Abstracts

Attila L. Tóth
Electron Probe Microanalysis (EPMA) in Restoration Part 2: The X-Ray Measurement and its Interpretation

The SEM is generally considered as a user-friendly, basically qualitative instrument, where the results can be obtained from observation of the surprisingly realistic images. High magnification and good depth of focus are the most important features. On the other hand the SEM provides much more than a simple super magnifying glass. It can be considered as an analytical measuring system (AMS), where localized experiments of electron-solid interaction are made with results interpreted (in most but not all of the cases) as images.

In Part 1, the AMS concept was presented with the excited volume and the most useful analytical signals (backscattered-, secondary electrons, X-rays, their detection and analytical information provided by them) together with the technical realization of imaging in the SEM.

In Part 2 we concentrate to the X-Ray measurement, i.e. the elemental microanalysis (EPMA, microprobe, microsonde). From AMS point of view the X-rays and their detector is nothing more than another output signal from the numerous ones, but historically it is the first really quantitative SEM measurement (from 1948), practically one of the most versatile technique of the chemical microanalysis.

The restorers, interested in local composition of the piece of art, most likely meet a SEM equipped with energy dispersive X-ray spectrometer (SEM-EDS) or its results.

If they can take part in the measurement (what is highly recommended), it is useful to take part in the setting up the strategy and parameters of the measurement, because the knowledge of the sample is important and can improve the results.

On the other hand, if the results are simply presented, or they are read in reports or literature, it is even more important to know the interpretation of the data, and the possible artifacts of the method, in order to avoid the false conclusions.

Some of the artifacts arise during the detection and processing of the X-ray quanta. The escape peak (appearing at energy 1,74 keV less than the real peak) reflects the fact, that in the Si detector Si KA X-rays are excited, which escaping from the detection process decreases the detected energy. (Example of misinterpretation: the escape peak of Cu KA interpreted as Fe KA). In quantitative analysis the programs remove the escape peaks.

The sum peak is generated, if the detector – in high intensity measurements – is unable to resolve two quanta, and gives a peak at double energy. (Example: the sum peak of Al KA interpreted as Ar KA). If the intensity of the electron (and consequently the X-ray) beam is kept below the limit given by the supplier of the EDS, the sum peaks can be avoided.

Spectral contamination can be generated if the backscattered electron beam or the high energy X-rays from the sample reach large area of the sample environment, i.e. the too large holder, or the wall of the SEM chamber. Careful preparation and orientation of the sample, together with collimation of the detector can minimize these effects.

The quantitative EPMA generally requires the analysis of all constituents of a flat, solid conductive specimen with known orientation, which is homogeneous over the excited volume. If rough, porous, stratified, insulating samples are investigated, extreme care has to be taken to the details of direct and indirect generation inside and outside of the excited volume, together with absorption and shadowing.

In the last section, a quantitative analytical measurement is demonstrated step by step, from peak identification through definition of the region of interest until the quantitative data correction. Comparison the goodness of results it can be seen, that due to nonlinearity of correction methods the correct average concentrations can be obtained from averaging the results from individual point analyses instead of exciting inhomogeneous areas, then processing the arising single spectrum.

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Zsuzsanna Mara
Conservation of a 15th–16th century altar-piece titled Mary's Crowning

The 15th–16th century altar-piece is a representative item of the church collection of the Csíki Székely Museum. According to the preserved documents, it got to the museum from the Catholic church of Csíkszentdomokos in Felcsík in the 1950's. The central figure of the panel painting is Mary on the knees in a light-coloured dress of a lilac tint. She turns slightly to the right turning down up her clasped hands. The three young males of identical features, who

embody the Holy Trinity, appear behind her sharing red mantle. They hold various symbolic objects in the hands: a globe, a crown and a sceptre. Six infant angels dressed in yellow hold together the composition in the font. The background is decorated with a golden leaf ornament.

It is not accidental that the technical literature describes it as a matchless work of art since according to art historical investigations, it has only a few or no analogues in the region. It is certainly a piece of art the master of which learned not in this region. According to the stylistic traits, the origin of the painting can be found in Salzburg: the rendering and the pictorial solutions of the details are certain evidences of the profound knowledge of masters of the Southern German territories (circles of Rueland Frueauf Sr and master Grossgmaini). The Szepesváralja altar in the National Gallery of Pozsony shows the greatest similarity with the pattern of the background. The style of this altar can also be attributed to the art of the above-mentioned masters. The painter of the panel panting of Mary's Crowning probably came from the same artistic environment as the Szepesváralja master: the style is generally of a Salzburg character coloured with many individual traits.

The infrared radiation of the picture revealed sketches of the figures of the composition, which the painter applied over the gesso with narrower and wider sweeps of the brush. Smaller and larger discrepancies could be observed between the sketch and the final painting. The lines of the sketch nearly completely disappear at Mary's face, since the pictorial formulation exactly follows the drawing. Only smaller, a couple of millimetres large discrepancies could be observed between the sketch and the painting at the three young men and the angels. The most conspicuous difference appeared in the case of Mary's gesture: in the sketch the hands are raised to prayer, while in the painting they are clasped and turned down. The folds of the dress also changed: they run downs in loose arches until the angels kneeling in the foreground.

After the investigations, the peeling paint layers were consolidated in the lower part of the panel painting. The dirt was wiped off from the surface with a soft brush, while the more persistent, greasy dirt was removed with the alternating application of chemical and mechanical methods. The solvent mixture chosen after cleaning tests (ethyl alcohol, dimethylsulphoxide, linseed oil and ammonium hydroxide) proved useful for wet cleaning. The clotted, greasy and resinous dirt layer on the lower part of the picture softened after repeated chemical treatment and it could be removed with an ophthalmologic scalpel. During cleaning, a thin coating was preserved on the surface of the entire painting. To seal the tiny missing areas of the paint layer, the mixture of 3.5-7% solution of isinglass glue and chalk was used, and the watercolour was applied for retouching mostly with trateggio technique. The replacement of the small wear did not necessary need tratteggio technique: it was the size of the missing area that determined the technique of completion. The large missing area of the paint layer in the lower part of the painting was not replaced similarly to the plastic injuries of the support because the missing areas do not disturb the compositional unity of the painting.

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Petronella Kovács
Leather covered 18th c. Transylvanian chests. Part 2 Condition survey and conservation possibilities

The first part of the study published in the preceding volume of ISIS deals the manufacturing technique of the chests and the identification of the materials which were used to make them. The research comprised the classification of the chest according their motives, and the identification of the nationality of the former owners. This part describes the damages of the organic and the inorganic components of the examined chests. Then the possible treatments are outlined.

Due to the desiccation of the wood, fissures, sometimes cracks appeared along the fittings of the chests. Damages caused by use are on the edges where the body of the chest and the lid meet. The leather covers dried out, crackled, tore and got detached from the wooden base. The leather darkened around the metal mounts, it became hard and shrunk on chests decorated with iron. Smaller and larger fragments are missing from the leather cover on each chest. On the fibres of 43 samples taken from the leather covers was carried out sizing test, measured the pH value, the iron content and the shrinkage temperature. The methods, the circumstances and the results of the investigations carried out on the leather samples are summarized in tables in the study. The low shrinkage temperatures call the attention to the fact that the leather covers are in a very poor condition. The applications prepared from iron got perforated at a few places in consequence of corrosion. Both the iron and the copper ornaments curled up, broke and became incomplete. In a few chests, the materials that cover the interior surfaces – textile, paper – are less exposed to environmental influences are relatively well preserved.

In lucky cases, the structural composition and condition of objects prepared from various materials afford the separation of parts made from diverse materials and they can be treated separately. But the objects can only rarely be dismantled without causing physical injuries – a fact that is scarcely mentioned in conservation reports. In the case of the examined chests, the iron shafts of the corroded nails get stuck in the wood, sometimes the ends of the shafts were bent over the backsides of the planks,

and both the wood and the nails can be damaged when trying to pull the nails out. The copper heads of iron nails can easily fall of because of the corrosion that developed in consequence off electrochemical processes. The dismantling of thin metal plaques can cause mechanical injuries. The lifting of leathers full of micro-fissures from the wood to which they were glued can lead to further physical injuries, etc. All these confirmed what may not be self-evident that the chests should not be disassembled in order that the various materials could separately be treated. Three chests have already been conserved without being disassembled. In the followings, the suggestions the methods and the experiences will be summed up.

The wood of the chests was cleaned with vacuum-cleaning and with sulphur-free vinyl rubber. The by insects deteriorated areas were consolidated with 15% solution of Paraloid B 72. Completion of wooden elements was made only for structural reason. The copper sheets were treated on the chests with the neutral or slightly acidic (pH 5 at the most) solutions of Selecton B2 gelled with methyl-cellulose. The iron ornaments were treated with RO55 also gelled. After chemical treatment, the metal surfaces were wiped with distilled water using propylene sponges of a great absorbing capacity. The metal ornaments that curled up and got corrugated to smaller and larger degrees were partially evened. But because of it can result the elongation of the plaques and cracks in it, it is advised only at curled up edges and fracture surfaces, which are apt to cause further damages. The gluing of the broken metal ornament caused a series of problems. The application of a Japanese paper support in these cases brought a good result. It was attached to the backsides of the plaques with the 20-25% solution of Paraloid B 72 in acetone. The missing metal parts can be replaced with elements cut from metal sheets similarly to the original ones. Gluing the metal elements along the edges is difficult, as discussed above, so it seems more practical to cut a larger element for completion and attach it to the original with half-lapping. The question arises, not to get around the above problems but because of the change of the approach in the field of conservation in the past 10-15 years, if the metal ornaments of the chests should be completed or it is sufficient to somehow fix the broken metal elements, for example with tiny nails. Both solutions were applied at the conserved chests. The solutions of various acrylates can be used for the coating of the metal mounts. Anticorrosive greases should not be used because of the leather cover.

After dry cleaning of the leather covers with sulphur-free vinyl rubber wet cleaning was carried out with watery or alcoholic liquor depending on the condition of the leather. One should be careful not to apply too much liquor since the fat/oil content of the leather can rise over the 5% that is necessary for elasticity. The presence of iron content of the leather covers is to be expected around iron elements on chests with copper mountings even when the leather does not show discolouration. On one of the three chests, the hardened and shrunken leather was moistened with water through a semi permeable Sympatex membrane. Despite continuous control, the iron ions of the leather continued spreading on the effect of the water, and the poorly preserved leather darkened and cracked after desiccation. The shrinkage temperature measured during the research was very low at the leather samples of all the chests, in a few cases it staid under 36-37 ^{o}C. On the base of the experiences above it is not advised to use watery detergents and liquors of high water content by the treatment of the examined chests since water permeates between the fibres through the cracks and sticks them together during drying because of its high surface tension. This can lead to shrinking, which is especially emphasised at leathers of iron content, which is sensitive to hydrolysis.

The detached leather elements were glued back at the conservation of the first two Transylvanian chests with the 5:1 mixture of Planatol BB superior and wheat starch. The torn and detached leather fragments on the third chest were glued with rice starch mixed in the mixtures of Lascaux 498 and Lascaux 360 acrylic adhesives. The missing areas of the leather covers were completed with leather from the same animal species that were determined by the analyses. They were glued by the edges or fit to original ones with half-laps. No completion of the leather covering was made at the very incomplete chest considering also the missing metal and textile elements.

In certain cases, it was enough to remove the dust from the lining cloths of the chests. At the strongly stained items distilled water was used, while the greasy stains were removed with organic solvents. The above-mentioned polypropylene sponge proved useful at the wet cleaning. Where it was only the weakened adhesive that caused the detachment, the linings could directly be glued back with starch to the wooden base. At the poorly preserved parts, linen of a similar weave to the original was applied as a support, which also served as a completion.

The preservation of the original materials was the primary aim at the conservation of the chests. The completions were also applied mainly to protect the injured materials although sometimes aesthetic aspects were also considered. Despite the assessments and analyses carried out during the research and the experiences gathered in the course of the conservation of three chests, no recipes can be given that are valid for all the chests since the condition of the individual items, the degree of their damages can influence the necessary interventions and their depths. It should be added, however, that the approach that considers the preservation of the materials of the objects of art and the retardation of their deterioration the most important and not the aesthetic reconstruction has generally been gaining preference.

It is very sad that nowadays, several examples are in the WEB of the conservation of leather covered travelling chests, when the above aspects were totally disregarded, the objects were completely disassembled and the

materials – leather cover, metal straps and nails – were replaced. Regrettably we cannot yet say that this does not happen in museums.

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Enikő Sipos
Textile conservation case studies

The decomposition of archaeological textile is a very complex process, which is determined by the interaction of physical, chemical and biological factors between the object and its environment beside common wearing, tearing and deformation.

They are often contradictory and extremely complicated processes.

Organic materials, mineral salts, gases, ground water, which can be found in various quantities in the soil, and the pH value of the soil also play an important role in the decomposition processes.

Decomposition cannot practically be stopped but it can be slowed down with creating an adequate environment.

It has often been proved that stabile climatic circumstances are more favourable for every object than constant environmental changes. This is why it is important to store the excavation fabrics until the conservation within an environment of the same temperature and moisture content as at the site.

Historical and archaeological textiles are the most sensitive material relics and they also perish the fastest. No general outlines can be given concerning their treatment and conservation since every object is different and they must be treated as unique objects.

As every object is unique, it is difficult to find a method that can universally be used. Through these case studies, we illustrate the treatment methods of various object types.

Two 16th century ladies' wear, a 16th century headdress, the remains of the grave-clothes of Ernő Vas prince of Styria, and a possible manufacturing technique of the Hungarian coronation mantle will be discussed in the followings.

We have chosen these items because the treatment of excavation materials is significantly different from those that were not recovered from the earth. We intend to speak about the coronation mantle because it was not conserved in a classical sense. As it is a national relic, the repairs, modification and completions of the object have a historical value and they had to be preserved. In this case, conservation meant the determination of the materials of the object, the description of the various manufacturing techniques and the assessment of the missing areas and the condition of the object.

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Katalin Orosz
Possibilities of the analysis of painted paper objects and conclusions drawn from certain analytical results

Huge amounts of painted, printed paper objects and paper-based documents are preserved in public collections. The determination of the materials and the condition of the coloured layers is important from art historical, technical historical and conservation aspects but it is generally a complicated task needing much background information and the co-operation of specialists of various fields. The planning, carrying out and ordering of the necessary analyses, the comparison and evaluation of the results are the tasks of the conservator. The objectives of the analyses and the information we would like to get by them must always be formulated before the determination of the series of analyses. It is important to consider if the risk of an intervention (e.g. sampling or the movement of the object) and the information we expect are proportionate. Before the determination of the analysis series, the conservator must learn about the contemporary manufacturing technologies. The pieces of information gained with various methods must be compared and summed up and if necessary, the series of analyses must be modified. The author shows in the study the aspects of planning a series of analyses, the types of information that can be got from various analyses (scrutiny, optical, microanalytical and instrumental analytical), and the process of summing up of the analytical results.

The author illustrates the analytical process through the analyses she carried out within the frames of her doctoral thesis on Georgius Agricola's work on mining titled „De re metallica" printed in German language in 1557. The volume preserved in the Central Library of the National Archives of Hungary contains 292 illustrations. The significance of the examined volume lies in the fact that the illustrations, which occupy half a page or an entire page, were painted with green, blue, red, yellow, ochre, black, grey, brown, beige and white colours. There are no data about the person who painted the volume and the date of the painting but it does not match any of the other 3 painted volumes preserved in Hungary. The

analyses were justified by the differences in the painting and the conditions of the leaves between the first and the second halves of the body of the book. In the second half of the volume, the tone of the painting changes, the leaves are covered with a whitish incrustation and deteriorations resembling ink corrosion can be observed in the painted illustrations. The colour of the green areas is vivid, yellowish green in the first half of the book, while in the second half, it was applied in a thinner layer, it faded and had a slight brownish tint. In the second half of the book, brownish discolouration appeared on the leaves, the painted surfaces faded, a brownish penetration of the paint layers, a few smaller missing areas and fissures were observed. The objective of the analyses was, accordingly, the determination of the deteriorations and the causes of the differences observed in the condition of the volume.

The pigments and the binders used in the volume were determined with phototechnical methods and microanalysis, dust-slides for microscopic analyses, electron dispersive spectroscopy (EDS) Raman spectroscopy and Fourier transform infrared spectroscopy (FTIR). The author gives full details of the analytical process of the green and red pigment layers and the smoke depictions, which appeared in a grey colour in the first half of the volume and in a brown colour in the second half. With the analyses, the author was looking for the reason of the change of the tone of the green pigment layer, the crumbling of the red pigment layer and the deterioration of the paper areas coloured in brown and beige. Another question was if the differences of the conditions and the tones of the two parts of the volume came from the composition of the paint or some kind of a transformation, deterioration.

It could be determined from the analyses that in the first half of the volume the painter used verdigris, minium, lead white and coal black pigments in the green, red and grey layers, which he applied on the surface with acacia gum binder. In the second half of the volume, the painter changed the composition of the pigments. The above-mentioned pigments were mixed with vegetal colours precipitated on starch and probably added alum to the paint. The presence of alum could only be demonstrated from the results of element analytical analyses and the acidity in knowledge of the contemporary paint recipes (since it was present in a very low amount). The binder was most probably acacia gum in the second half of the volume as well. The different composition appears in the tone, the colour and the physical and chemical properties of the painted layers. The deteriorations of the paper and the transformations of the painted layers observed in the second half of the book can most probably be attributed to the change of the manufacturing technology. The alum added to pigments containing iron and copper ions probably caused acidity, which deteriorated both the paper and the paint layers. The presence of metal ions influenced the process. The crumbling of the red paint layers was caused by the insufficiency of the acacia gum binder and/or the deterioration of the binder (acidic decomposition).

The example illustrates that the examination of painted paper objects is a very complex process, in which various analytical methods must be used together and the knowledge of contemporary descriptions, recipes and the data published in the technical literature is indispensable. In many respects, the materials that compose the paint layers and the reasons of the deteriorations can only indirectly be deduced.

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Éva Benedek
Conservation of an 18th century copy of the Weeping Mary picture of Kolozsvár

A Mother of God icon prepared in 1681 belonged to the furnishing of the wooden church of Füzesmikola (Nicula) close to Szamosújvár (Gherla) (Kolozs (Cluj) county). It was painted by Lukács of Iklód, who according to certain sources was a Ruthenian, according to other sources a Russian painter, and a local Romanian nobleman called Kupsa (Copsa, Cupsea ?) gave it to the church. According to the local tradition, it got spread in 1699 that the above-mentioned Mother of God icon started to weep; the phenomenon was considered a miracle and the picture was revered accordingly. Regarding its type, it is a Hodigitria Mary depiction. The name came from the monastery of Ton Hodegon the original place of preservation of the icon attributed to Holy Luke, which was destroyed by the Turks at the siege of Constantinople in 1453. Pictures of this type depict Mary either standing or sitting on a throne, the infant Jesus conferring blesses with the right hand and holding a scroll, the symbol of the Word of God, the Logos, in the left. The name also implies that Mary indicates the right way.

Numerous copies were made of the picture on various supports. The engraving, the topic of this study is one of them, which was printed on a hand-made paper. The inscription Mansfeld Sculpsit Viennae, the signature of the copperplate engraver can be read in the right lower corner. The inscription on top of the paper runs ”NOS CUM PROLE PIA BENEDICAT VIRGO MARIA” (it cannot be seen since it was covered by the crown coated overlaid by blue silk at the dressing of the Virgin), while we can read the followings at the bottom of the frame: „VERA EFFIGIES B. VIRG. MARIAE, FLENTIS IN TRANSILV. AD CLAUDIOPOLIM AO 1699.DIE 15. FEBR. visitur in Templo Academico. Claudiopoli„. During the historical investigations we could determine certain similarities and identities with other copies of the Weeping Mary.

The central part of the engraving was cut out, the Holy Virgin and the infant Jesus were dressed up in claret silk, silk brocade, swivel silk fabric, metal threads, a small string of beads, etc. Then the backside was supported with papers containing 18th century (1780, 1782, 1783) manuscript in iron tannic ink probably to consolidate it.

The earlier fate of the object is not known. It could be in a damp environment according to the water stains, brown discolourations and traces of mildew on the edge. The greyish blackish stains caused by mildew are the consequences of an irreversible process since the metabolic products of mildew tint the cellulose fibres of the paper, which cannot be removed even with wet cleaning. Beside the damages observed on the paper, the fabric also seemed faded and worn.

After historical research, photo documentation and the assessment of the condition, the materials were analysed. The mildew and its thallus morphology were determined with a Novex optical microscope of an enlargement of 400x, and it was cultivated on Czapek-Dox foster-earth at 30 °C by 1 week of incubation. The sample did not evolve, which meant that quickly growing mildew could not be demonstrated on the object although its presence could not completely be excluded. The paper was examined with a pigment prepared after Graff's C recipe, which showed a slightly orange colour indicating the presence of plant fibres. The pH measurement was made with a Hanna pH meter; it gave a pH value of 6.79.

The conservation started with the application of 0,5-1% solution of Preventol CMK (para-chlorine-metacresol) in ethyl alcohol applied with a brush on the areas attacked by mildew. Dry cleaning was made with a soft brush and a rubber. To learn more about the production technology, the back cover was removed. The consolidating manuscript material was cleaned with a non-ionic detergent. After "re-sizing", drying and pressing, the sheat was refit to the original place with a Glutofix 600 (methyl cellulose) adhesive. Smaller tears and defects were observed along the edges of the engraving. We decided to conserve them from both an aesthetic and a durability aspect. Japenese paper similar to the original one in colour and thickness was used for completion. We aimed for applying reversible solutions during conservation, as far as it was possible.

The object is a private property. After conservation, we advised the owner about the storage conditions, the appropriate lighting and the evasion of the deteriorating effects of relative humidity content and temperature. We suggested that a UV filer film should be placed on the glass if he intended to keep the engraving in a frame hanging from the wall.

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László Nemes Takách
On the conservation of papier mâché stuccos

Papier mâché stuccos were made from the first third of the 18th century generally from laminated handmade rag paper made for the purpose in blue, brown or red colour, which was glued with a paste made from rye-flour. In other cases, first a white paper layer was laid in the negative so that the colour of the coloured paper layers did not show through the wall paint. Papier mâché stuccos, which were easy to transport, they could be cut with a knife or scissors, bent to arched surfaces and vaults and fixed with nails, were very popular.

Papier mâché stuccos are generally conserved when a building is restored, when they were soaked by leaking water or suffered mechanic injuries. The author illustrates the problems of the damaging and the conservation of papier mâché stuccos of diverse structures through three items he has conserved.

The rooms in the Royal Castle in Gödöllő furnished for Queen Elisabeth are decorated with hollow crust type mâché stuccos. The interior cavities are closed and the edges of the motives were closed with plaster. High moisture content developed in the cavities in result of the dampness of the wall or the precipitation of moisture, which could not evaporate because of insulating, washable distemper. Moisture encouraged the development of mould on the laminated mâché, the layers loosened, and the paint film that shrank as it aged ripped off the upper layers. During conservation, the paint layer was mechanically removed from the mâché that had been lifted from the wall but the area that was strongly infected by mould fell to pieces. The perished parts and the motives that had earlier eroded from the wall were replaced or completed with copies moulded in plaster negatives taken from the original parts.

Mâché stuccos with filled in cavities can be found in the Orczy palace in Gyöngyös. When they were prepared, first a layer of white paper was laid into the negative, on which some sawdust mixed with starch was spread. Iron wires securing the stiffness of the stucco was laid over it, and then another layer of sawdust mixture was pressed over it. Finally, the back of the mâché was closed with a thick cardboard painted in English red. Owing to this structure, there is barely any enclosed space left between the mâché stucco fixed to the wall and the wall so no space with high moisture content can develop behind it.

A mixture of unsized rag paper (flax-hemp, cotton) and pine cellulose was used for the production of the papier mâché built on a lattice skeleton in the 1890's on the walls of a civil flat in the "palace district" of Budapest. The mâchés were made from layers of white and brick red paper with flour-paste so that four smaller units were glued together to compose 2 m long strips. The larger cavities were filled in from the back with a paste of wood-pulp, and loosely woven sacking was

glued to the back after drying. It was followed with more layers of brick red paper, the last one of which enclosed the lattices nailed along the two longer edges of the assembled mâché. During transportation, the lattices protected the mâché from breaking, they helped in fixing it to the wall and ensured that it did not touched the wall. When the mâché was disassembled, a huge closed channel appeared along the walls of the room. Air current was generated in the common space of colder and warmer wall surfaces, which facilitated the balancing of the moisture content. Regarding the precipitation of the moisture, this structure is a third type that is less apt to become moist. Nevertheless, the mâché suffered from mould infection in a length of about four metres in consequence of repeated soaking with leaking water, so it had to be dismantled. After mechanical cleaning, the surfaces were cleaned and sealed with a thick Glutofix solution. The smaller repairs were made with poly(vinyl-acetate) dispersion adhesive, with gluing sulphate paper strips on the surfaces. The areas of the mâché chosen for taking negatives were isolated by several layers of 5% alcoholic solution of Regnal (poly(vinyl-butiro-acetal). Next the borders of the chosen areas were surrounded with plasticine, and, due to the concave, arched surface, it was moulded with plaster in three phases. After the consolidation of the plaster, the mâché was carefully removed from the negative, the surface of which was isolated with Regnal and then beeswax. Then the mâché copies were made in the followings: first a layer of white (sulphite pine cellulose, 28 SRo) paper was laid, then six layers of brown sulphate paper (120 g/m2) with rye-flour paste followed, next, when it had dried, another layer of white paper came followed by six more layers of brown paper. When they had dried, the backside was covered with loosely-woven calico, which was covered with a final layer of brown paper. After complete drying, the mâché was turned out of the negative and its surface was coated with a cold chalk layer. This will help the removal of the applied paint layers during a later conservation.

The disinfection and the consolidation of the multilayer paper material attacked by fungi is one of the gravest problems of the conservation of mâché stuccos. Often only saturation in vacuum can help. Descriptions in the technical literature often mention saturation with acryl derivates. This process lends a great stability to the mâché, however, it changes the properties of the object and it is irreversible. We did not apply such saturation at the papier mâché stuccos we conserved.

Generally plasterers treat the papier mâché stuccos and not paper conservators. But the two material types, the inorganic plaster and the complex papier mâché made of organic materials demand different treatments. Mâché stuccos have become scarce because of their sensitive materials. Another and unacceptable reason is that in our enterprise-centred world they are replaced by plaster stuccos, sometimes for large sums of money, perhaps in lack of expertise. Papier mâché stuccos are more-or-less exquisite evidences of an already extinct technology of a past world. It is our duty to preserve them.

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Raluca Marilena Dumitrescu
The restoration of three glass icon paintings from Nicula and Gherla centers from Cluj county, Romania

The icons painted by unknown masters, dated in the second half of the nineteenth century were accomplished in the famous painting centers of Nicula and Gherla in Cluj County. The thin sheet of glass has the specific irregularities which are typical for the glass workshops ”glăjării”. The wooden frames of the icons are simple, with a smart joining system. The two icons from Nicula, presenting Saint Paraschiva and Saint Nicholas have a simple composition, with a naive drawing and vivid colors, while the third icon titled ”The Grieving Mother” from Gherla, has a more elaborate composition, with more refined features, though still naive, and red and black as dominant chromatic scale. The icons belong to private property, but three authentic icons have been found at Nicula Monastery, with very similar drawing, spelling, colors, dimensions and frames. A comparison can also be made between ”The Grieving Mother ” from Gherla and the similar icons from Nicula, where influences and borrowings can be seen, since the two centers are not far from one another.

The condition all of the three icons, as their damages were very similar. The deteriorations can grouped in a rank, from the more to the less powerful as follows. Losses and delaminations at the level of paint layer, powdering, scattering and isolation from the context of color scales; weakening, cracks and losses of wooden parts due to boring insects and inadequate repairs, dirt, fading and discoloration of paint layer due to light, humidity stains on the wooden planks. The flaking had occurred because of the natural weathering of the binding media and loss of elasticity at the level of paint layer. There are different types of detaching between the glass support and the paint layers – air pockets, roof-shaped liftings and flaking sockets. The flaking socket type includes the occurrence of lacunae’s area. In addition, we have to consider the action of humidity, especially in the case of powdering. The color scales fallen from the glass support gathered at the bottom of the icons, between the frame and the back lid. This type of damage combined with dissimilar dirt, which made it worse. The restoration implied thorough consolidation at the level of the paint layer. First, the dirt particles were removed; the paint scales were cleaned with a fine brush and collected with the putting down of their location. For consolidation egg yolk

was used in distilled water (1:3), salicylic acid was add as disinfectant the emulsion acting both as adhesive and plasticizer. It was introduced in the roof-shaped liftings and flaking sockets with thin hypodermic syringe and on the rest of the area to be conserved by fine brushing. The paint layer as it adsorbed the emulsion and became plasticized, it was delicately pressed over the glass, manually, by means of Melinex foil. This method is favorable because of its gentle kind of pressing that the glass support is uneven, and the thermal contribution of the hand is appropriate in the consolidation process. Then the detached color scales were relocated in their original place. The cleaning of the back (the painted surface) was achieved with the same emulsion, for its quality to act also as a natural detergent and for its gentle action as a solvent for dirt in this case. The front side of the icon was cleaned with a solution based on alcohol and detergent, using nitro diluent for bronze stains present on the surface. The integration implied both the use of tempera and watercolors, depending on the different consistence of the paint layer, also combined with egg yolk emulsion. The small gilded areas with erosion (aura and collars, sleeves) received a completion with "schlag-metal" foil, fixed with a water-based "mixtion" solution. The consolidation of the wooden back panels and the frames has been done with Paraloid B 72 in toluene – in progressive dilutions from 8-10% to 20%. In the cleaning process of the wooden elements, the most efficient was the solution of ammonium hydroxide 5%. The split parts were fixed with Paraloid B72 or polyvinyl acetate – varying by case – and for the completion Covidez RLP was used. This includes 60 parts of paraffin, 30 parts of esterified colophony, and 10 parts of thermoplastic copolymer EVA. The wax-resin compound, in which we added wood dust, we applied by means of heat and metallic spatulas. New ones, because of their weakened and fragmentary structure, replaced the most of thin wooden joining elements of the frame. The chromatic integration was done with stain solution for wooden joints, and a mixture of oil colors/dammar resin/ turpentine for the frames. The mounting of the ensemble – glass, frame and the panels of the back – followed the successive steps. 1. Providing a secure ground for the glass sheet through attaching felt strips with adhesive band on the interior groove of the frame. 2. Fitting together the elements and the thin wooden joints of the frame in a stable fixing system. 3. Placing and fixing the glass sheet by use of thin, elastic wooden rods which correct the imperfections of glass edges, and stop moving in the frame, fixing the back panels by screwing tiny screws for wood, considering that in the future it can be necessary to disassemble the object.

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Galvanoplasty in conservation practice

Electroplating and electrotyping or galvanoplasty are two different methods based on the same theory: electroplating is the creation of a coating on a surface while galvanoplasty is building a three-dimensional metal object. Galvanoplasty was already used in the second half of the 19th century to prepare copies and reconstructions. An electrotyping workshop operated in the Museum of Applied Arts in Budapest and the copies prepared there have been used in exhibitions ever since like the Nagyszentmiklós treasure in the Archaeological Exhibition of the Hungarian National Museum. The copy is so excellently preserved that only the gilding had to be restored in 2002.

Various materials were used for creating moulds in the course of the evolution of the technology, which were rendered conductive with graphite, rarely copper or zinc dust. The surface to be copied was surrounded by a network of a thin copper wire pinned down with "U"-shaped pins, and it was connected to an electric supply. The same method is applied to date only silicone rubber is used for taking a negative. Sometimes fluid silver solution is used for rendering the surfaces conductive. Cyanide baths are generally used for electroplating, which does not attack the surface of the basic metal, while an acidic copper bath is the most suitable for galvanoplasty.

Both single-sided copies and objects in the round can be prepared with galvanoplasty. At preparing a mould, the thin copper wire must be at a distance of about 0.5 cm from the negative. The specific weight of the copper bath must be the same or somewhat larger than that of the silicon negative, so a frame made of a brass wire or plastic should be fixed to the back of the negative so that it did not float or bend in the bath. The negative rendered conductive is linked to an electric supply and placed in the copper bath. Within optimal circumstances, a copper layer of a sufficient thickness develops in 24-36 hours. The resulting positive is brittle and fragile so it is desoldered with lead-tin solder. Silver solder is used at fine duplicates. Then the excess is removed. Objects in the round are copied in more than one part. It is important that no so-called "undercutting" should remain in the negative. Barriers are made from plasticine or wax, etc. at the planned edge of the mould parts and the silicone is moulded between them. It is simpler to use silicone, which can be kneaded and spread, although bubbles can appear in the negative and the depressions may remain empty. When the duplicates of deeply enchased and embossed objects like bowls are made, first just a little silicon should be turned around in the bowl since no bubbles remain in a thin layer and it can perfectly follow the pattern. With the repetition of the operation, the shape becomes thicker, and then it can be raised to the necessary thickness with silicon paste. The author turned the silicon used for the first layer into a paste form with aerosil, and did not use another material. Distance from

the anode influences the degree of the metal deposition so it seems practical to start the galvanoplastic work from the deepest point of the negative at objects in the round, which often contain deep areas. In this case the conductive wire is pierced across the negative instead of being coiled around it. An interior anode can also be applied at very deep and complex forms. To remove the excess from objects in the round, the surfaces to the soldered are first coated with lead-tin, and then they are fit exactly together and temporarily fixed with wires, tongues etc. In the next step, they are soldered together at a few dots and the temporary fixing is removed. If the permanent soldering is made with a soldering iron instead of a flame, the fixing dots will not smelt. After the finishing of the soldering seams, the object is cleaned and coated with copper or electroplated with precious metal. The preparation of duplicates from objects in the round is illustrated by preparing duplicates of a Lar and an Apollo statue.

Galvanoplasty can also be used for the completion of objects. In this case, the missing area is moulded from e.g. plasticine with leaving small rims along the edges to be fit together, then a silicon negative is made of it. The galvanoplastic completion is glued into the original object with this small rim. The rim prevents that the two different metals touch. The author cites the jug of the Roman period cart find of Szomor-Somodorpuszta as an example. A thicker than average galvanoplastic completion had to be prepared since it had to bear the load of the heavy, cast bronze neck and the handle. A helmet was completed with the same method. The author mentions that experiments were made for the direct completion of bronze objects, e.g. a cantharos, with galvanoplasty in the Hungarian National Museum in the 1960's in a way that a wax negative was placed inside the object at the missing area and the cantharos was isolated with wax. The mould was rendered conductive; the object itself conducted the electricity. The copper settled in the completion yet it did not get bound to the original. It could not be desoldered, it remained rigid, quickly broke out: the experiment was unsuccessful.

Nowadays, fragmentary objects are generally not completed: they are cleaned and conserved and a completed copy is made of them. So the preparation of duplicates and galvanoplasty play an increasingly important role in conservation.

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Local galvanotechnical solutions in conservation

Galvanic baths, electrochemical solutions necessitating immersing have been used since the early 20th century. Local galvanotechnics started to spread in object conservation in the 1970's following industrial application and making use of its experiences. The need of local solutions emerged because during immersing, the entire surface of the object was affected by the solution, which could cause permanent damages on the surfaces that were not meant to be treated. Local electrochemical solutions have been used in Hungarian conservation practice since 1974. First "Galvan electric" guns were used, which touch the object through a tampon. They can be used first of all for the precipitation of metals on surfaces, but due to the disintegration of the tampon, not during the cleaning phase. Both art object conservation and industry needed a solution that could be used locally without immersing in the cleaning phase and for surface treatment and ornamental purposes. This is why in 1983 Dr Oszkár Pavlik from the Hungarian Academy of Sciences and the author, independent of each other, introduced to conservators an instrument made of marker pens rendered conducted with pulling a metal wire through it, which could be used on small surfaces. In 1990, Hungarian conservators started to use the so-called Selectron Process developed by the Selectrons Ltd. It was a mobile system suitable for applying metal on metal. The negative wire, the cathode of the direct current power supply is connected to the object. The other wire is linked to a mobile anode, a writing instrument fashioned to touch the surface to be treated – a pencil, a pen, a tampon etc. It can be flat, elongated, convex or round as the surface needs it. The positive anode is covered with an absorbent material, and it is saturated with a metal-containing electrolyte solution. The tool connected to the electric current is passed over the territory on which the metal is to be applied. A microprocessor regulates the precipitation speed and the thickness of the coating. The DC current powers, the microprocessors and all the supplements are produced by the SIFCO Industries Inc. and its European branches.

The author illustrates the broad opportunities of its application by his experiences and the work done by the students of conservation of applied art objects of the Hungarian University of Fine Arts. 1. The author first used the method at the conservation of two so-called bureau statues from a private collection. They were made of zinc and patinated to a bronze colour. The task was to stop the deformations caused by corrosion and to restore the aesthetic appearance of the surfaces. The cleaning of the surfaces and the filling in of the cavities was made with a founding mixture of a low melting point, while local electroplating was used for restoring the copper coating and the patina. 2. The stains caused by copper corrosion in the 18th century butchers' guild plate painted on a copper plate preserved in the collection of the Hungarian

National Museum could be losened with the mobile anode method used in the cleaning phase, and then they could be removed by chemical wiping. 3. The Saint Florian statue belonging to the so-called "Nyírgyháza fire brigade relics" found during the uncovering of a refugee camp at Linz in 1986 was made with a mixed technology. Certain parts are bronze moulds, other ones were embossed from a copper plate, and the assembled object was coated with silver. The corrosion products of the bronze showed through the silver coating. The silver coating was applied on the damaged areas with the mobile anode method. 4. Numerous 20th century objects prepared from plates and hand-painted or stencilled with oil paint are preserved in our museums and many of them were treated with the mobile anode method, which can excellently be used for removing the iron corrosion that shows through the electroplated surface where the paint layer peeled off. 5. The four-grade students of the Applied Art Conservation Department of the Hungarian University of Fine Arts specialised in metals and goldsmith's craft have conserved numerous engraved, gilded silver laurel wreaths preserved in the collection of the Institute and Museum of Theatre History as their thesis works. The missing elements of the wreaths were replaced with silver. The completions and the worn surfaces of the objects were locally gilded by a mobile anode. 6. In 2008, students of metal and goldsmith's work conservation conserved several objects within the frames of their diploma works, and they applied the mobile anode method. One of them was a fire-gilded silver ornamental belt decorated with a filigree technique which is in the possession of the Serbian Diocesan Museum. The filigree and cloisonné enamel ornaments of the belt were deformed and incomplete. The student replaced the missing elements with silver and gilded them by mobile anode electroplating. 7. The graduating student prepared the missing elements of a silver, fire-gilded water consecrating cross made mostly with filigree and granulation techniques from silver according to the original technology, and then gilded the surfaces by the mobile anode method. 8. A late 19th century sanctuary lamp prepared in the workshop of Gyula Jungfer one of the most significant ornamental blacksmiths of Hungary was conserved within the frames of a diploma work. The object is a gilded brass blacksmith's work. During soldering, the precious metal coating perished in small areas in the basket of the lampholder of the sanctuary lamp, which had broken into several parts. Mobile anode gilding was appropriate for its restoration.

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Ten days „on the upper reach of Nagy-Küküllő" or local and guest conservators at the creation of the permanent exhibition of the Molnár István Museum of Székelyudvarhely

The exhibition titled "Millennia on the upper reach of Nagy-Küküllö" was opened in the Molnár István Museum of Székelykeresztúr on August 7, 2009. The exhibition occupies 8 rooms on a surface of about 140 m^2. Five of them are occupied by archaeology, two by local history, while the room exhibiting grave-clothes from the crypt of the Matskási family connects the two units. This exhibition is the only archaeological exhibition in Hargita County. The high standard exhibition, regarding either professional or scenic respects, could be realised with the help of numerous private persons, entrepreneurs and local leaders and with the contribution of a number of specialists and volunteering friends of the museum.

Beside the staff of the museum, a group of five Hungarian conservators and two conservator students helped in the preparation of the objects for the exhibition. In this paper, a short selection is presented from the complete, partial or minimal conservation of the exhibited objects.

1. Ceramics: The formerly already conserved ceramic objects intended to be exhibited were completely or partly conserved once more to meet the standards of the new exhibition. The medieval stove tiles completed with white plaster meant the greatest task.

2. Metals: From among the metal exhibits, the 12th–13th century metal finds, which were close to perishing, could be cleaned, conserved and prepared for exhibition with wheelblast equipments, polishers and other appliances suitable for chemical-free cleaning. The surface of a poorly preserved copper cauldron dated from the 17th century, the metal core of which was very weak, could be freed from the dirt and then glued and completed by applying chemical packing.

3. Wood: From among the archaeological objects, white salt precipitation had to be removed from the elements of a 14th century wooden bucket, and then the wood material had to be consolidated with saturation. The elements of an especially interesting and rare find, a well dated from the 14th–15th century were cleaned but they did not need consolidation. A scenic installation was built around the well, which illustrates it in a vertical cross-section in the moment of its uncovering, and so the visitors can get an idea of its structure as well. The churchyard gate from 1694 separated two historical periods. The gate had stood in the open for decades. The wooden material, which had been treated with linseed oil, was strongly deteriorated. After cleaning and consolidation, the individual elements were completed and then the missing top part was reconstructed. In the rooms illustrating local history, there were 19th century interiors, a marquetry table, an upholstered armchair, and a two-door wardrobe.

All the three pieces of furniture were dirty and structurally weak. The removal of the old varnish layer was followed by structural consolidation and the completion of the missing veneer areas, and then the surfaces were polished.

4. Textile: The 19th century crypt of the Matskási family was uncovered in 1968–1971. A few items of the costumes were rescued from the ruined coffins. The textiles were desiccated and crumbled to a great extent. Their primary cleaning had earlier been started, and during the actual interventions, they were completed and furnished with appropriate supports. Finally two shirts, the front of a dolman, a cap and a pillow slip were exhibited.

5. Paper: Paper objects can be found in the rooms illustrating the modern history of the town: among a few bequests of the Gyárfás family and requisites recalling the atelier of Béla Nagy photographer of Székelykeresztúr. Only the indispensable interventions, cleaning and gluing, sometimes completions were carried out during their conservation, among others on photo boxes, photo albums and framed photos.

In the final chapter of the study, the measurement results important from the respect of the protection of the object like the temperature and the moisture content, the lighting and the types of the show-cases and the installation are shortly described.

Anybody who has the opportunity to visit the small town on the upper reach of the Nagy-Küküllő should also pay a visit to the museum in the centre of the town where there are also other interesting things to be seen beside the above-described permanent exhibitions.

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