Abstracts

Zsolt Nyárádi
The Medieval Church at Bögöz and Its Churchyard

Begun in 2012, the restoration of the church at Bögöz (today Mugeni, Romania) offered a unique opportunity for the archaeological excavation of the churchyard surrounding this medieval edifice.

The early Romanesque church at Bögöz was completely demolished by the end of the 13th century and none of its materials were used in the building of the next church. At least, this is what is suggested by the plinth course carved from soft sandstone which stretches all the way around the building's nave. The fresco series depicting St. Ladislaus I of Hungary, St. Margaret of Antioch, and the Final Judgment were painted on the north wall of the church at Bögöz during the second half of the 14th century.

Further significant work on the church began in the second half of the 15th century and led to its complete rebuilding in the Gothic style of the age. It is believed that the chancel was the first part to be rebuilt. It was extended slightly and was given a polygonal apse, windows with Gothic tracery, pillars, and ribbed stone vaulting with richly decorated bosses.

The rebuilding of the church's nave was performed at the beginning of the 16th century. The roof was removed and the walls were made higher in order to accommodate large Gothic windows. Traces of this heightening work can be clearly seen today on the west gable. An entrance was opened on the south side which was then fitted with a door-frame and the space of the old Romanesque window was filled up. Unlike that of the chancel, the ceiling of the nave was supplied with terracotta ribs, and seven pillars decorated with sculpted black andesite plinths were built in order to support it. The pillars' capitals were made of black andesite. The earlier vestry in the north part was demolished and a wider one was built and fitted with a doorway with a stone frame. Once the construction work was finished, the entire interior of the church was paved with stone slabs.

During the archaeological excavation work, we dug small excavation pits along the walls, and we also investigated the drainage trenches, which generally had a width of 1 m. One of the major disadvantages of this artefact rescue excavation was that we could only work on the areas designated by the planners and that we could only investigate the areas archaeologically to the relative depth designated by them. The trench system created to drain away rainwater surrounded the church on all sides except the west side. We only occasionally had the opportunity to study the church's construction layers, since our main objective was to study the drainage of water from the roof and from along the walls. Further away from the church, we dug exploratory trenches south, east and north of the church that extended right the way across the churchyard.

The churchyard surrounding the church dates from the 12th century, after the construction of the first church, and was used up until the end of the 19th century. Today, it is surrounded by a slightly oval cemetery wall stretching from east to west which was built following the Gothic reconstruction work in the 15th–16th century. During the excavation work, we also found the remains of an earlier cemetery wall, one connected to the construction activity in the 14th century. In the churchyard at Bögöz, we excavated an area of 160–170 m^3 in 2012, happening upon the remains of 215 burials, in which are included the 10 burials excavated in 2009.

We could discover which parts of the churchyard were the most used through the centuries. The burials discovered were not numerous enough for a study of the settlement's demography, but they nevertheless yielded much valuable data about burial customs. By using this data, we could analyse the effects of more widely adopted 18th-century legislation regarding burials. More thorough analysis of the burials will offer unique opportunities to get to know the changes in, and the use of, a medieval churchyard. Moreover, from anthropological analysis of the bone material recovered, we could learn important details concerning the day-to-day lives, lifestyles, and diseases of the people of Bögöz, and also valuable information about burial customs and their evolution. The artefact rescue excavation work also showed a settlement layer dating back to the Arpadian dynasty and predating the church.

Additionally, it answered many questions concerning the features of the 12th–13th-century churchyard and its size.

Translated by Zsolt Nyárádi

Lórand Kiss
Wall Paintings in the Calvinist (Hungarian Reformed) Church at Bögöz

Restoration of the wall paintings in the Calvinist church at Bögöz became timely when renovation of the building was planned. The restoration work was preceded by detailed wall research.

The frescoes were discovered in 1865, when a window was built in the north wall of the nave to bring light to the pulpit. In 1898, on the initiative of Adolf Csehely, a teacher of drawing at a main secondary school in

Székelyudvarhely, the wall paintings in the church were made visible. Subsequently, József Huszka was charged by the National Committee for Historic Monuments to make a number of on-site aquarelle copies and photographs of the wall paintings. Because no measures were taken to conserve them, the wall paintings were again covered with lime wash shortly afterwards. In the 1930s, they were uncovered once more, this time partially. In 1943, the National Committee for Historic Monuments set their restoration in progress, but the work was interrupted by wartime events.

The pictures on the west wall of the nave were uncovered by Sándor Vetési, the local minister, in 1966. On the north wall of the nave, three registers one underneath the other can be seen. The uppermost register, a series of paintings presenting St. Ladislaus I of Hungary, begins on the west wall, a wall of the tower, with a scene showing the egress from Nagyvárad Castle. On the left edge of the wall painting, the plaster has been smoothed away, thus indicating that the picture probably did not extend any further southwards. The scenes are not separated from one another. The wall paintings were made using earth pigments (red oxide, yellow ochre, grey, and black); for white, lime wash was used. The figures were drawn by means of a few lines only, and depiction is not excessively detailed. Because of the late Gothic vaulting in the nave, significant parts of the scenes have perished. It is possible that originally the series of wall paintings continued all the way round to the chancel arch. This, however, was rebuilt in the Gothic period, with the result that any scene or scenes there would have perished.

Depicting the legend of St. Margaret of Antioch, the middle register begins in the western corner of the north wall. As was made clear by the investigations also, the fresco plaster of the middle register is the same as the plaster of the upper register. The two registers were, then, made the same time. This finding is valid from the stylistic point of view also.

The lowermost register differs from the two registers above it stylistically but also from the standpoint of execution technique. The richness of the detail in these scenes and the fine transitions between the various shades of colour bear witness to a much surer and more practised hand. The wall paintings were sketched out in dark red. Body colour is shaded with green earth, similarly to Italian Trecento wall paintings. The impression of a bluish background is achieved by applying dark grey as a ground and painting transparent white on top of it. The hues of the wall painting amount to a wide range of earth colours: white (lime), black, yellow, and green earth. A significant part of the lower register is taken up by a large scene showing the Last Judgment.

The chronological order of the wall paintings is as follows. The wall paintings of the uppermost register were made first. The joins do not everywhere correspond with the edges of the scenes. The pictures were painted from left to right. The middle register was painted after completion of the upper register. Both these registers were painted using the fresco technique. The wall paintings of the lowermost register were made partly using the fresco technique and partly the secco technique. This conclusion was corroborated by the investigation findings also.

As discovered in the course of the research and as proved by archaeological excavations also, the exterior surfaces of the nave were at one time covered by wall paintings. Of these, one small fragment survives today, on the south wall. The decoration on the south wall covered the surface of the tower also. The masonry of the earlier chancel was incorporated in the walls of the present, late Gothic chancel. On the surface of some shaped stones, coloured fragments from the decoration of the earlier chancel have survived.

During the restoration work, we removed the cement-containing plaster at the base, the plaster filling put on in 1943–44, and the plaster and lime-wash surfaces partially covering the painted surfaces. During investigations of the painted surfaces, it emerged that most of the damage had been caused by two inexpert uncovering operations performed in quick succession. As a result of these, 15–20% of the painted surfaces were missing. The painted surfaces were interspersed with damage caused by blows, scratching, and scraping. In the course of aesthetic repair work, gaps on the painted surfaces were retouched using the velatura painting technique, while the surfaces that had been stopped up were repaired using the tratteggio technique, with short-line retouching. For the retouching, we used aquarelle, meaning that the repairs will remain reversible at all times. As a result of the restoration, one of most intact assemblages of wall paintings in the Szekler Land could become understandable and thereby a public treasure.

Translated by Chris Sullivan

István Bóna
Applying the Minimum Intervention – Maximum Results Principle on a Series of Baroque Wall Paintings. The Uncovering and Restoration of Baroque Wall Paintings in the Bíró-Giczey House at Veszprém

The baroque art found in Central Europe presents conservators with special tasks. In this era, a wall painting was not an independent work of art, but one important element of an artistic unity extending throughout the entire interior space. The purpose of this unity was to create an illusion as exciting and as interesting as possible. If this illusion is lost, then the meaning of the work is also lost. In other words, when damaged and decayed works are made good, the illusion must be made to appear and must work. Otherwise, there is no sense in the restoration operation. At the same time, one of the main basic principles of restoration is the preservation of original creations

using their own materials along with their presentation in their fully original state. This does not permit the degree of repair which has already been performed on this particular work. These two viewpoints are seemingly at variance with one another.

The baroque wall painting uncovered in the Bíró-Giczey house in Veszprém had in many places deteriorated to the limits of restorability over the last decades. The present paper discusses first and foremost issues to do with making good the decay. We performed the restoration on the basis of the minimal intervention – maximum results principle. We attempted to use as little in the way of materials, chemicals, and work as we could. The goal was to uncover and show the original decoration. Ten conservators worked in such a way in the four rooms that by employing the principles decided on beforehand they created a spectacle that was completely unitary.

In the first half of the 18th century, Márton Padányi Bíró built a single-storey house in the Veszprém Castle District. Canon István Giczey added an upper storey in 1772. In four rooms in this part, baroque paintings were found. All four rooms are the so-called Gartenzimmer. Through architectural frames painted in an illusionistic way, we may look out upon landscapes or parks of idyllic beauty. The sky appears on all of the ceilings. On the ceiling of the ceremonial hall, we see, in addition to sky, a number of mythological scenes also.

The decoration and the 'artistic painting' were made using the same – secco – technique. This enabled the artists to employ trompe d'oeil elements. Baroque plasters consist of a mixture of crushed limestone and lime wash, with additives of plant origin. The compositions on the walls had been drawn using a pencil or piece of charcoal. On infrared photographs, sketches in pencil could be seen beneath the figures on the ceilings. To the layer of fine plaster covering the plasterwork, a thin layer of pale pink paint had been applied, although not on the ceiling of the ceremonial hall. On this, painting in tempera had been performed, most probably with the use of egg as a binder.

On the ceiling of the ceremonial hall, there was no preparatory layer of paint. The base hues, the so-called 'dead colours' (Totenfarben), were applied to the roughly worked surface straightaway. The modelling layers were then put on. The paint layers on the ceiling were thicker than those on the walls. In all the rooms, the painters used very expensive pigments, e.g. malachite, and covered very large surfaces with them. On the ceilings of all the rooms, oil gilding was used, and in the bedroom silvering also.

When we took charge of the rooms, they were painted white with emulsion paints. Under this there were other, strongly attached, paint layers. Most of the repainting we carefully scraped off using a scalpel. The thin layer adhering directly to the surface of the plaster we removed with the help of a glass pencil and special erasers. Uncovering performed with erasers also served to clean surfaces very well, but in such a way that the patina with the wealth of information it contained remained on them undamaged.

We fixed the wall paint uncovered by repeatedly applying to it a 0.25% solution of methyl cellulose. The plaster parts that had come away we re-attached using the injectable plaster Vapo Injekt 01. Crumbling plaster and paint we made firm using Porosil ZTS silicate emulsion before sticking them back on the wall.

Retouching was done using aquarelle. The larger gaps, those which already could not be retouched, we painted in colours that fitted in.

Translated by Chris Sullivan

Brigitta Mária Kürtösi
Original (and) Copy. The Making of a Copy of a Roman Mosaic Floor from the Villa Romana Baláca and Investigations into the Original

The Villa Romana Baláca, situated outside Nemesvámos on a site of approximately 9 ha marked by three springs known to the Romans already on what was once a large landed estate in Pannonia, is so far the most significant Roman-age excavations site in the Balaton Uplands area. During excavations conducted on the territory of Nemesvámos-Balácapuszta in the early 20th century, between 1906 in 1909, four mosaic floors in Roman Residential Building No. 1 were uncovered. Room 20, the main building's apse-ended *tablinum* with a floor area of 70 m^2, must have been an imposing reception room. Its colourful mosaic floor was removed from its original site in 1925 under the direction of the archaeologist Gyula Rhé. After a long break, archaeological excavations began again, from 1976, as well as work that expertly evaluated and presented the findings at Baláca. At the time the mosaic floor of Room 20 was discovered, namely during an excavation performed in 1907, damage to it could be seen: changes in the surface, missing parts, and scorch marks. Having been cut up, the mosaic was placed onto 46 reinforced concrete slabs. Later, with the retention of these rigid supports, it was installed in the foyer of the Hungarian National Museum and later on in the lapidarium there. On the basis of designs made by Gyula Hajnóczi, a protective roof was erected above Baláca's Building No. 1 in 1984. After this, the three other mosaic floors removed from that building were taken back to Baláca and put back in their original places there. The place of the fourth mosaic floor, however, remained empty.

At the initiation of the Veszprém County Museums Directorate, a copy of this Roman mosaic floor from Baláca could be made within the framework of a project aimed at developing the Baláca Villa farm from the cultural and touristic points of view. One year in all was available for the performance of this work.

During the making of the copy, importance was attached to the achievement of authenticity in the fields of materials and aesthetic effect. The aim aesthetically was not to reproduce the mosaic's present condition, featuring the marks made over approximately 1700 years by

impacts affecting it (e.g. fires) and by events (e.g. archaeological excavation, removal, restorations), but to give back the appearance it probably had originally. Hence, we did not reproduce on the stones we used colour changes caused by external factors. On the other hand, we did reproduce without exception the 'mistakes' made when the motifs were created, namely the unwarranted use of particular colours. We regarded the conveying of the original colour range and mode of execution as the principal goal. After studying Gyula Rhé's notes and archive photographs of the excavation work, we performed a complete diagrammatic recording of the motifs of the original mosaic floor now in the lapidarium of the Hungarian National Museum. The laying of the stones was done in the studio using transparent film which had been drawn on earlier: the film was cut to fit the different parts to be executed. The geometrical system of the mosaic's motifs presented good opportunities for this, since around every element in the design ran a contour consisting of a double row of black stones. Certain parts, however, we made in one piece, cutting them into smaller pieces only after the mapping of the entire surface. By turning the film over and sticking onto it a layer of gauze, we made a stable and light temporary support for the laying-out work. On this we set out, and stuck, the mosaic pieces with their top part pointing downwards. For this we used a mixture of 1 part polyvinyl acetate emulsion and 3 parts methyl cellulose, which ensured strong holding but which could easily be removed from the surfaces of the stone pieces using cold water. The laying out of the motifs was a task that took four persons eight months.

The original grounding of the mosaic floor in Room 20 was disturbed in a number of places, but was still there. We therefore had the opportunity to take examples before making new grounding to be put on. On the basis of investigations, dolomite of different degrees of fineness and brick rubble had been used as filler in the limey binding material for the grounding in the tablinum. For the building of the copy, we used an injectable mortar containing lime, metakaolin, and powdered marble – and also a mixture of quartz-bearing preparations – as material for embedding and pointing. On this basis of its properties, this composition accorded with the expectations of the monument's surroundings. Similarly to those executing the original, we worked mostly with packed limestone. Certain colours, e.g. yellow and light green, we made by mixing stones of several hues. For the laying out of the mosaic copy, we fashioned the stone into pieces of appropriate size: first, using power tools, we cut it into blocks and then broke in into cubes approximately 1 cm^3 (plus or minus 0.5 cm) using the traditional method, a steel wedge and a hammer.

The copy that was made has been in Room 20 in the main building on the villa farm since June 2012. The copy is to be found in the place occupied by the original mosaic when it was unearthed. In the creation of the copy, conservators and artists took part.

Translated by Chris Sullivan

Márta Guttmann

The Analysis of Organic Materials in Painted Surfaces Using Gas Chromatography Coupled with Mass Spectrometry (GC-MS)

The identification of organic materials is always an important issue in the analysis of paint layers, since by their kind and their condition organic components determine most proprieties of the layers. They are also the ones defining the different painting techniques.

Chemically, the natural organic materials encountered in paint layers each belong to one of the following classes: lipids (drying oils, waxes, ox gall, cholesterol), sugars (starch, gum arabic, fruit-tree gums), proteins (gelatin and glues, casein, egg white and yolk, garlic), resins (colophony, dammar, mastic, etc.), or bituminous materials (asphalt, tar, pitch). They are complex organic mixtures, of variable composition, mainly consisting of macromolecular substances or natural polymers. Identification of organic components is difficult because they undergo chemical changes with ageing, because they are present in the layer together with inorganic materials (pigments, grounds, fillers) that interfere with processes aimed at identifying them, and because samples available for analysis are fairly small (a few μg-s), where the organic material represents at 10% at the very most.

Analytical techniques range from simple histochemical or microchemical methods to more advanced ones like immunofluorescence microscopy (IMF), enzyme-linked immunosorbent assays (ELISA), Fourier transform infrared spectroscopy (FTIR) and related techniques (μ-FTIR, ATR), Raman spectroscopy, nuclear magnetic resonance (NMR), mass spectrometry (MS), and gas chromatography coupled with MS (GC-MS).

GC-MS is considered one of the most suitable methods for analysis of organic materials in paint layers, and also enables quantitative measurements. Samples need a chemical pre-treatment whereby proteins, sugars, and lipid-resinous materials are separated, broken down by hydrolysis into small molecules (amino acids, monosacharides, uronic acids or fatty acids, and characteristic fractions of resins, respectively), purified, and derivatised before GC-MS. The article presents an analytical procedure which allows the characterisation of the organic content of a paint layer starting from a unique microsample.

The procedure was applied to three groups of Transylvanian painted heritage items.

The analyses of 38 Transylvanian glass icons dating from the 19th century showed that a wide range of materials were used by the painters of the artefacts, who mostly used for their colours mixtures of a proteinaceous material and a lipid one. Data also highlighted that although the materials employed on all the glass icons under study were similar, some particularities could be observed in the painting techniques of the centres and icon painters that produced them.

By applying the procedure to samples from five Transylvanian painted coffered ceilings and a gallery parapet all dating from 17th–18th century, it could be concluded that paint layers were put onto painted woodwork with animal glue mainly. No lipid or resinous materials were identified in the samples, which accorded well with the matte aspect of the painting. An interesting specific feature was revealed in connection with the binding media used by Umling the Elder, a famous painter and joiner of the region who seemed to prefer egg for some of his colours. Specific decay of a painted surface could not be related to a specific binding medium. However, it probably could be related to the amount of animal glue in the paint layer present.

Two wall-painting samples were also analysed. The paint layer of the Renaissance prayer alcove in Siklós Castle (Hungary) contained gum arabic. In the bright and vivid blue layer on the exterior of the main church at Voroneţ Monastery in Bukovina (northern Romania) – the church dates from the 15th century –, a considerable amount of protein was detected, identified by PCA as egg.

Translated by Márta Guttman

Levente Domokos – Éva Galambos – István Sajó
Research Findings in Connection with the Restoration of an Inscribed Coffer in the Joint Unitarian–Calvinist (Hungarian Reformed) Church at Fiatfalva

The restoration of an inscribed coffer in the church at Fiatfalva (today Filiaş, Romania) shared by the Unitarians and Calvinists took place as coursework for a master's degree in the 'Restoration of Painted Wood'. This course was provided within the Department of History, Art Object and Historical Monument Protection, and Protestant Theology belonging to the Faculty of Humanities and Social Sciences at the Lucian Blaga University at Nagyszeben (today Sibiu, Romania). The restoration was directed by Prof. Dr. Livia Bucşa, head of the department, and Ferenc Mihály, a conservator. Investigation of the pigments and binders was performed at the Hungarian University of Fine Arts and at the Research Centre for Chemistry of the Hungarian Academy of Sciences, by Éva Galambos, István Sajó, and Judith Mihály.

We possess no written sources on the early history of the church at Fiatfalva. According to our researches, the present form and interior ordering of the church took shape in the wake of reconstruction operations conducted between 1802 and 1805 and between 1893 and 1897. However, in connection with the church's detailed architectural history, and also with its furnishings, fittings, and changes affecting these, more researches are necessary.

Data relating to the church appears comparatively late, during the last three centuries. Many authors have adopted the year in which the tower was built (1803) for the church as a whole, overlooking the fact that the church features on 18th-century maps made for the First Military Survey and also in a late 18th-century property inventory published by Rudolf Adorjáni. On the basis of data in the church's archive, we know that the chancel arch was demolished in the late 18th century or early 19th century (presumably before the building of the tower in 1803). In all probability, it was after the demolition of the chancel arch and after the building of the tower in 1803 that the church's coffered ceiling, which was mentioned in 1784 already, was taken down and a new one made. A number of coffers from this new ceiling (among them three with inscriptions) were incorporated following building operations conducted in 1894.

According to the church's records, decisions which would radically alter the interior of the church were taken from 1892 on. In the course of the building operations conducted in 1894, the height of the church's ceiling was raised by approximately 1 m and the height of its walls by approximately 2 m. It was at this time – using some elements of the 1804 coffered ceiling (albeit without attention to the original positioning of the coffers) – that another ceiling was made and the sizes of the doors and windows increased. It was probably then that the ceiling acquired its first layer of oil paint.

Below the oil paint applied to the ceiling were three inscribed coffers bearing data of exceptional value in connection with the architectural history of the church. Of the three inscribed coffers, only the one recording the name of the painter-joiner who made it had text that could be read with the naked eye, albeit in parts merely. On one of the other two inscribed coffers there was writing that could be seen with the naked eye, without the use of technical means, although this writing could not be read. Only during later computer work with the digital photographs could we discover the existence of the writing on the third coffer.

During the putting together of the restoration documentation, following studies of the specialist literature, local history, and archival material, more thorough research took place only after stratigraphic investigations targeting the number and composition of the paint layers. These were performed in parallel with the on-site research involving instruments and photography. Opportunities for additional investigations arose when the coffering was dismantled. As a consequence of this, surfaces became visible under the skirting which had never been painted over. The tell-tale stains and surfaces nestling in areas that had been protected served as important points of reference concerning the original condition of the coffered ceiling, and represented a good starting point for the subsequent restoration or conservation operations. The preparatory work provided data not only for the putting together of a complete restoration plan for the church, but also for historians of the locality and for art historians, too. As a result of microscopic and X-ray diffraction investigations, the pigments used by the painter were established: gypsum for white, orpiment for yellow, indigo for blue,

a mixture of indigo and orpiment for green, and cinnabar for red. The middle part of the flower motifs which today looks brown would at one time have been red, since during microscopic investigation of the pigment in transmitted light the brown particles appeared as a dark red organic dye-like isotropic material.

In the course of the work, an inscribed coffer was restored, during which cleaning, conservation, and restoration procedures were worked out that can be employed on other painted surfaces on the furniture and fittings in the church.

Translated by Chris Sullivan

Zita Sor
'What Adheres, Sticks' – An Investigation of Adhesives and Their Removal in Restoration Practice

An investigation of pressure-sensitive sticking tapes is presented through the restoration of a children's toy from the early 20th century, a toy theatre resembling a real theatre. In this type of theatre, no play is performed. Rather, a narrator tells a story whose principal scenes feature in coloured, printed depictions on a roll of paper inside the theatre itself.

The artefact is the property of the Hetedhét ('Over the Hills and Far Away') Toy Museum in Székesfehérvár. It passed to the museum as a jealously-guarded treasure of a family with eight children. This family was originally from Budapest but later moved to Kassa (today Kosice, Slovakia). The family was deported from there in 1945. The theatre was greatly esteemed in the family, whose members were so fond of it that they tried all means possible to keep it in service. They repaired it themselves, using different substances and materials from generation to generation.

The artefact consists of a wooden box, a varnished chromolithographed roll of paper 3.6 meters long, a paper front panel, a textile curtain, a metal musical box, and a paper back panel. The wooden box and the paper front and back panels had been nailed through in the course of the repairs. The nails had caused damage to both the wood and the panels. The theatre's originally removable cranking-handle, needed to operate the musical box, had been fixed slantwise to the spindle of that device. The front panel had been sewn together with thread along the edge of the torn fastening band. Because of frequent use, perpendicular and horizontal tears had developed in the paper roll, on the edges of which the weakened paper had split in many places, with pieces coming off. Attempts had been made to repair the tears on the front and reverse sides of the paper roll using various kinds of sticking tape – cellotape, glued paper cellophane, insulation tape, and textile sticking tape –, often with the application of more than one layer. The adhesive materials had soaked in among the fibres of the paper, causing brown coloration.

During conservation, the artefact was taken apart completely. Deficiencies regarding the wooden frame were made good. The paper covering was cleaned and backing paper was prepared for the purpose of reinforcing it. In the course of the work, the cleaning and conservation of the textile curtain, the musical device, the front paper sheet, the back paper sheet, and the different paper scenery elements were performed.

Of all the various parts, the paper roll represented the most difficult, time-consuming, and meticulous conservation task. The different plastic adhesive tapes were removed from the surface using a heated iron spatula adapted for the purpose that was supplied with a temperature regulator. One kind of adhesive was removed using a crepe eraser. Fragments of the paper roll, which had disintegrated into many hundreds of pieces, were kept in place using temporary adhesive strips for the duration of cleaning with solvent, which after lengthy experiments, finally took place using a mixture consisting of two parts methyl-ethyl-ketone and one part acetone, with immersion. After careful washing, repairs to the paper roll were performed using a special table. Throughout the above-mentioned treatments, it had to be kept in mind that because of the sensitivity of the varnish (barium sulphate mixed with kaolin), mechanical impacts affecting the surface had to be kept to a minimum. So that the musical theatre could be shown in operation, a copy was made of the paper roll – in the interests of preserving the condition of the newly-restored original one – and the copy placed in the wooden box. A reconstruction of the missing tympanum part of the theatre was made on the basis of an analogy.

The following is an extract from a letter sent to the museum by Mrs. Béla Thurnay, née Vilma Schulek, the donor of the artefact: 'At the end of the 1950s, the grandchildren were already born. Of them, the eldest ones remember the theatre and today regret that we were unable to have it repaired. By that time already, we didn't use it much. It was very old. I guarded it jealously. Placed in a box in the attic, it was awaiting a better fate. In the end I decided to donate it to the toy museum where they could have it repaired and where children could see it from a distance, but could not damage it. My wish is that many children should look with joy at this theatre, which is so dear to us. I would like to thank the 'master' who gave it new life. He must have had a lot of work with it…'

Translated by Chris Sullivan

Ildikó Beöthyné Kozocsa – Márta Kissné Bendefy – Katalin Orosz – Marianne Érdi
The Structure, Behaviour, and Deterioration of Parchment and Untanned Hide from the Viewpoint of Restoration of Works of Art

In the present volume, two studies by the above authors are published on closely connected themes. They appear sepa-

rately, for the sake of easier viewing. The first surveys the structure and chemical make-up of stripped animal skin, the raw material for parchment and untanned hide, and also the physical and chemical changes that occur in it during its processing. In addition, it presents the main types of artefacts made from these two materials, their reactions to different impacts from the environment, and the types of impairment characteristic of them. The second study surveys the possibilities for the restoration of the above materials.

Today, by the term *parchment* we understand any limed, fleshed, unhaired, untanned, raw skin which has been dried stretched out and whose surface has been made even and smooth by rubbing and scraping. Skin prepared in this way is opaque, soft, thin, velvety to the touch, and easily pliable. Many written documents from the Middle Ages onwards tell of its mode of preparation: according to these, there were only a few differences in the materials used and in the steps to be followed. *Untanned hide* is fleshed and in most cases unhaired raw skin. The technology for its production can be very different from district to district and from culture to culture, and the precise steps have not been sufficiently documented, unlike those for parchment. The simplest production method is to scrape off the flesh layer from a freshly removed animal skin while that skin is still moist, but this is often preceded by washing and soaking even. Moderate preparation of the surface (smearing with plant-derived liquids, shaping above a fire, etc.) also takes place occasionally, which may have the effect of partially tanning the skin.

Artefacts made from parchment and untanned hide can be grouped according to a number of criteria. Examples are the artefact's function, its materials, its spatial form (two-dimensional or three-dimensional), and the type of custody/collection in which it is found. Parchment and untanned hide artefacts include authenticated documents (charters, treaties), works of fine art (miniatures, pastel pictures), movable artefacts (books, shadow puppets, fans), resonating membranes stretched on structures (drums, stringed instruments), and artefacts with hard surfaces beneath (boxes, cases, rocking horses), as well as clothing and materials for clothing (Inuit underclothes, special metal threads, sequins).

Using untanned hide and parchment is in many cases more advantageous than using tanned leather. Processing them requires a good deal less time and expense, and when they are moist, they can be shaped very well; stretched on a mould, they assume their required shape after drying. Their material has a closed structure and resonates well, meaning that they are suitable for the making of musical instruments. Also, thanks to their dense structure, their resistance to wear and tear is considerable. Parchments are thin, pliable, but strong also; because of this, they are good as bearers of writing. Besides their numerous attractive properties, however, they are from many points of view more vulnerable than their tanned cousins. Since they do not contain tanning agents, they are capable of absorbing water more quickly and in greater quantity. Through changes in relative humidity, the secondary bonds stabilising their strung fibre structure may rupture, causing deformation, at higher temperatures shrinkage that is irreversible, and the production of gelatine. In the presence of water, hydrolysis, too, can take place, during which primary (covalent) bonds break down, reducing the strength of the material. Through the impact of the inks and pigments on them, parchment manuscripts have a heightened sensitivity to different types of electromagnetic radiation. By means of photo-oxidation, these break down the covalent bonds. The structure of their basic material, the physical and chemical structure that develops during processing, influences their behaviour fundamentally, not just on the shelves of collections or in glass cabinets in exhibitions, but during restoration also.

Translated by Chris Sullivan

Ildikó Beöthyné Kozocsa – Katalin Orosz – Márta Kissné Bendefy – Marianne Érdi
Conservation Possibilities for Artefacts Made from Parchment and Untanned Hide, and the Impact of Treatment on Works of Art

In Hungary, the beginnings of a scientific approach to parchment restoration may be linked to the 'Corvina programme' launched in 1983. In the course of this, conservators at the Conservation Laboratory at the National Széchényi Library (OSZK) endeavoured, in co-operation with a number of different institutions, to rescue parchment codices at the University Library in Budapest and at the National Széchényi Library that were in very poor condition. The programme aimed to chart the programme's investigative possibilities for parchment and to develop the most appropriate conservation methods for the volumes. The investigations and experiments were directed at disinfection, the securing of coloured materials and metal foils, and the strengthening and repair of the parchment. It was at this time that Hungarian conservators developed a technology of parchment moulding and worked out a 'recipe' for a parchment pulp experimentally; these are now known across Europe as a Hungarian method. As a result of the programme, the conservation of 31 parchment codices was performed by conservators at the National Széchényi Library and the University Library. As well as these written documents, in the 1970s and 1980s there were also a number of theoretical and practical findings and results in the field of the conservation of museum artefacts made from hide.

The three decades that have elapsed since then have brought many new ideas and observations. Accordingly, this study takes into account the current situation of parchment and untanned hide conservation, and also the methods it employs. Additionally, the study summarises the state of knowledge today and the research findings of the last years. The authors endeavour to give a picture

of the more important conservation problems as regards the main types of artefacts made from parchment and untanned hide, as well as to present the advantages and disadvantages of the materials and procedures employable in the course of conservation. In their work, they relied first and foremost on the lessons gained from practical work performed during the training of applied arts conservators at the Hungarian University of Fine Arts, but also on research reported in the specialist literature.

The survey showed that the substances and procedures developed in the heroic age of the 1980s are today already well known, that many are successfully using them, and that the earlier methods are being continually developed further. There is a need for continuous rethinking, because a lot of things have changed in the last decades:

- Environmental and health rules have become stricter, and conservators, too, have become much more aware in this field. With the help of the Internet, it has become easy to find out about the effects of chemicals on the basis of the data-sheets concerning them. Even when not a danger to the work of art under treatment, some substances (e.g. methyl alcohol, benzene, thymol) can no longer be used for reasons of human health, while others (e.g. sperm whale oil) have been dropped in the interests of nature conservation.

– Conservation expectations have changed. While a few decades ago the primary standpoint was that a work of art should be as clean, as smoothed off, and as similar to the original as possible, today the aim is not the removal of marks made by use.

– In the past decades, in the interests of preserving the written cultural heritage primarily, serious research programmes have dealt with the investigation of parchment as a material. Owing to these, we now have a more nuanced picture regarding the kinds of changes that take place in it during the manufacturing process and when it ages. We know that as it decays, parchment's shrinkage temperature decreases, and that as it ages parchment is less and less capable of absorbing moisture and does so more and more slowly. On the other hand, as it ages it dries out at a faster rate. It is a known fact that its temperature increases as it takes in moisture, which may increase the danger of gelatinisation. It has also been observed that although the 50–55% RH recommended earlier best ensures the elasticity of the collagen, chemical decay can be slowed down if this is reduced to 40–45% during storage.

– In many cases, we have no concrete information on the effects of different substances on parchment and untanned hide as materials used in works of art. However, the above-mentioned researches have proved that these materials react to outside influences in a much more complex way than was earlier thought. With this in mind, a worthwhile goal is to conduct on works of art only those interventions which are absolutely necessary from the point of view of their survival. We should try to assess their condition by measuring their pH value and the shrinkage temperature, minimise as much as possible treatments performed with solutions and mixtures using water, and perform softening by means of slow, gradual, humidification and slow drying. Also, with the help of experiments, we should attempt to reduce the risks attendant on the different treatments and regularly check the condition of the artefacts conserved earlier on.

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Katalin Puskás

An Experiment Regarding Leather Affected by Red Rot, or an Episode from the Restoration of a 19th-century Photograph Album

Many of the covers of leather-bound books and other leather artefacts found in libraries and other public collections are susceptible to red rot. This is connected with changes, in the 19th century, to production techniques for vegetable-tanned leathers, and also to the sudden change in the quantity of harmful materials polluting the air.

We encountered this very problem when restoring the photograph album. Therefore, when treating the leather covering we decided to try out in Hungary a chemical developed by colleagues at the Leather Conservation Centre in Northampton, England, and used successfully by them. As well as relating in brief the different steps in the restoration work, the present piece of writing gives a detailed account of the laboratory experiments and observations which preceded our use of the chemical on the leather covering of the album. In this case, the aim of the restoration was to halt the red rot, to reduce the acidity in the leather, and to stop the leather crumbling away. This type of decay in leather is called red rot when the colour of the leather changes from brown to red and when its pH value, cohesion, and, consequently, its shrinkage temperature also decrease. Depending on the degree of the problem, the leather's strength changes: it splits into different layers, flakes off, and, in more serious cases, turns completely to dust. This phenomenon was observed in 1905 already. Later, with the investigation in the 1920s and 1930s of the tanning agents used, a search was launched for the causes of red rot and for solutions to the problem. After many unsuccessful experiments, researchers directed their efforts towards working out a revolutionary new procedure: re-tanning. Employing a procedure using aluminium salts that was already known from leather-making, they showed, in the 1940s, that using this procedure on leather originally tanned using vegetable substances increased the resistance of the leather to agents causing acidity-driven decay. When the findings of numerous experiments had been appraised, a chelate of aluminium isopropoxide and ethyl acetoacetate (short name: aluminium alkoxide) was found to be the most suitable. Later on, a suitable treatment technique was worked out.

For technical reasons, we could obtain only aluminium isopropoxide for the album's restoration. Experiments were necessary because the specialist literature did not extend to every detail regarding its use. We sought out those solvents for the compound which would be least harmful to human health and which would not change the condition of the leather. We wanted to check whether the white deposit on the surface would detach, and if it would, whether it could be removed. In addition we wanted to determine the amount of the chemical necessary for the treatment of a particular area of leather.

Since risky experiments of this type could not be performed on the work of art itself, we used test materials similar to the original leather. We worked with different solvents and with solutions of different concentrations in order to select the most suitable on the basis of experimentation. The effectiveness of the treatment could be observed most of all through changes in the pH value. We therefore measured the pH values of leather samples after treatment, subsequently comparing them with the pH values determined before treatment. It could be seen clearly that the values increased, albeit by a few tenth parts. The more chemical was put on the leather, the greater its property of reacting with the free sulphates and neutralising the acidity, thus raising the pH value and stabilising it at a value already more favourable for the leather. This was continued during the time that we could find in the leather a chemical capable of sufficient transformation and in the air a level of humidity that was likewise sufficient.

Having assessed our observations, we arrived at the following finding. Of the solutions used during the experiments, the one containing 25 ml isopropyl alcohol, 25 ml mineral spirit, 50 ml toluene, and 1 g aluminium isopropoxide proved to be the most suitable. We used this to stabilise the leather covering of the artefact.

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