anfract).

Conservation status and proposals: The specimen has substrate deposits, a biological attack area (fungal mycelium) (Fig.7 A), missing parts of the shell and of the spines of the anfracts (the siphonal canal is incomplete, and a spine of the last anfract is missing) (Fig.7 B). The specimen requires cleaning.

4. Conidae (3 species) – inv. no. 41.426-41.429, 41.430-41.431, 41501-41.503 - Nine shells are stored in the collection, arranged in 3 boxes made of cardboard or wood and paper (dimensions 35x50 mm). Specimens originate from Badenian, Lăpugiu de Sus Hunedoara County, are preserved by fossilization and are small in size (length 15-33 mm, width 10-17 mm, weight 0.65-3.36 g), and have a white-gray color.

Conservation status and proposals: The specimens have white-crystalline deposits (Fig.9 A-B), some have micro fissures and missing parts. Specimens and boxes require cleaning (Fig.12 A), the fragile ones require consolidation.

5. *Callista italica* – inv. no. 32289 - Only the left valve is kept in the collection. It has an oval, relatively asymmetrical shape, the impressions of the adductor muscles (anterior and posterior) are observed inside. The specimen originates from Bade-

nian, collected from Panc, Hunedoara County and has a diameter of 105 mm, weighing 164.77 g.

Conservation status and proposals: The specimen is fragmented; parts of the valve and the inner layer are missing (Fig. 13 and 14 A). It also has substrate deposits (clays containing other very small molluscs. The specimen requires dry and wet cleaning, fixing of the fragments, completion of the gaps and chromatic integration.

6. *Gisortia sp.* – inv. no. 41.878 - The specimen is preserved as an internal mold of the shell. It originates from the Eocene and it was collected from Turnu-Roşu (Porceşti), Sibiu County. A label with the collection data is accompanying the sample: "Porceşti, July 29, 1957, 8<sup>th</sup> place, Doltu". The dimensions are: 7.3 cm in length, 8 cm maximum width, and it has a weight of 441.56 g.

Conservation status and proposals: The specimen has soil deposits, yellow clay and a general dark brown color (the color of the substrate origin). The surface has numerous cracks and holes covered with traces of substrate, deformations and missing parts (Fig.15 A-B). It requires cleaning to remove the traces of soil.

Malacological Collection

7. Esperiana esperi – inv. no. 205.243-205.260 -There are 18 specimens of extant gastropod shells belonging to the Order Caenogastropoda, Family Melanopsidae. The specimens kept in storage come from Sasca Montană, Caraş-Severin County. The shells are small in size (17-25 mm long, 7-8 mm wide) and placed in a cardboard box. The specimens have a brownish-black color, elongated conical shaped, are dextral and have 7 smooth anfracts.

Conservation status and proposals: The specimens have mold-like deposits of a white-cream color. The box of the specimens has dust deposits, and traces of insects feeding. Bodies of dead insects are present in some of the shells (Dermestidae) (Fig.18 A). A microscopic examination was realized in order to determine the kind of the biological attack (fungal) (Fig.17 A). The specimens require cleaning and disinfection to stop the fungal attack and removing the degradations produced. The cardboard box requires cleaning.

8. *Cerithium* sp. – inv. no. 207.546 - There are 28 specimens (shells and soft bodies) preserved as liquid preparation (in formaldehyde). They are kept in a small glass jar (3.5 cm in diameter), with a glass cap. The pieces were collected from Palestine (Israel, Migdal-Tiberias and Jericho) in 1928, July 8-21, *legit* A. Muller. The label is stored inside the jar.

Conservation status and proposals: Dirt deposits are visible on the outside of the jar, the seal of the jar is damaged and no longer performs the sealing function, the label is partially deteriorated, fragmented and shows deposits as a result of its reaction with the preservative solution. The liquid in the jar evaporated completely and the parts are dry. As a result, the shells have deposits due to the formaldehyde evaporation (Fig.19 A). The container and the label require cleaning and drying. The samples must be hydrated in alcohol-glycerin solution, then the preservative liquid must be replaced. 9. Clausiliidae (4 species) - Strigillaria cana - inv. no 205.618-205.655; Vestia elata - inv. no. 206.136-206.146; Balea stabilis - inv. no. 205.658-205.681; Clausilia sp. - inv. no. 205.111-205.143, 205.205-205.242, 205.144-205.204 There are 205 specimens (Fig.20 A-C, Fig.21 A-C) of actual pulmonate gastropods belonging to the Order Stylommatophora, Family Clausiliidae, collected from Prahova (Buşteni) and Sibiu (Păltiniş) counties. The shells are small and placed in 6 boxes with different sizes. The specimens are brown, gray, cylindrical shapes, sinistral and with 10-12 anfracts. The original labels are preserved containing the names of the specimens and the name / signature of the person who collected them (legit) (Fig.21 A). The labels are fragile due to the passage of time, internal degradation of the paper, oscillations of the temperature and humidity and manipulation.

Conservation status and proposals: The specimens have mold-like deposits of a white-cream color (Fig.22 A). Some, traces of insects feeding (Fig.24 A) and bodies of insects can be seen in the boxes (Fig.24 A). Dust deposits are also present (Fig.24 B). In the past, the specimens were preserved on cotton-wool in boxes (Fig.25 A-C). Cotton-wool could be a source of food for the pests of the collections (Fig.22 B). A microscopic examination was performed to determine the biological attack (fungal) (Fig.23 A-C). The specimens require cleansing to stop the fungal attack, removing the degradations produced. Boxes and labels require cleaning.

10. *Mya arenaria* – inv. no. 207.580 - Four small specimens are kept in a cylindrical glass container with a glass cap, 12 cm high and 6 cm in diameter. The shells together with the animal's soft body are preserved in formaldehyde solution. On the lid of the jar is the label with the inscription of the Socie-ty (Siebenbürgische Verein für Naturwissenschaften zu Hermannstadt) and collection data: "*Mya arenaria*, Nordsee-Neuwerk, W. Korte (Palmhert)". The valves have 3-5 cm long and have a

matte white-yellowish color (the color may be due to the substrate from which the specimens were collected or due to the preservation method). Their shape is oval, rounded to the edges and slightly directed towards the rear end, growth is concentric, and the umbo is small, located at the middle of the shell (Skolka, Gomoiu 2004, 64). At the rear end we can see a cylindrical siphon tube (0.5-2 cm) (this structure is oval in cross-section and contains two tubes through which the animal absorbs and removes water).

Conservation status and proposals: The label of the preparation is slightly degraded, with corrugations and reddish spots (Fig.28 C). It is recommended to be sealed and to be kept on the jar lid. The container has deposits of dust, excess wax around the lid, and a deteriorated seal. Specimens are relatively dehydrated; the liquid is low and deposits due to formaldehyde are formed (Fig.28 A); some shells have missing parts (scraped edges). The specimens require moisturizing, replacing of the preservative fluid and sealing of the container.

11. Sepia orbignyana – inv. no. 207.589 - The specimen, preserved as wet preparation, is placed on a glass plate, bonded with cotton yarn and is kept in a glass jar with a glass cap. The jar is sealed with a tough wax. The small-sized sepia has 8.5 cm long, oval body and the bone is oval in shape with a long thorn at the base. Around the mouth has two relatively long arms, surrounded by several short tentacles, which are tapering towards the top. The label is written with black ink and has information about the preparation and origin: "Sepia orbygny Lam., Adria, F.v. Saschsenheim "- the species originates from the Adriatic Sea, legit Saschsenheim.

Conservation status and proposals: The liquid is completely dried; the jar is broken at the base and the label shows dirt. The specimen is dehydrated, mummified tissue is observed due to the loss of water from the body, it has deposits due to the preservative liquid (formaldehyde) (Fig.29 A). A tentacle is loosed and dropped on the bottom of the jar. The recommendations were to replace the jar, to wash and hydrate the specimen. Additional recommendations are: to replace the cotton with thin nylon thread, to fix the broken tentacle, replace the preservative liquid with alcohol and to seal the jar. The old label needs to be recovered and stored on the jar lid.

# **Results and discussion**

The restorer writes his remarks in a restoration diary during the interventions for the restoration. At the end, a Restoration Sheet (Fişă de Restaurare) is completed, where these details are written, as well as recommendations regarding the conditions of keeping the specimen in the storage area. We will briefly describe the interventions on the specimens and notable details or problems encountered during work. The specimens are listed in the same as above order:

1. Cypraeidae (2 species) – inv. no. 40.808-40.818, 40.829-40.842, 41.284-41.286 (Fig.4 A-C). The deterioration was in an early stage. Removal of the salts deposited on the surface of the specimens was carried out. The specimens were individually cleaned with a brush, washed with 1% soap solution, neutralized and dried. Specimens that had cracks and orifices, that could evolve over time and fragment the shells, were introduced in a bath of vinyl polyacetate solution. The cardboard boxes were brushed and kept in a medium with 45% relative air humidity (for drying and stabilization of the constituent material).

2. Strombidae – inv. no. 32284. The specimen was mechanically cleaned with a soft brush and 1% soap solution to remove impurities; the scalpel was used to mechanically clean adhering deposits (Fig.6 A-B). The specimen was then dried.

3. Strombidae (cf. *Persististrombus* sp.) – inv. no. 40844. The specimen was washed with a solution 1% of distilled water and soap. The mold inside the shell was disinfected by inserting the specimen into successive alcohol baths and mechanically removing deposits from accessible areas. The substrate deposits were mechanically removed using the scalpel. An acetone bath was used for degreasing, and then the specimen was dried at room temperature (Fig.8).

4. Conidae (3 species) – inv. no. 41.426-41.429, 41.430-41.431, 41501-41.503. Boxes were cleaned with a brush. The specimens were washed with 1% soap solution, rinsed, then placed in an alcohol bath to stabilize and dry (Fig.11 A). Those requiring impregnation were introduced into the vinyl polyacetate solution. After dry cleaning, the substrate of origin was stored in a plastic container in the box (small shells and other microfossil fragments were observed) (Fig.11 B, Fig.12 B).

5. *Callista italica* – inv. no. 32289. The deposits of clay inside the valve have been removed with the Dremel, and then have been brushed and cleaned with the scalpel. The fragments were afterwards wet cleaned (degreased) and dried. The cleaning operation was then followed by the matching of the fragments that were glued together with a vinyl polyacetate adhesive. The gaps were filled with synthetic clay (Fig.14 B) and chromatically integrated (Fig.13 B).

6. *Gisortia sp.* – inv. no. 41.878. The specimen was mechanically cleaned of coarse deposits, washed with a fine brush with 1% water and soap to remove finer deposits of substrate, degreasing. Then it was rinsed with distilled water for neutralization. For drying and stabilization an acetone bath (immersion) was used. The specimen was placed on filter paper for drying (Fig.16 A-B).

7. Esperiana esperi – inv. no. 205.243-205.260. The specimens were placed in an alcoholic bath (Fig.17 B) for a few minutes, then transferred onto an absorbent paper until dry. The cardboard box was cleaned with the brush and the vacuum cleaner, and then stored in a dry place. After drying, specimens have been transferred back into the box (Fig.18 B).

8. *Cerithium* sp. – inv. no. 207.546. The specimens were placed in a container with distilled water, alcohol and glycerin. An alcoholic solution would be added later in order to hydrate and preserve the specimens until a concentration of 70% was reached. The label from the jar was washed and dried. The wax and other residues were cleaned from the jar and the lid and then dried. After a while, the specimens were introduced in the original container and the preservative (alcohol) was added. The jar was sealed (Fig.19 B). The label was sealed in cellophane foil on the top of the jar.

9. Clausiliidae – *Strigillaria cana* – inv. no. 205.618-205.655; *Vestia elata* – inv. no. 206.136-206.146; *Balea stabilis* – inv. no. 205.658-205.681; *Clausilia sp.* – inv. no. 205.111-205.143, 205.205-205.242, 205.144-205.204. Specimens were immersed in alcohol solution and dried on filter paper. Labels were cleaned with a fine brush, eraser dust was used to remove stains on the paper; also, their storage boxes have been cleaned (Fig.26 A-C, Fig.27 A-C). The specimens were placed in the boxes, the labels attached.

10. *Mya arenaria* – inv. no. 207.580. The label on the jar lid was wrapped in cellophane foil. The specimens were transferred to a Petri dish, washed with 1% soap solution and then introduced into a solution for hydration, while increasing the alcohol concentration to the desired level (Fig.28 B). The jar and the lid were cleaned of the wax and the other deposits. The specimens were placed in the jar and preservative liquid was added. The container was sealed (Fig.28 D). The label was kept sealed on the lid.

11. *Sepia orbignyana* – inv. no. 207.589. The support plate of the specimen was removed with the specimen and the fragments recovered from the old jar. The label from the outside of the jar was also recovered. A new jar was chosen according to the

specimen dimensions. The support plate with specimen was gently washed in distilled water and 1% soap to remove the deposits without affecting the integrity of the specimen. Also, the glass plate was washed. The loose fragment was re-attached to the specimen with a 0.5 mm nylon thread. The specimen was re-hydrated in alcohol-glycerin solution. After a period, the solution was replaced with a solution of ethyl alcohol (Fig.29 B). The jar was sealed and the label was kept wrapped in cellophane on the jar lid.

The type of preservative solution of the specimens in liquid was changed because the mollusc shells are composed of calcium carbonate which is degradable in acid environment. Formaldehyde solution for preserving specimens has pH value around 4, so it's acid. After the formaldehyde has been washed thoroughly, the liquid was replaced with an ethyl alcohol solution.

A major threat to carbonated fossils that causes irreversible damage is the "Byne" Disease, this is the case case for the Cypraeidae and Conidae mentioned above. The first mention of this "disease" occurs in 1883 and is described as a" chalky appearance" on shells in collections (Cavallari et al. 2014, 36). George Byne assumed in 1899 that the disease was bacterial in origin and transmitted from one shell to another. Tennent and Baird elucidated the cause and the physical-chemical mechanisms of its action in 1985. Calcium carbonate in the shells deteriorates rapidly in an acid environment, so there is a problem related to the presence of organic vapors (volatile acids) in collections. Wood, lacquer, paper, cardboard, resins and other storage materials release acetic and formic acids. At a high relative humidity and inadequate temperature, the acids react with the carbonate of the shells and produce salts (calcium acetate) (Fig.10) and carbon dioxide. The methods of mitigation are: a relative humidity around 45-50%, a temperature between 16 and 21°C and the use metal cabinets polyethylene bags for specimen isolation (an effective solution because it isolates the sample from acid gases) and neutral pH paper labels (Walker et al. 1999).

Applying protective films is questionable - often solutions based on shellac, nitrocellulose, polyvi-

nyl alcohol could shrink, gather dust, obscure the structure of the surface, and can cause damage in time. Some of the specimens restored were fragile and needed consolidation, so we choose to use only a low concentration solution based on vinyl polyacetate.

# Conclusions

The fossil specimens preserved by mineralization and the recent ones are preserved by various techniques (boiling and drying, drying and preservatives liquids - alcohol, formaldehyde), thus needing different storage conditions (different types of furniture, microclimate). Some damage can be irreversible, but there are ways to avoid this.

Restoration process is of course influenced by the deterioration factors. These main factors are: temperature and humidity (the two are closely related and the microclimatic stability is pursued); sources of lighting (fading of the coloration and activation of internal degradation processes); radiation; human pollution (gases, emissions, acid vapors); biological factors such as micromycetes which decompose organic material, insects; the human produced physical-mechanical effects and functional wear (forced handling, inappropriate transport, study, movement of the object) and internal factors determined by substances contained or introduced in the specimens processing (chemical instability) (Moldoveanu 1999).

The large spectrum of the physical-chemical properties of the materials of the objects chosen in the study is reflected in in a large diversity of reactions of the specimens to the action of the degradation factors. We observe a wide range of processes: physical - deformations, cracks (Cypraeidae, Gisortia sp., Strombidae), biological attacks - insects, molds (Clausiliidae, Melanopsidae, cf. Persististrombus sp.), chemical deposition of material (Gisortia sp.), dehydration of tissues in the liquid preparations (Cerithium sp., Mya sp., Sepia sp.), decomposition, "Byne degradation" (Cypraeidae, Conidae).) In general, for the natural history specimens the main mechanism of degradation is chemical. An important aspect for preventing degradation and protecting heritage is knowledge and attention given to each item.

## REFERENCES

Anastasiu et al. 2007	Anastasiu Nicolae, Grigorescu Dan, Mutihac Vasile, Popescu Gheor- ghe, <i>Dicționar de geologie</i> , Editura Didactică și Pedagogică, București (2007), 348 p.
Catalog Drumul Colecțiilor 2014	Catalog de expoziție, Muzeul de Istorie Naturală, <i>Traseul cultural</i> <i>Drumul Colecțiilor Muzeului de Istorie Natural</i> , Muzeul Național Brukenthal, Sibiu (2014), 94 p.
Cavallari et al. 2014	Cavallari Caracanhas Daniel, Brincalepe Rodrigo, Salvador Da Cunha, Bruno Rodrigues, <i>Danger to malacological Collections: Bynesian De-</i> <i>cay and Pyrite Decay</i> . Collection Forum (2014), 28 (1-2), p. 35–46.
Corocleanu 1998	Corocleanu Ileana, <i>Colecția Malacologică</i> , Muzeul Brukenthal - Studii și comunicări – Științe naturale, Sibiu (1998), p. 165-171.
Ciobanu 1998	Ciobanu Rodica, <i>Considerații asupra colecțiilor paleontologice ale Muzeului de Istorie Naturală din Sibiu</i> , Muzeul Brukenthal - Studii și comunicări – Științe naturale, Sibiu (1998), p. 55-66.
Harzhauser, Kronenberg 2013	Harzhauser Mathias, Kronenberg Gijs, <i>The Neogene strombid gastro- pod Persististrombus in the Paratethys Sea</i> . Acta Palaeontologica Po- lonica (2013), 58 (4), p. 785–802.
Moldoveanu 1999	Moldoveanu Aurel, Conservarea preventivă a bunurilor culturale, București (1999), 416 p.
Neugeboren 1854	Neugeboren Johann Ludwig, <i>Notiz über das erst kürzlich entdeckte</i> <i>Petrefactenllager bei dem Dorfe Pánk unweit Ober-Lapugy</i> , In Verhandlungen und Mittenlungen des Siebenburghisen Verein für Naturwissenschaften zu Hermannstadt Vol. 5, Sibiu (1854), p. 194-197
Skolka, Gomoiu 2004	Skolka Marius, Gomoiu Marian-Traian, <i>Specii invazive în Marea Neagră</i> , Constanța (2004), 179 p.
Walker et al. 1999	Walker Annette, Fitton Mike, Vane-Wright Richard Irwin, Carter Dan- iel, <i>Insects and other invertebrates</i> . In: Carter, D. & Walker, A. (eds). Chapter 2: <i>Care and Conservation of Natural History Collections</i> . Ox- ford: Butterwoth Heinemann (1999), p. 37 - 60.

## LIST OF ILLUSTRATIONS

- 1. Inv. no. 40.808-40.818. Aspect before restoration: A, B Crystalline deposits, traces of clayey / sandy substrate, holes, cracks in shells.
- 2. Inv. no. 40.808-40.818. Detail, affected specimen (Byne Disease): A, B Dorsal-lateral view.
- 3. Details before restoration: A Inv. no. 40.829-40.842, B Inv. no. 41.284-41.286.
- 4. Aspect after restoration: A Inv. no. 40.808-40.818, B Inv. no. 40.829-40.842, C Inv. no. 41.284-41.286.
- 5. Inv. no. 32.284. A, B Details before restoration.
- 6. Inv. no. 32.284. A, B Aspect after restoration.
- 7. Inv. no. 40.844. A Detail of biological degradation inside the shell, crack on the right, B Overview before restoration.
- 8. Inv. no. 40.844. Overview after restoration.
- 9. Inv. no. 41.426-41.429. A, B White crystalline deposits (Byne Disease).
- 10. Inv. no. 41.426-41.429. Microscopic detail Byne Disease: calcium acetate.
- 11. After restoration: A Inv. no. 41.426-41.429. B Inv. no. 41.430-41.431.
- 12. Inv. no. 41.501-41.503 A Aspect before restoration, B After restoration, the removed substrate is stored in a container.
- 13. Inv. no. 32.289. A Aspect before restoration, B After restoration.
- 14. Inv. no. 32.289. A, B Appearance during restoration interventions (fixing fragments, filling the lacunas).
- 15. Inv. no. 41.878. A, B Aspects before restoration.
- 16. Inv. no. 41.878. A, B Aspect after restoration.
- 17. Inv. no. 205.243-205.260. A Detail of biological degradation, B Disinfection of specimens
- 18. Inv. no. 205.243-205.260. A Appearance before restoration, B After restoration
- 19. Inv. no. 207.546. A Overview before restoration, B After restoration
- 20. Aspect before restoration: A Inv. no. 205.111-205.143, B Inv. no.205.144-205.204, C Inv. no. 205.205-205.242
- 21. Overview before restoration: A Inv. no. 205.618-205.655, B Inv. no. 205.658-205.681, C Inv. no. 206.136-206.146
- 22. Details before restoration: A Inv. no. 205.111-205.143 Mold, B Inv. no. 205.144-205.204. Mold, body of insect in the shells
- 23. Microscopic details before restoration: A, B Inv. no. 205.205-205.242. Molds, C Inv. no. 205.618-205.655. Appearance changes.
- 24. Inv. no. 205.658-205.681. Microscopic details: A The box and the label: bodies of pest insects, B Deposits of dust, mold.
- 25. Inv. no. 206.136-206.146. Microscopic details: A Blurred color, mold, B Traces of insects feeding, C - Dust deposits, mycelium
- 26. Overview after restoration: A Inv. no. 205.618-205.655, B Inv. no. 205.658-205.681, C Inv. no. 206.136-206.146.
- 27. Overview after restoration: A Inv. no. 205.111-205.143, B Inv. no. 205.205-205.242, C Inv. no. 205.144-205.204
- 28. Inv. no. 207.580. A Overview before restoration, B Appearance after hydration of specimens, C Aspect of the label, D Overview after restoration
- 29. Inv. no. 207.589. A Before restoration, B Overview after restoration

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- 1. Nr. inv. 40.808-40.818. Aspect înainte de restaurare: A, B Depuneri cristaline, substrat argilos / nisipos, orificii, fisuri în cochilii.
- 2. Nr. inv. 40.808-40.818. Detaliu, specimen afectat (degradarea Byne): A, B Vedere dorso-laterală.
- 3. Detaliu înainte de restaurare: A Nr. inv. 40.829-40.842, B Nr. inv. 41.284-41.286.
- 4. Aspect după restaurare: A Nr. inv. 40.808-40.818, B Nr. inv. 40.829-40.842, C Nr. inv. 41.284-41.286.
- 5. Nr. inv. 32.284. A, B Detaliu înainte de restaurare.
- 6. Nr. inv. 32.284. A, B Aspect după restaurare.
- 7. Nr. inv. 40.844. A Detaliu degradare biologică în interiorul cochiliei, fisură în partea dreaptă, B Aspect înainte de restaurare.
- 8. Nr. inv. 40.844. Aspect după restaurare:
- 9. Nr. inv. 41.426-41.429. A, B Depuneri albe, cristaline (degradarea Byne).
- 10. Nr. inv. 41.426-41.429. Detaliu microscopic Byne Disease: acetat de calciu.
- 11. După restaurare: A Nr. inv. 41.426-41.429. B Nr. inv. 41.430-41.431.
- 12. Nr. inv. 41.501-41.503 A Aspect înainte de restaurare, B După restaurare, substratul curățat se păstrează într-un recipient
- 13. Nr. inv. 32.289. A Aspect înainte de restaurare, B După restaurare.
- 14. Nr. inv. 32.289. A, B Aspect din timpul intervențiilor de restaurare (fixarea fragmentelor, completarea lacunelor).
- 15. Nr. inv. 41.878. A, B Aspecte înainte de restaurare.
- 16. Nr. inv. 41.878. A, B Aspect după restaurare.
- 17. Nr. inv. 205.243-205.260. A Detaliu degradare biologică, B Dezinfectarea specimenelor.
- 18. Nr. inv. 205.243-205.260. A Aspect înainte de restaurare, B După restaurare.
- 19. Nr. inv. 207.546. A Aspect înainte de restaurare, B După restaurare.
- 20. Aspect după restaurare: A Nr. inv. 205.111-205.143, B Nr. inv. 205.144-205.204, C Nr. inv. 205.205-205.242
- 21. Aspect după restaurare: A Nr. inv. 205.618-205.655, B Nr. inv. 205.658-205.681, C Nr. inv. 206.136-206.146
- 22. Detalui înainte de restaurare: A Nr. inv. 205.111-205.143 Mold, B Nr. inv. 205.144-205.204. Mucegai, exuvie de insectă în cochilie
- 23. Detalii microscopice înainte de restaurare: A, B Nr. inv. 205.205-205.242. Mucegaiuri, C Nr. inv. 205.618-205.655. Aspect modificat.
- 24. Nr. inv. 205.658-205.681. Detalii microscopice: A Cutia și eticheta: exuvii de insecte dăunătoare, B - Depuneri de praf, mucegai.
- 25. Nr. inv. 206.136-206.146. Detalii microscopice: A Culoare estompată, mucegai, B Urme ale hrănirii insectelor, C Depuneri de praf, micelii
- 26. Aspect după restaurare: A Nr. inv. 205.618-205.655, B Nr. inv. 205.658-205.681, C Nr. inv. 206.136-206.146.
- 27. Aspect după restaurare: A Nr. inv. 205.111-205.143, B Nr. inv. 205.205-205.242, C Nr. inv. 205.144-205.204
- 28. Nr. inv. 207.580. A Aspect înainte de restaurare, B Aspect după hidratarea specimenelor, C Aspect of the label, D Aspect după restaurare.
- 29. Nr. inv. 207.589. A Înainte de restaurare, B Aspect după restaurare.



1. Inv. no. 40.808-40.818. Aspect before restoration: A, B - Crystalline deposits, traces of clayey/sandy substrate, holes, cracks in shells.



3. Details before restoration: A - Inv. no. 40.829-40.842, B - Inv. no. 41.284-41.286.

B



4. Aspect after restoration: A - Inv. no. 40.808-40.818, B - Inv. no. 40.829-40.842, C - Inv. no. 41.284-41.286.





5. Inv. no. 32.284. A, B - Details before restoration.





6. Inv. no. 32.284. A, B - Aspect after restoration.



7. Inv. no. 40.844. A - Detail of biological degradation inside the shell, crack on the right, B - Overview before restoration.



8. Inv. no. 40.844. Overview after restoration.



9. Inv. no. 41.426-41.429. A, B - White crystalline deposits (Byne Disease).



10. Inv. no. 41.426-41.429. Microscopic detail - Byne Disease: calcium acetate.



11. After restoration: A - Inv. no. 41.426-41.429. B - Inv. no. 41.430-41.431.



12. Inv. no. 41.501-41.503 A - Aspect before restoration, B - After restoration.



13. Inv. no. 32.289. A - Aspect before restoration, B - After restoration.



14. Inv. no. 32.289. A, B - Appearance during restoration interventions (fixing fragments, filling the lacunas).



15. Inv. no. 41.878. A, B - Aspects before restoration.





18. Inv. no. 205.243-205.260. A - Appearance before restoration, B - After restoration





20. Aspect before restoration: A - Inv. no. 205.111-205.143, B - Inv. no.205.144-205.204, C - Inv. no. 205.205-205.242



21. Overview before restoration: A - Inv. no. 205.618-205.655, B - Inv. no. 205.658-205.681, C - Inv. no. 206.136-206.146



22. Details before restoration: A - Inv. no. 205.111-205.143 - Mold, B - Inv. no. 205.144-205.204. Mold, body of insect in the shells



23. Microscopic details before restoration: A, B - Inv. no. 205.205-205.242. Molds, C - Inv. no. 205.618-205.655. Appearance changes.



24. Inv. no. 205.658-205.681. Microscopic details: A - The box and the label: bodies of insects pests, B - Deposits of dust, mold.



25. Inv. no. 206.136-206.146. Microscopic details: A - Blurred color, mold, B - Traces of insects feeding, C - Dust deposits, mycelium



26. Overview after restoration: A - Inv. no. 205.618-205.655, B - Inv. no. 205.658-205.681, C - Inv. no. 206.136-206.146.



27. Overview after restoration: A - Inv. no. 205.111-205.143, B - Inv. no. 205.205-205.242, C - Inv. no. 205.144-205.204



28. Inv. no. 207.580. A - Overview before restoration, B - Appearance after hydratation of specimens, C - Aspect of the label, D - Overview after restoration



29. Inv. no. 207.589. A - Before restoration, B - Overview after restoration

# THE CONSERVATION OF THE WOODEN CEILING FROM EVANGELIC CHURCH FROM VULCAN, MUREŞ COUNTY

## Cristina Maria DĂNEASĂ\* Andrea SÎRBU\*\*

**Abstract:** This case study refers to the wooden ceiling from the Evangelic Church from Vulcan, Mureş County. This ceiling was dismounted and stored in the south gallery of the Evangelic Church from Cristian, Sibiu County. The fragments of this ceiling were stored improperly, so we proposed to research, to conserve and to rearrange the ceiling. In this article we detailed the steps of these interventions: documentation, organization of the workshop, inventory of all the fragments, suitable storage according to the typo-sizing, obtaining the results of the inventory, registration of state of conservation, conclusions.

Keywords: painted wooden ceiling, distemper paint, conservation, storage, research, state of conservation

**Rezumat:** Acest studiu de caz se referă la tavanul casetat din lemn de la Biserica Evanghelică din satul Vulcan, județul Mureș. Tavanul a fost demontat și depozitat în galeria de pe latura sudică a Bisericii Evanghelice din Cristian, județul Sibiu. Fragmentele de tavan casetat au fost depozitate inadecvat, astfel ne-am decis să propunem realizarea unei reactualizări a datelor despre tavan, să conservăm și să rearanjăm fragmentele. În acest articol vom detalia etapele acestei intervenții: documentarea, organizarea unui workshop, inventarierea fragmentelor, depozitarea adecvată, prelucrarea datelor ce oferă o imagine de ansamblu asupra inventarierii dar și asupra stării de conservare, concluzii.

*Cuvinte-cheie:* tavan casetat din lemn, pictat, tempera slabă, conservare, cercetare, stare de conservare

The Evangelical Church from Vulcan was built in the 15<sup>th</sup> century. It's plane have in east part the polygonal altar (with five sides), a central rectangular nave and the narthex under the massive tower from 1528 (Fabini 2002, 819). Constructive interventions have been made during the 17<sup>th</sup> century. In 1682 was mounted the wooden painted ceiling over the nave and the altar (Burnichioiu 2009, I, 234).

The painted ceiling is formed from sixty-three cassettes over the nave and twenty three cassettes over the altar. In east part of the nave are seven cassettes with inscriptions with names of donators, text and the year that is mentioned -1682. The painter used floral motives to decorate the other cassettes. We can observe two stylized animals on the center of nave ceiling.

For better results we used the photographic archive and descriptions from Hermann Fabini and Mihály Ferenc. The fir boards was joined together to form a surface for three or four cassettes in line, which was painted in distemper paint technique (Biological analysis was made by Associate professor Livia Bucşa).

## Investigation

For a better understanding of the painted ceiling from Evanghelical Church from Vulcan, we tried to obtain many data from scientific investigation. Were made many pictures from different angles to ansamble and details, pictures with digital microscope with magnification up to 200X (Fig. 2 a,b; 4; 5; 6; 8).

For the determination of the wooden spices used were made biological identification on some samples from the back of planks. The fir wood was used to build the ceiling from this church (Bucşa, biological analysis) (Fig. 7 a, b).

Many mesurments of wood humidity were made to observ the state of planks before and after one year

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from restorage of fragments.

The X ray radiography offered some information about the nature of colors and primer. In this case the painted layers didn't offer a signal, so the painter used organic pigments, dye or soil/acre powders. There are visible all degradation of the wood (Fig. 9 a, b).

For a better observation of the paint and draws we made IR and UV pictures. These were useful for digital chromatic integration of four cassetes (Fig. 10 a, b; 11 a, b).

To observe the nature of primer were made some test with clorhidric acid. The base for primer were calcium carbonate, mixed with a proteine binder (like animal glue) (Fig. 12 a, b).

The painted layers were applied differently on the surface, so it was necessary to do some stratigraphycal analysis to observ the thickness of the layers and the order of their overlapping. In all samples exist arsenic, that can confirm the supposition of the existance of this mineral on the entire painted surface. Lime, organic blue and some pigments based on iron were used. The primer is possible based on calcium carbonate (Fig. 13 a, b).

There were made XRF analysis to observ some components of primer and the nature of sensitive pigments (Niculescu, XRF analysis) (Fig. 14 a, b, c).

# State of conservation

All fragments of the painted ceiling was temporary stored on two modules in the southern gallery of the Evangelical Church from Cristian, Sibiu County from 2002 (Fig. 2 a, b). From administrative reasons there were no necessary found and no specialized staff to handle this valuable patrimony recovered.

The natural ventilation was stopped by the cardboard used to separate the ceiling planks. In this situation the wood humidity was high at the base of module with planks (28-34%), dropping to the top where optimal values were recorded (15-20%) (Auner, Bucşa, Ciocşan 2005, 68). These values can be a problem for wooden objects, but in this case we registered few xylophages' hole and no active attack in middle and upper part of module. After observing the XRF analysis we concluded that the high concentration of arsenic in painted layers offers a good protection for biological decay (Niculescu, XRF analysis). Marginal areas of planks stored on lower part of module, are fragile because here the biological decay was active. Wood of planks presents modifications on tangential and radial directions (curds, shrinkage and deformations), longitudinal cracks and resizing of fragments. Four boards is presenting broken fragments and all wood profile used for fixing the planks weren't stored in the gallery of the church. We observed that there are missing approximately twenty five percent's from all ceiling.

All surfaces are covered with dust, adherent deposits, spots, halos and residual deposits of protein nature.

A big problem of conservation is the photo.chemical modification of colors which are sensitive. In this case the draw and some inscriptions are difficult to see.

The painted layers are fragile and with cracks, especially in those areas where the color is applied in a thicker layer. We can observe that the painted layers are lost differentiated from the ceiling over nave and altar: about twenty percent's from nave and ten percent's from altar.

# Inventory of the cased ceiling

The priorities for this ceiling were to inventory, to conserve and to store all fragments preserved.

It was necessary to make more visits to the church from Cristian together with the architect curator of the collection Heidrun König (Superior Evangelic Consistory from Sibiu).

For a better inventory we used old studies about this ceiling (from Mihály Ferenc and Hermann Fabini). We made a visit to Vulcan Evangelical Church to know the current state of conservation of the monument. After that was organized a workshop with voluntary students from Department of History, Heritage and Protestant Theology, Socio-Human Sciences Faculty, Lucian Blaga University from Sibiu. The coordinator was lect. Univ. dr. Cristina Maria Dăneasă and like participants were voluntaries: Andrea Sîrbu, Maria Elisabeta Toader, Katharina Lindner-Barth, László György. There were prepared all protection equipment and necessary machines. The activity was organized on two teams: one to lower the fragments of the gallery into the nave and another one to move and arrange the fragments in the choir. All fragments were grouped into cassettes after dimensions and decor. The cassettes were photographed and assembled at the altar on the church plane, like a surveying.

The back of each board was de-dusted with natural brushes.

Our action ended with adequate storage of each plank in the cleaned gallery.

# Minimal intervention for conservation of painted ceiling

For an adequate storage with a minimal investment we made some proposal and was selected a similar storage on two module but with enough distance between planks.

The space where the planks were situated was cleaned. Three planks were placed on each level with a little distance between them. Every three plank forms a cassette, so the pieces can be researched anytime without the need to repeat the assembling (the way it was needed in this action, which implicated the supplementary manipulation). On each level were placed timbers with 2,5 centimeters thickness on the unpainted zones, so the vertical pushing force to be on the approximate same zone (the timbers was placed approximately on the same vertical line on the unpainted zones, where the original profiles were mounted). The timbers do not overtake the width of a level. The free spaces formed between the planks assure the necessary ventilation, keeping the optimal level of humidity in wood, removing the direct touch of the painted surface with any other surface. There have been formed a free hallway near every module for access and to assure the uniform natural ventilation. At the beginning the modules were supported by the balustrade of the gallery. The first module contains long planks with variable dimensions between 300 and 200 cm and the second module contains shorter planks with dimensions between 250 and 110 cm. The planks were not covered because it is necessary to buy a natural textile which assures the ventilation between the planks. We recommend protecting the planks from dust.

The storage action began with the cleaning of the space (with broom, vacuum cleaner, swab and arranging the other pieces around). The initial materials for storage were selected: the cardboard was eliminated and the good quality timbers were selected and used. The new and the old timbers were cut to dimensions to put between the planks. Around were diverse materials stored inadequately – textile materials used for packing, cellulosic materials, cardboards, etc. these were grouped, cleaned and stored separately.

After the preparation and the cleaning of the space the planks were climbed up carefully, one by one. The planks were positioned on the timbers according to the typo-sizing: the longer ones down and the shorter ones above. The planks were positioned in complete repose and stability. Between the planks were positioned the cut timbers only on the unpainted zones where were originally the profiles. The modules were tagged with the dates about the origin of the piece, which were positioned on the unpainted zones, easily visible.

# Conclusion

The painted ceiling needs restoration interventions for its conservation for a long time. The study about the pieces stored at Cristian aren't finished, so, we hope that the research to be made to complete our preliminary data. One of our proposal concerns to remounting of the ceiling back *in situ*, after church restoration, because in present the Saxon community can take care of this monument.

## REFERENCES

Fabini 2002	Fabini Hermann Atlas der siebenbürgisch-sächsischen Kirchenburgen und Dorfkirchen, Sibiu, 2002
Burnichioiu 2009	Ileana Burnichioiu <i>Biserici parohiale și capele private în comitatele</i> <i>Alba și Hunedoara (1200-1550)</i> , teză de doctorat, Universitatea Națională de Arte București, vol. I, 2009
Auner, Bucșa, Ciocșan 2005	Niels Auner, Corneliu Bucșa, Livia Bucșa, Octavian Ciocșan Tehno- logia consolidării, restaurării și protecției împotriva biodegradării structurilor de lemn din monumente istorice, Sibiu, 2005
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- 20. Tăierea laților la dimensiune
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- 22. a, b. Aranjarea finală a fragmentelor de tavan casetat
- 23. Igienizarea spațiului înainte și după intervenție
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1. The actual church east side



2. a, b. The painted wooden ceiling stored on the south side of the gallery



3. a, b, c. The painted layers



4. Deposits of protein residuals

## 5. Exfoliation





7. a, b. Image biological investigations



8. Product of corrosion



9. a, b. Comparison between the image realized with X-Ray and image in natural light



10. a, b. Images realized with IR light



11. a, b. Images realized with UV light



12. a, b. Images primer analyzes



13. a, b. Images stratigraphical analyzes



b. R66/67 Petală floare alb (mare): REZULTAT : Alb de var cu sulfură de arsen



C. R68/69 Petală floare roșu (mare): REZULTAT :Ocru roșu cu sulfură de arsen (posibil realgar)



14. a, b, c. Images XRF analyzes







16. a, b. Lowering the planks



17. Assembling the planks pairs

18. The arranged and assembled



19. Climbing the planks



20. Cutting the timbers to dimensions



21. a, b. Arranging the timbers and planks



22. a, b. The final arrangement of the wooden ceiling fragments



23. Cleaning of the storage space before and after intervention



24. a, b. Ensemble of the painted layer and color loss