The Restoration of the Apor Codex With a Preface by László Boka,* Director of Academic Affairs, National Széchényi Library, Budapest

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Abstract: The Apor Codex is one of the earliest Hungarian linguistic records, its value is further increased by its preserved original Hungarian Renaissance binding. The pages of the codex were destroyed by ink corrosion; since this destructive effect does not cease by itself, it has become necessary to restore the codex in order be preserved. The restoration was completed as a joint project of the National Széchényi Library Budapest, Hungary, the Szekler National Museum Sfântu Gheorghe, Romania, and the Romanian National Library Bucharest, Romania, thanks to the exhibition of early Hungarian linguistic records organized in the framework of the programme series Year of the Hungarian Language. The restoration took place in the National Széchényi Library, with the financial support of the Balassi Institute.

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PREFACE

The Apor Codex Renewed

The preservation, restoration, and exhibition of the five hundred-years-old codex was accomplished as a result of serious efforts of diplomacy and expertise

The middle-sized, octavo book is the fourth earliest Hungarian coherent narrative linguistic record, considered to be of literary importance. It is part of the earliest preserved Bible translation in Hungarian, the so-called Hussite Bible. The codex comprises the psalms of the mentioned Bible translation, completed with hymns, canticles, and two additional texts of Premonstratensian origin. Its binding was made at Buda, commissioned by the Premonstratensian nuns of the Nyulak island monastery, in the early 16th century.

The codex, which bears the name of its former owner, Baron Péter Apor, was discovered in 1877, when, due to a descendent of the Apor family, it got into the possession of the Cserey family. The widow of János Cserey placed it in the Szekler Museum founded by her at Imecsfalva, so the highly damaged codex arrived at its final resting place, the Szekler National Museum, meanwhile relocated to Sfântu Gheorghe (Sepsiszentgyörgy), in 1880.

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The most valuable piece of this institution arrived to Budapest at the beginning of the 1940s, a facsimile edition was published with the introduction of Dénes Szabó in 1942 (series Codices Hungarici II). It has been long unknown that, despite its facsimile edition published in Cluj (Kolozsvár), the codex – formed as a colligate of three independent manuscripts – survived WWII in the capital of Hungary. It is probably because of this that it has been considered lost even by experts for quite a long time, since the transport rescuing book rarities and other valuable works of art from northern Transylvania to the West during WWII was bombed, therefore it was assumed that the Apor Codex was among the books and other valuables perished. The codex was finally returned to Transylvania in 1953, but it has been guarded in a safe ever since, and rarely removed from it, understandably, during the communist regime. All this while, the condition of this piece of heritage was continuously decaying, the already degraded codex, which was not written on parchment, but on paper, had probably been soaked on repeated occasions, even its intact pages fissured because of the high acid content of the ink, and, since the surroundings of the letters were rapidly destroyed, the letters themselves simply began to fall out.

In order to avoid its complete destruction, the codex' restoration has become imperative; nevertheless, it has not been at all an easy process! The preserving museum tried to organize its restoration repeatedly in post-communist Romania, but it has never been possible to start the actual work. At the same time, the institution has always supported the idea of the codex' restoration in Hungary, as it was its basic interest not to let this highly appraised piece of art be destroyed. In response to the failures of the Transylvanian efforts, the National Széchényi Library has repeatedly offered its assistance, but unfortunately it has always met with obstacles. Beginning with the second half of the 1990s, the Romanian Ministry of Culture responsible for issuing the permissions for the restoration has come up with diplomatic excuses guised as professional against the restoration abroad.

In the beginning of 2008, following a several-years-long period of preparations, the National Széchényi Library embarked on a singular enterprise, setting out the preliminary works for the comprehensive exhibition of Hungarian linguistic records entitled *"Látjátok feleim..." Magyar nyelvemlékek a kezdetektől a 16. század elejéig* (Hungarian linguistic relics from the beginnings to the early 16th century). The idea of the preservation and restoration of the codex, jointly with its loan for the exhibition, has been formulated again during the preparations for the exhibition. From that moment on, the professional and diplomatic efforts on the part of the National Széchényi Library were conducted by the writer of these lines; recognizing the positively changing relations and possibilities with Romania's adherence to the European Union, these efforts also envisaged the enlargement of professional institutional cooperation. Drawing also the Romanian National Library into the loan project, a three-sided agreement and exhibition loan contract was elaborated (the owner institution together with the two national libraries), serving as a framework for the lengthy process of acquiring the necessary permissions, which eventually ended with the lending of the codex for one year and a half, in return for its complete restoration and digitization![1]

[1] Let us also mention here the names of former Director General István Monok (NSzL), Director General Elena Târziman (RNL), Director Mihály Vargha, and Library Manager Hunor Boér (SzNM), former Director General Éva Lauter (Balassi Institute), and Attila Cseke, state secretary

During this while the experts of the Hungarian National Library and the museum in Sfântu Gheorghe began the assessment of the condition of the codex, and prepared the restoration works. The codex arrived at the National Széchényi Library in the autumn of 2008, and with regard to its poor condition, the delicate and lengthy restoration process – with the expertise of restoration expert Zsuzsanna Tóth – started already the next day, financially supported by the Balassi Institute.

As it was revealed, the manuscript of the Apor Codex consisted of three distinct unknown handwritings and three kinds of ink, therefore one of the basic difficulties in the course of restoration was the variable acid content of the inks. At any rate, when the successful exhibition *"Látjátok feleim…" Magyar nyelvemlékek a kezdetektől a 16. század elejéig* opened in October 2009, the codex restored over a year could be admired not only by experts, but by the public at large as well! As a major spectacle and curiosity of the event, all the three codices containing parts of the Hussite Bible were exhibited together for the first time in their history. The Codex of Vienna, the earliest of the three, is in the possession of the National Széchényi Library, the Codex of Munich, containing the Gospels of the New Testament, was loaned from the Bayerische Staatsbibliothek, and the Apor Codex, now saved from destruction, worthily presented the psalm fragments of the Hussite Bible.

In December 2009, the Hungarian Ministry of Education and Culture awarded the *Magyar Nyelv Emlékérem* prize to our institution for the organization of the exhibition and the exemplary restoration of the codex. The reincarnated codex was delivered back to the Szekler National Museum in Sfântu Gheorghe in the spring of 2010, where it was received with a special exhibition and scholarly session organized in its honour. The exhibition version is preserved in a copy in the National Széchényi Library, while the restoration and digitization has laid the foundations for the publication of the awaited critical edition, also as a result of institutional cooperation, possibly by the end of 2012. This version, completed by a transcription, will be published in the Magyar Kódexek (Hungarian Codices) series.

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Introduction

The codex was named after its first known early modern owner, Baron Péter Apor,[1] and

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at the time (Romanian Government, Governmental Chief Secretariate), who all played a part in furthering the matter.

[1] The earliest possessor note in the codex, "Petrus Apor," belongs in all probability to Baron Péter Apor, although it may also refer to his great grandchild by the same name (Hunor Boér, "Adatok az Apor-kódex és a Csereyné-kódex kutatástörténetéhez" [Completions to the research history of Apor and Mrs Cserey codices], in *Erdély reneszánsza* [Transylvanian Renaissance] [Cluj: Erdélyi Múzeum-Egyesület, 2009], vol. 2, 267–285.) The generally accepted owner is however Baron Péter Apor, born in Altorja in 1676, and died at the same place in 1752. He lost his father in the year he was born, his first guardian was Farkas Apor, the second one his uncle, István Apor. He was educated at the convent of Cluj-Mănăştur (Kolozsmonostor) since 1686, then by the Jesuits at the university of Trnava (Nagyszombat), where he acquired a degree in philosophy and law. He

it contains one of the earliest Hungarian linguistic records. Several attempts have been made for its restoration, the first in 1942–43, when the volume was taken to Budapest for a facsimile edition. It was already recognized at that time that the pages were damaged by ink corrosion. Despite the continuous negotiations, the restoration was eventually hindered by WWII. The good-quality copies of the pages, which were published in a facsimile edition[1] with the introduction of Dénes Szabó, were also made in Budapest on that occasion. A long break followed afterwards, then, after 1989, the issue of the codex's restoration was again repeatedly raised,[2] until it was eventually finalized as a joint project of the National Széchényi Library, the Szekler National Museum, and the Romanian National Library in 2009–2010.

1. Information and description of the codex

The codex is kept in the collections of the Szekler National Museum, its shelfmark is A. 1330.

1.1. The Apor Codex

The manuscript collection was copied in the late 15th or early 16th century, its binding was probably made in the workshop of the Dominicans from Buda around 1520. The codex probably belonged to, and was used by Premonstratensian nuns. The volume currently contains fragments of three works, the psalm book of the Hussite Bible, comprising the translations of psalms 56–150 with hymns and canticles and the liturgy of Marian feasts; a part entitled *Három jeles szolgáltatás* (Three noted services); and the translation of the passion-dialogue of Saint Anselm.[3] The Hussite connections of the codex have been questioned lately on repeated occasions.[4] Besides these three works,

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was a memoir writer, poet, family history writer. His major work is entitled *Metamorphosis Transylvániae, azaz Erdélynek régi együgyű alázatos idejében való gazdagságából e mostani kevély, cifra, felfordult állapotjában koldusságra való változása* (Metamorphosis Transylvaniae, that is, Transylvania's change from its richness in its old, simple, humble times to beggary in its proud, gaudy, overturned state today) is an important source of the history of culture and mentalities (Baron Péter Apor entry in: *Magyar Művelődéstörténeti Lexikon* (Lexicon of Hungarian cultural history) (Budapest: Balassi, 2003), vol. 1, 125–126. More on Péter Apor: see the afterword by Gyula Tóth in Péter Apor, *Metamorphosis Transylvaniaé, azaz Erdélynek változása* (1736) (Budapest: Magyar Helikon, 1972), 97–107.

[1] Dénes Szabó, "Introduction," in *Apor-kódex* (facsimile edition), Codices Hungarici 2 (Cluj-Napoca [Kolozsvár]: Erdélyi Tudományos Intézet, 1942).

[2] Based on the oral communication and the recorded handwritten elenchus of Hunor Boér, librarian (Szekler National Museum).

[3] Edit Madas, "Apor-kódex," in Eadem, ed. *"Látjátok feleim..." Magyar nyelvemlékek a kezdetektől a 16. század elejéig. Az Országos Széchényi Könyvtár kiállítása, 2009. október 29 – 2010. február 28.* (Hungarian linguistic records from the beginnings to the early 16th century. Exhibition of the National Széchényi Library, 29 October 2009 – 28 February 2010) (Budapest: Országos Széchényi Könyvtár, 2009), 261. Cf. Eadem, "Apor-kódex," in *Magyar Művelődéstörténeti Lexikon*, vol. 1, 126–127.

[4] Cf. most recently György Galamb, "A Huszita biblia és a ferencesek. Megjegyzések az első magyar bibliafordítás kérdéséhez" (The Hussite Bible and the Franciscans. Notes on the problem of the first Hungarian Bible-translation), *Egyháztörténeti Szemle* 2 (2009): 3–12.

the codex contained one additional part, which however was removed, probably because of reasons connected to its content.

On the basis of the notes on the pastedown, it is possible to follow the owners of the volume, probably ever since it got into private possession. Arguably, the first known owner of the volume was (later Baron) Péter Apor, the writer. He probably acquired the volume from the Vienna court library in 1699, on the occasion of his marriage, taking it to be a "Corvina" codex, from among the books surviving the Turkish occupation of Hungary, and transported to Vienna from Buda after its recapture from the Turks in 1686. The codex got in the possession of the Szekler National Museum, at that time located at Imeni (Imecsfalva, Covasna county, Romania), as a gift of Mrs Gergely Pünkösti Baroness Zsuzsánna Apor, great granddaughter of Baron Péter Apor, the writer. The Hungarian Academy of Sciences asked for its loan for the purpose of publication in 1878, and it was returned in 1880 to the Museum, relocated in the meantime to Sfântu Gheorghe, where it is also kept today.[1]

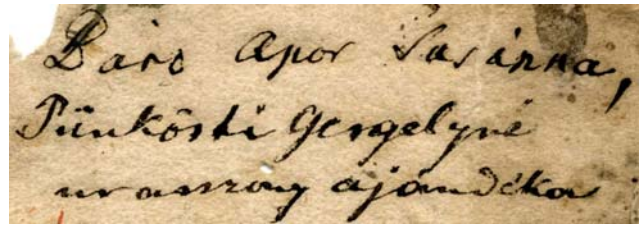


Fig. 1–4. The notes visible in the volume enlist the early modern owners

1.2. Description of the binding

The codex is not very large in size, well readable, its leaves are easy to turn, the size of the boards is 219 mm x 144 mm. The wooden boards are between 5 and 6 mm thick. The thickness of the spine cannot be assessed with great precision due to the warping of the wooden board and the many missing leaves, but it probably was around 33 mm.

In accordance with Renaissance board decoration, the boards of the Lányi and Apor codices were decorated by narrowing frames with stamps filling the frames.

[1] Boér Hunor, "Adatok az Apor-kódex és a Csereyné-kódex kutatástörténetéhez." The mentioned edition of the codex: *Apor-kódex*, ed. Áron Szilády, Nyelvemléktár 8 (Budapest: Magyar Tudományos Akadémia, 1881).

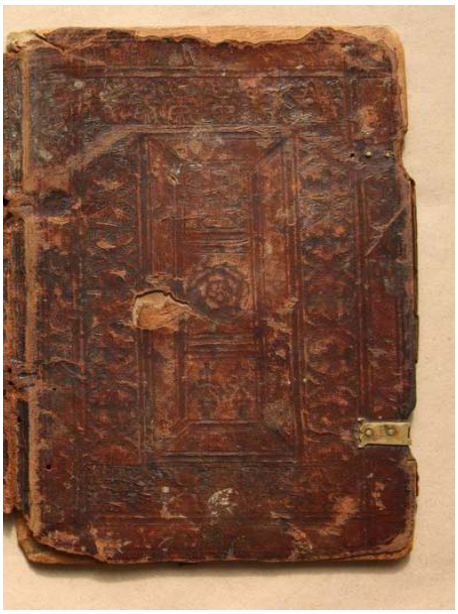


Fig. 5. The binding board of the Apor Codex

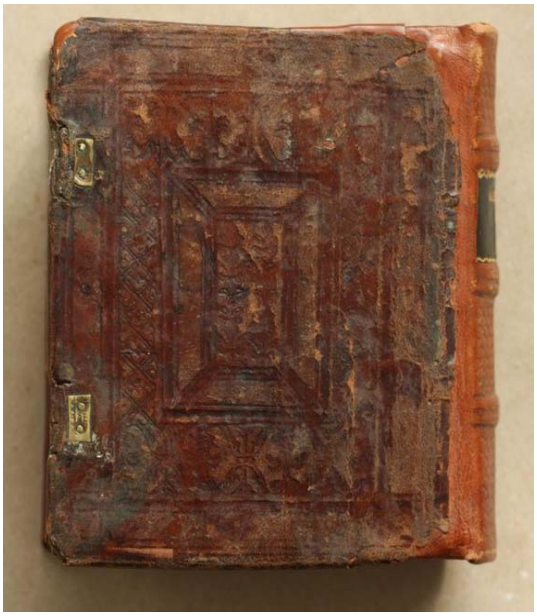


Fig. 6. The Lányi Codex

The book is covered in reddish-brown, blind stamped, full leather binding. Of the Renaissance-type bindings made in Buda, the binding of this volume, based on the stamps decorating it, belongs to the group of the Lányi codices.[1] Many of the stamps decorating the leather binding is identical with those decorating the Lányi Codex (impressed contoured palmette, grid pattern with heart, small blossom, floral pattern).

Figs. 7–13. Stamps of the binding

Rosette

Floral pattern

Palmette row formed by single stamps

[1] Marianne Rozsondai, "Eredeti kötésben fennmaradt nyelvemlékeink" ([Hungarian] linguistic records preserved with original bindings) in Madas, ed., "Látjátok feleim...," 179. On the binding see also: Éva Sz. Koroknay, *Magyar reneszánsz könyvkötések* (Hungarian Renaissance bookbindings) (Budapest: Akadémiai, 1973).

The grid pattern of the spine is identical with the frame on the board of the Lányi codex (to the left)

A row of palmettes made by roll

Blossom with five petals

Fig. 14. Blind stamped binding boards

The binding was made of goatskin. The stamps on the front and back covers are identical. The panels are formed by gradually narrowing frames in a central organization. The outmost frame is stamped with blossoms with five petals. The second frame from the sides is filled with palmette decoration. The curiosity of the frame decoration is that the palmettes of the header and footer sections differ from the palmettes decorating the side sections. The identical pattern is found in two distinct designs, the palmettes in the header and footer sections are in relief stamps, and were made by rolls, while the vertical side sections are intaglio stamps. These latter palmette rows were made by two, alternately used single stamps. The next, narrower frame was undecorated, but the corners of the bordering frames are connected by line pallets. The innermost frame in the centre of the board delimits a rectangular field. The central field is also divided into three parts by line pallets and double line pallets. The two extreme fields of the three are decorated by a

couple of outward oriented floral patterns. The central field, in the middle of the cover, is stamped with a large, gothic rosette. The line pallets forming the frames consist of a threefold line, a thick one and two narrow ones on the sides of the first.

Not only the boards, but the spine of the volume is also blind stamped. The leather bands and the endband supports are emphasized by transverse line pallets, which do not run over the boards. The line pallets are identical with those used on the boards. The fields between the leather bands were decorated by transversal floral patterns similar to those in the central fields of the boards. The fields below and beneath the leather bands are stamped with grid pattern. Within the grids of this pattern one may find hearts facing each other.

The caps of the volume are missing, therefore their form and height can no longer be assessed, but it was clearly visible on the edge of the remaining spine leather that the endbands were also emphasized by line pallets.

The turn-ins of the leather cover were folded in at the corners and the overlapping strata were cut with one incision, then the cut-off and unnecessary parts were removed. The edges of the turn-ins joined thus in angle on the corners. The trace of the incision of the tool and the overrun of the cut is well perceivable on the inner side of the wooden board. The split seen today between the edges of the turn-ins is due to the drying out and shrinkage of the leather.

Fig. 15. The cut-in corner, with the straight cut of the turn-ins well visible

Fig. 16. The trace of the incision used to make the cut-in corner on the inner side of the board

There were no line pallets applied to the turn-ins of the book. The turn-ins were cut round after leather covering, but not with a ruler. The trace of the cut and the torn edge of the leather was also preserved on the wooden boards.

There is a dark stripe perceivable on the turn-ins which raises the question, very difficult to answer, whether the binding leather was dyed or not. The use of both kinds of leathers – dyed and not dyed – was customary. The reason was that vegetal tanning already coloured the leather and dyeing was only used to change the colour of tanning. If the leather used for binding was dyed, then it was usually done on the almost finished book, after the leather covering of the boards. In this case the turn-ins are only partly covered with dye. Such a darker stripe can be seen on one of the turn-ins. However, what makes the decision on whether or not it was dyed difficult is the fact that the leather

turned darker anyway on the wooden boards and the repeated damage by water could have made clear contoured traces similar to dyeing.

Fig. 17. Pigmentation on the turn-in

The sewing of the codex was made on two double leather bands made of white leather, with link stitch. The endband supports, made also of white leather, were attached to the sheets in the same instance of sewing. The sheets were sewn across, the leather bands on the spine were completed to reach the thickness of the sheets by repeatedly coiling the sewing thread. During sewing, leaving one sheet at the link-stitch, they looped under the sheet beneath it, then forming a chain-stitch, they returned to the upper sheet, and continuing the sewing, they went round the endband support. The endband support, similarly to the leather bands, was thickened by repeated coiling, then they moved to the next sheet by looping the leaving thread. The knot on the loop of the endband support falls to the edge.

Fig. 18. Fragment of the spine with the endband and the looped link stitch

Uncommonly, sewing was made with a double thread; the reason could have been that the sewing thread was found too thin. The two threads were loosely twisted during the sewing. The twist of the sewing thread is S shaped, as well as the twist of the two threads.

Fig. 19. The twisted sewing threads

The sewn bookblock, due to the sewing technique (since the endband support fixed during the sewing raised above the fore edge), could no longer be cut round, therefore the sheets were cut to size after the composition of the colligate, but before the sewing.

The endbands were sewn on the prepared supports once the bookblock was already sewn. Two colours of endbands were used on the codex. This type of endband was sewn with two colours and two needles, in this case with four threads for each. The embroidering threads are reddish-brown and raw coloured.

Fig. 20. The endband in two colours, the threads hanging from the detached endband fixed the endband support under the embroidery

Once the bookblock and the endbands were sewn, the ends of the leather bands and endbands longer than the spine were fixed with a wooden nail to a specially made recess on the outer side of the boards.

Fig. 21-22. Fixing of the leather bands and endband supports on the outer side of the wooden boards

The spine of the book was not, or only slightly, rounded, thus when the book was ready, the spine was already straight. This straight spine is typical for this kind of binding.

The spine was lined with narrow strips of parchment between the leather bands, the ends of the strips longer than the spine were pasted to the inner side of the boards. The parchment strips lining the spine contained no writing.

Fig. 22. The ends of the parchment strips used for lining the spine were pasted to the inner side of the boards

The wooden boards were made of beech, their inner side was bevelled along the edges, and left straight on the spine side. The outer side of the boards was steeply bevelled on the spine side through the entire thickness of the boards, therefore its edges are sharp. The boards are not only bevelled on the inside, but also on the outside at the head and tail. The bevelling is hardly visible on the outside, it is irregular, and seen almost exclusively in side illumination.

Fig. 23. Score marks of a coarse file visible on the outside of the board

The bevelling of the boards at the head and tail, both inside and outside, was made by a coarse file. The bevelling of the front side and the spine side is much smoother, it can be stated for sure that it was not made by the same tool.
On the edge of the front board a special recess was shaped for the clasp, and on the edge of the back board for the turn of the strap. The recess on the edge of the front board is significantly wider than the clasp, and in the middle of this recess there is another, narrower recess, which serves for the fastening of the clasp on the strap to the catch plate on the board. This design of the board edge is typical for this kind of clasp.

Fig. 24. The recess for fastening of the clasp on the edge of the wooden board

A recess was made on the board for the end of the straps with the clasp, thus the straps were levelled with the board. The end of the leather bands and the endbands were also recessed into the boards. Under the leather bands the bevelling was made at a smaller angle, which raised the bands and probably served to make them more elaborate. No such raising is seen under the straps of the endbands; moreover, at the points where the straps mount the boards, although observation is made difficult by the boards being worn, one can see the rounding of the corners and a slight, arched recess.

Fig. 25. The recess formed under the leather bands on the bevelled wooden board

Fig. 26. Inner side of the front board

Fig. 27. Outer side of the back board

The straps were folded, the turned-in edges of the strap were matched in angle on the back of the strap. The strap was decorated with three blind-stamped line pallets, identical with the framed stamps of the boards. No enforcement was inserted in the strap.

Fig. 28. Fragments of the straps decorated with line pallets

The pastedowns of the volume were made of white handmade paper, but only pieces of these pasted on the inner side of the boards were preserved. The structure of the pastedown cannot be established due to its fragmentariness. There was no watermark on the pastedown fragments.

Fig. 29. Clasp belonging to the type of arched clasps

The clasps of the codex were made of brass plate, and belong to the typical form of arched clasps prevalent after 1500. The hooks attached to the board are bent at the fore, undecorated. The clasps on the strap have been lost. The plates fixing the straps, again matching the type, are simple rectangular shaped. The hook and the strap fixing plates were attached to the boards by brass nails with almost no head.

1.3. Sheet distribution of the codex

After disbinding the codex, I had the opportunity to establish the distribution of sheets and compare it with the literature on this subject. The sheet distribution found, taking into account the fragments large enough to be adequately evaluated, corresponded to that defined by Dénes Szabó.

At the beginning of the codex I found the fragments of, demonstrably, two pairs of leaves of two sheets, rolled over a stitching thread; moreover, at least one more thread was also visible in the opening, but it was impossible to decide whether it belonged to a sheet, or fixed the pastedown. It was difficult to assess the number of the missing sheets because the sheets were stitched with double thread, while the missing leaves were followed by a large number of fragmentary leaves. This assessment was made even more difficult by the fact that the paper fragments of the mutilated first sheets were rolled over the also damaged pieces of stitching thread.

During the restoration works, the decision was made that the pages missing from proven places in the book will be replaced. The reason was not only the fact that the

completed pages were better indicators of the amount of missing pages, but also because this way the volume could be restored in its original thickness.

To mark the pages, I used the book's original page numbering written in pencil for a better identification. However, this page numbering did not observe the leaf fragments at the beginning of the book, nor the missing pages. This renders more difficult both the page references to the volume, and the understanding of sheet distribution.

Therefore, in order for a better manageability, I used a T(töredék [fragment]) and numbering for the triangle-shaped fragments, and also numbered the completed pages in case of multiple missing leaves, in continuation of the page numbering of the last preserved page. This temporary marking facilitated the composition of the sheets. Since I did not want to mark the originally numbered pages with new numbering, I only wrote the continuous numbering in the sheet distribution list presented below. Within the list the "original page numbering" of the volume written in pencil is formatted in bold letters, my own numbering of the page fragments in regular letters, and the reconstructed page numbers of the missing pages in italics. However, probably this continuous numbering in italics still does not accurately reconstruct the original page numbers of the codex. This imprecision derives from the fact that only the attested missing pages were replaced. Based on the extant fragments, the sheet distribution reconstructed below makes up a volume of 356 pages, however, only 186 numbered pages can be found today in more or less complete form, plus 42 unnumbered, triangle-shaped page fragments with writing. If we also take into consideration that only two pages of the last two sheets contained writing (while 26 did not), the losses of the codex still amount to 122 written pages…

The page numbering of the codex reconstructed this way counts 60 pages, that is, 15 pairs of leaves (14 pairs at the beginning, and 1 pair at the end of the volume) less than Dénes Szabó's sheet reconstruction.

The existence of these leaves is highly presumable on the basis of the range of sheets, but it cannot be proved based on the fragments alone.

Below I shall describe the pairs of leaves and sheets reconstructed as presented above, marking also the sheet distribution described by Dénes Szabó. I list the pairs of leaves one by one, with *page numbering*, according to their place in the sheet. (The last line within a sheet is the middle of the sheet).

Sheets of the Apor Codex:

Szabó Dénes: -3 VI (three missing sheets consisting of 6 pairs of leaves)
Only two sheets were replaced:

Sheet 1.
1-2 empty leaf — empty leaf *7-8* with small fragments in the line of the spine
3-4 empty leaf — empty leaf *5-6* with small fragments in the line of the spine

Sheet 2.
9-10 empty leaf — empty leaf *15-16* with small fragments in the line of the spine
11-12 empty leaf — empty leaf *13-14* with small fragments in the line of the spine

Szabó Dénes: +VI (-1-11-12)

Sheet 3.
17-18 empty leaf — empty leaf *39-40*

19-20	T1 — empty leaf	*37-38*	no watermark
21-22	T2 — T9	*35-36*	bishop's mitre watermark
23-24	T3 — T8	*33-34*	no watermark
25-26	T4 — T7	*31-32*	no watermark
27-28	T5 — T6	*29-30*	bishop's mitre watermark

Szabó Dénes: +VII (-1-2-13)
Sheet 4.

41-42	empty leaf — T20	*67-68*	no watermark
43-44	empty leaf — empty leaf	*65-66*	(narrow paper fragment at mid-sheet)
45-46	T10 — T19	*63-64*	bishop's mitre watermark
47-48	T11 — T18	*61-62*	no watermark
49-50	T12 — T17	*59-60*	bishop's mitre watermark
51-52	T13 — T16	*57-58*	bishop's mitre watermark
53-54	T14 — T15	*55-56*	no watermark

Szabó Dénes: +VI
Sheet 5.

69-70	T21 — **21-22**	*91-92*	balance-shaped watermark fragment
71-72	**1-2** — **19-20**	*89-90*	no watermark
73-74	**3-4** — **17-18**	*87-88*	balance-shaped watermark
75-76	**5-6** — **15-16**	*85-86*	no watermark
77-78	**7-8** — **13-14**	*83-84*	balance-shaped watermark
79-80	**9-10** — **11-12**	*81-82*	no watermark

Szabó Dénes: +VI (-9-10-11-12)
Sheet 6.

93-94	**23-24** — empty leaf	*115-116*	no watermark
95-96	**25-26** — empty leaf	*113-114*	balance-shaped watermark fragment
97-98	**27-28** — empty leaf	*111-112*	no watermark
99-100	**29-30** — empty leaf	*109-110*	balance-shaped watermark fragment
101-102	**31-32** — **37-38**	*107-108*	balance-shaped watermark
103-104	**33-34** — **35-36**	*105-106*	no watermark

Szabó Dénes: +VI
Sheet 7.

117-118	**39-40** — **61-62**	*139-140*	balance-shaped watermark
119-120	**41-42** — **59-60**	*137-138*	no watermark
121-122	**43-44** — **57-58**	*135-136*	no watermark
123-124	**45-46** — **55-56**	*133-134*	balance-shaped watermark
125-126	**47-48** — **53-54**	*131-132*	balance-shaped watermark
127-128	**49-50** — **51-52**	*129-130*	no watermark

Szabó Dénes: +VI
Sheet 8.

141-142	**63-64** — **85-86**	*163-164*	balance-shaped watermark
143-144	**65-66** — **83-84**	*161-162*	no watermark
145-146	**67-68** — **81-82**	*159-160*	balance-shaped watermark

147-148 **69-70** — **79-80** *157-158* no watermark
149-150 **71-72** — **77-78** *155-156* balance-shaped watermark
151-152 **73-74** — **75-76** *153-154* no watermark

Szabó Dénes: +VI (-1-2-3-10-11)
Sheet 9.

165-166 empty leaf — empty leaf *187-188*
167-168 empty leaf — empty leaf *185-186*
169-170 empty leaf — **99-100** *183-184* balance-shaped watermark fragment
171-172 **87-88** — **97-98** *181-182* balance-shaped watermark
173-174 **89-90** — **95-96** *179-180* balance-shaped watermark
175-176 **91-92** — **93-94** *177-178* no watermark

Szabó Dénes: +VI (-12)
Sheet 10.

189-190 **101-102** — empty page *211-212* balance-shaped watermark fragment
191-192 **103-104** — **121-122** *209-210* no watermark
193-194 **105-106** — **119-120** *207-208* no watermark
195-196 **107-108** — **117-118** *205-206* balance-shaped watermark
197-198 **109-110** — **115-116** *203-204* balance-shaped watermark
199-200 **111-112** — **113-114** *201-202* no watermark

Szabó Dénes: +VI
Sheet 11.

213-214 **123-124** — **145-146** *235-236* balance-shaped watermark
215-216 **125-126** — **143-144** *233-234* no watermark
217-218 **127-128** — **141-142** *231-232* no watermark
219-220 **129-130** — **139-140** *229-230* balance-shaped watermark
221-222 **131-132** — **137-138** *227-228* balance-shaped watermark
223-224 **133-134** — **135-136** *225-226* no watermark

Szabó Dénes: -3IV

3 unnumbered sheets, four pairs of leaves per sheet pawed animal watermark
The leaves were cut out from the volume in such a way that the fragment of each pair of leaves is still preserved in the stitching

Sheet 12.

237-238 empty leaf — empty leaf *251-252*
239-240 empty leaf — empty leaf *249-250*
241-242 empty leaf — empty leaf *247-248*
243-244 empty leaf — empty leaf *245-246*

Sheet 13.

253-254 empty leaf — empty leaf *267-268*
255-256 empty leaf — empty leaf *265-266*
257-258 empty leaf — empty leaf *263-264*
259-260 empty leaf — empty leaf *261-262*

Sheet 14.

269-270 empty leaf **—** empty leaf *283-284*
271-272 empty leaf **—** empty leaf *281-282*
273-274 empty leaf **—** empty leaf *279-280*
275-276 empty leaf **—** empty leaf *277-278*

Szabó Dénes: +IV (-1-7-8)
Sheet 15.

285-286 empty leaf — empty leaf *299-300* (with a strip-shaped fragment in the middle) no watermark
287-288 **147-148** — empty leaf *297-298* balance-shaped watermark
289-290 **149-150** — **155-156** *295-296* no watermark
291-292 **151-152** — **153-154** *293-294* no watermark

Szabó Dénes: +IV
Sheet 16.

301-302 **157-158** — **171-172** *315-316* no watermark
303-304 **159-160** — **169-170** *313-314* bishop's mitre watermark
305-306 **161-162** — **167-168** *311-312* no watermark
307-308 **163-164** — **165-166** *309-310* bishop's mitre watermark

Szabó Dénes: +III
Sheet 17.

317-318 **173-174** — **183-184** *327-328* no watermark
319-320 **175-176** — **181-182** *325-326* no watermark
321-322 **177-178** — **179-180** *323-324* bishop's mitre watermark

Szabó Dénes: +IV (-2-3-4-5-6-7-8)
Sheet 18.

329-330 **185-186** — empty leaf *343-344* with a small fragment at the spine no watermark
331-332 empty leaf — empty leaf *341-342* with a small fragment at the spine
333-334 empty leaf — empty leaf *339-340* with a small fragment at the spine
335-336 empty leaf — empty leaf *337-338* with a small fragment at the spine

Szabó Dénes: -IV
Sheet 19.

345-346 empty leaf — empty leaf *355-356* with a small fragment at the spine
347-348 empty leaf — empty leaf *353-354* with a small fragment at the spine
349-350 empty leaf — empty leaf *351-352* with a small fragment at the spine

In describing the sheet distribution, I marked the "original" page numbering of the volume, written in pencil, in bold letters, my own page numbering of the fragments in regular letters and the reconstructed page numbers in italics. In the followings, for a better collation, I refer to the volume's "original," well visible page numbering.

The first work of the book, containing the psalms, ends at the bottom of page 146, end of sheet. Next in the volume are the strips of the removed sheet 3, with four pairs of leaves per sheet, and unknown content. The ensuing work begins on page 147 with the initial words "Jesus maria." Conspicuously, this second work does not start at the beginning of a sheet, but a leaf "later." This leaf, however, similar to the previous

ones, was removed, leaving only a strip behind. From the point of view of production technique, that is, at the composition of the sheets and the works, the removed, 50-pages-long text and the "Jesus maria" part belonged together. It might be the case that these parts were not, or hardly connected in their content, but their text was written continuously on the leaves. The second part ends with two missing leaves, following page 156. The third opus, the passion-dialogue of Saint Anselm, starts on a separate sheet, on page 157, and the text ends on page 186, although the traces of two more sheet fragments, including the sheet containing page 186, are still also visible. In Dénes Szabó's opinion these pages were probably left empty. Summarizing: the codex probably consisted of three parts, but the second part might have contained two works, one of which was removed.

1.4. Watermarks of the codex

The sheets were made of paper displaying the variations of three distinct watermarks: one represents a bishop's mitre, the second an encircled balance with a star, while the third was only partly preserved, showing the fragment of a pawed animal, possibly dragon.

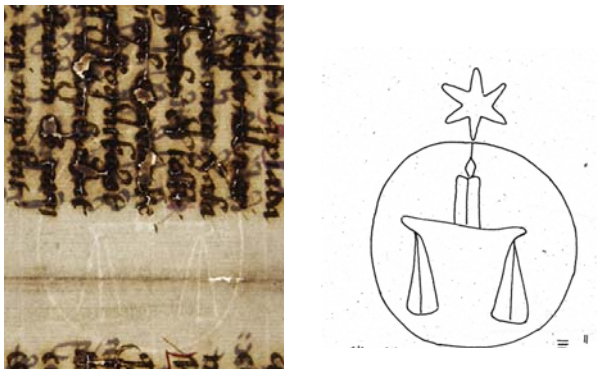


Fig. 30. The balance-shaped watermark

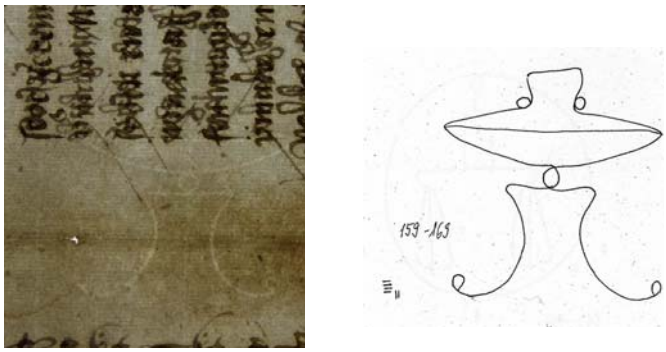


Fig. 31. Bishop's mitre watermark

Fig. 32. The pawed animal watermark

There is a very slight difference in quality between the three papers, hardly visible to the naked eye: the bishop's mitre-marked paper is whiter and thinner, harder than the balance-shaped watermarked one, and the third kind of paper was only preserved in strips, which seem to be similar to the paper with the balance-shaped watermark. The accurate definition of the watermarks has remained unsuccessful as yet, but by the oral communication of Jenő Pelbárt all three motifs were used first by the paper mill of Fabriano, and they only became widely used after the 1520s.[1] This information hints to the Italian origin of the papers, possibly from Fabriano. The bishop's mitre watermarks are only found on the fragments of the removed leaves at the beginning of the codex, and the final leaves. Variations of the balance-shaped watermark appear on most leaves of the book, while the pawed animal watermark only on the pages almost completely destroyed. Against my expectations, the incidence of the watermarks in the codex cannot be related to the probably independently written individual works contained therein.

Several types of encircled star and balance watermarks can be found both in the Lányi and Apor codices. However, it seems that the watermark variations are not identical, although it is possible that they come from the same paper mills, but were made by different screens and watermarks applied by different hands.

1.5. Forming and size of the sheets

A corner of one of the leaves, on page 37–38, was accidentally left turned in, and it preserved the sheet size before the bookblock was cut round. Distinctly from printing, where the entire paper sheets were printed, then folded, and the sheets were only cut after sewing, which made sewing easier, paper sheets were prepared differently for writing. In this case the sheets were cut to the size of pairs of leaves, and the sheets were formed by inserting the pairs of leaves one within the other, either before, or after the writing, adjusting to it. Since the work was done relatively systematically, it can be assessed how many pairs of leaves were cut out of one sheet. In the case of the Apor Codex, one sheet of handmade paper was first cut in half, then both half-sheets were folded in two, and one inserted into the other, that is, one sheet was used for creating two pairs of leaves. This procedure can be assumed by the rhythmic occurrence of watermarks and on the basis of the framing, since one pair of leaves of the sheet cut in half contains watermark, the other does not. For the largest part of the codex, the watermarked pair of leaves alternates with a non-watermarked one.

Naturally, since the number of pairs of leaves is partly adjusted to the length of the writing, and since the empty pages could get mixed up before writing on them, this

[1] Jenő Pelbárt filigranologist, president of MAPAVIT – Society of Hungarian Researchers of Paper and Watermarks, Budapest, Hungary.

repetition is not perfect. The relatively regular screen size of the different types and differently watermarked paper sheets made it possible to join independent works, since the similarly formed pairs of leaves of similarly sized paper sheets created pages of approximately identical size.

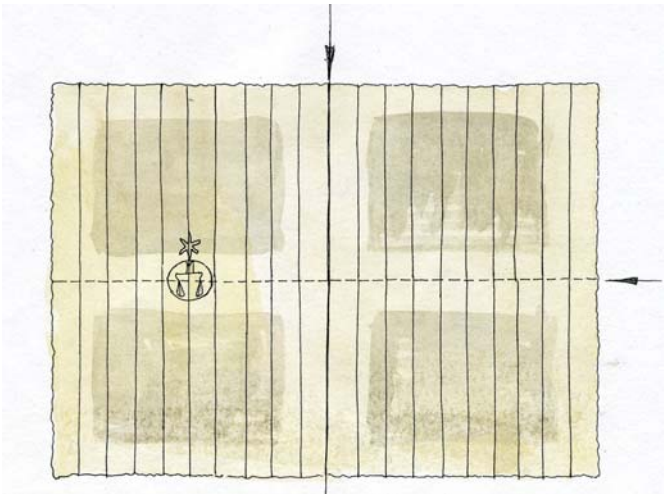


Fig. 33. Position of the watermark on the handmade paper sheet. On sheet was used for making two pairs of leaves.

The traces of preparation for writing appear on several pages of the codex. In some cases the pages were ruled and most times the text areas were also delineated.

On the edge of several pages vertical rows of tiny holes are visible. Such rows of holes are present in other codices as well (e.g., the Lányi Codex), they facilitated the ruling of the pages, the delimitation of line spacing; however, in the Apor Codex the rows of holes do not correspond to line spacing. The reason may be that the sheets punched possibly for the writing of other works were eventually used, with other line spacing, for the Apor Codex.

Fig. 34. Row of holes on the edge of the page

The codex was undoubtedly written by multiple hands, possibly in various places; not much is known about the scribes, but the fingerprint of one of them was preserved on a page.

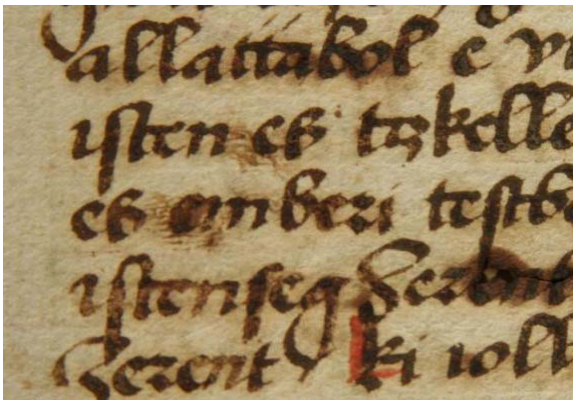


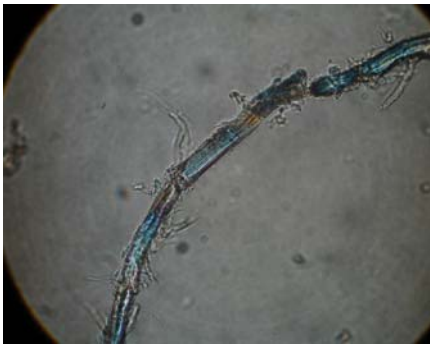
Fig. 35. Fingerprint on a page

1.5. Microscopic analysis of the paper fibres

After the disbinding of the volume I had the opportunity for a microscopic morphological analysis of the paper of the codex. From the perspective of analysis, I divided the paper material in two, the paper of the bookblock and the paper of the pastedown; the reason is that the pastedowns are almost always applied on the volume at the time of binding, and therefore their paper usually differs from the paper of the leaves. This means that the pastedown belongs to the binding and the time of binding, and not to the work. In the case of the Apor Codex, the pastedowns were mostly destroyed, only fragments of them survive pasted over the wooden boards. I found no watermarks on the pastedown fragments that could have enriched the history of the codex with some more details. The sample taken from the pastedown of the disbound codex revealed a mixture of several kinds of fibres. The majority of the fibres contained in the sample were flax and hemp, but there also were some remains of cotton. The fibres in the sample were in a highly fibrillated and mechanically less revealed state, small smashed fibre fragments mixed with the longer, almost intact fibres.

Fig. 36. Image of the pastedown fibres, original magnification 250x.

The sample taken from the leaves came from the folded sheets attached to the parchment lining of the spine, and it looked more uniform than the pastedown under the microscope. Mechanically revealed, fibrillated flax fibres were visible in the sample. The fibres are longer and there less smashed fibre fragments between them than in the pastedown sample.



Figs. 37–38. Image of the pastedown fibres, original magnification 250x.

2. Condition of the book

The binding of the codex was primarily worn and damaged by usage in the course of centuries. In time, the leather cover turned darker, wore out, and got completely detached from the boards and the spine. The detached leather shrank at the edges, causing the distortion of even the stamped frames. The caps were destroyed together with part of the leather cover of the spine. The grain of the spine leather cracked, the printing on it is hardly visible. In the middle of the front board the leather was torn. The leather wore off at the edges of the boards even before the leather cover became detached, therefore the preserved turn-ins, except for the fore edge of the front board, got also detached from the leather cover of the boards. Likewise the turn-ins of the front board, except for the head edge. The turn-ins were missing from the back cover, only their trace was visible.

Fig. 39. The detached, fragmentary, and cracked binding leather

The sewing disintegrated at the beginning and end of the codex because of the mutilations and mould, the sheets went loose. The leather bands remained intact, although fragile, but the endband supports broke in the opening. The stitches fixing the leather endband supports were also undone together with the sewing, since they were made in the same work process.

The wooden boards twisted, warped, the back board cracked. The boards considerably shrank in their width, therefore the bookblock protruded from the binding at the front.

The spine went hollow with much use, because the leaves were removed and the clasps were lost.

Figs. 40–41. The spine became hollow and protruded from the binding

The parchment strips lining the spine were for their most part detached, and broke at the opening of the book. The ends of the strips, pasted to the inner side of the boards, were preserved, partly hidden under the pastedown fragments.

Fig. 42. The damaged spine and its lining

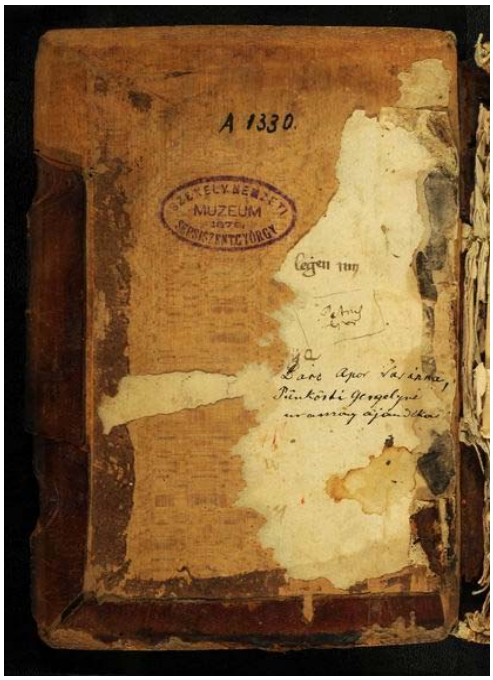


Fig. 43. Only fragments of the pastedown were preserved on the inner side of the front board

The clasp was only preserved at the tail end of the front board, at the head only the fixing nails and the impression of the catch plate can be seen. The straps fixing the plates were torn at the edge of the board, their almost only parts preserved were those hidden under the binding leather. The hooks were also lost with the straps. The

pastedowns were almost completely destroyed, only the torn-out fragments of the pastedowns pasted onto the boards were preserved.

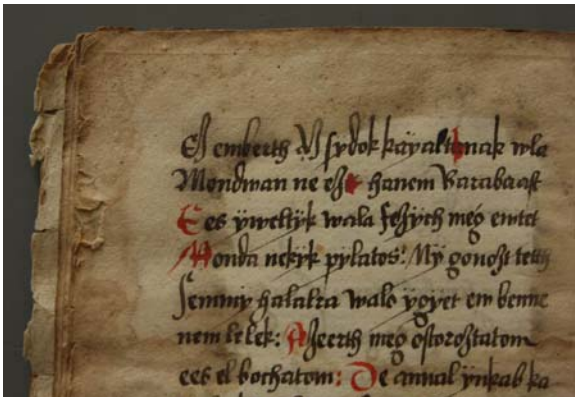


Fig. 44. Due to the repeated water damage, the edges of the leaves display yellowish-brownish stains; as a result of mould infection, the edges of some of the leaves became fragile and torn

The leaves bear the yellowish-brownish water stains of repeated water damage. Due to the humidity of the paper, the leaves were infested with mould, the greyish spots can be seen all over the paper edges. It also points to mould infection that some pages dampened unevenly, with stains when placed in water. The effects of mould infection were only visible on the edges of the leaves, but the text area was not affected. However, probably it was again humidity and mould which caused on several pages the decay of the binding medium of the ink, causing ink corrosion. In the corroded places a brown halo appeared adjacent to the ink and the writing became paler. The high level of ink loss had also been mentioned by Dénes Szabó in his book.

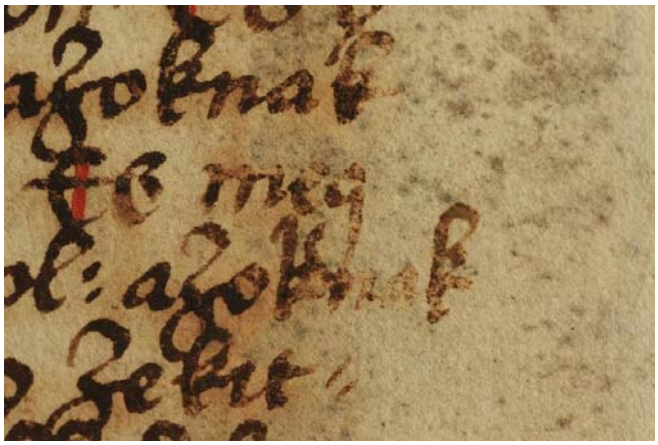


Fig. 45. Mould infection caused the appearance of grayish spots on the edge of leaves and the loss of ink due to the decay of the binding medium of ink

Luckily, at the same time, the repeated water damage did not dissolve the ink of the manuscript, nor the red-coloured highlights. The surface of the thickly applied red paint often cracked.

Fig. 46. The thickly applied paint often cracked

Water and mechanical damage were a lesser cause of the codex's paper destruction; the greatest reason of paper damage, except mutilation, was the ink used when writing the codex. Several mixtures of ink were used in this process. Presumably, in the process of ink preparation the right proportion of the ingredients was not observed, and this caused the modification of ink composition, and as a result, the various amount of damage done to the pages written in ink. On the text areas the paper turned brown and fragile around the letters. Primarily on the leaves written on both sides the paper cracked and split, the letters fell out some places, and the leaves split open through several centimetres along the ligatures of handwriting.

Fig. 47. Ink corrosion caused traces similar to burning on the paper

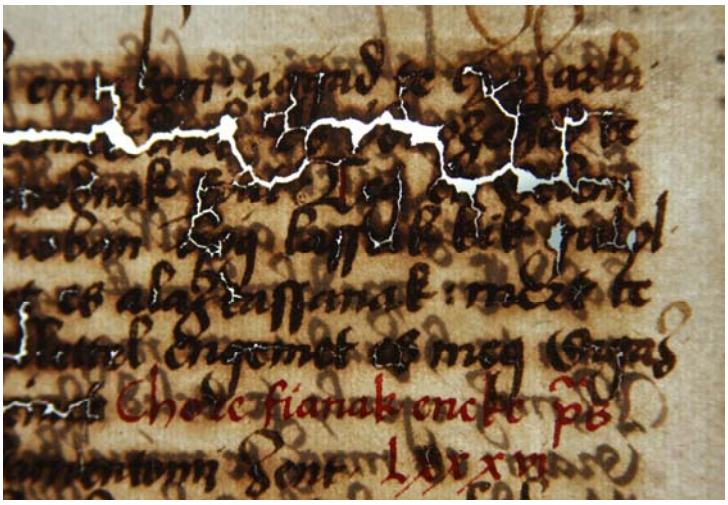


Fig. 48. The paper became fragile, cracked and split open along the lines

The actual state of the leaves, due to the strict conservation and careful manipulation of the book, was only revealed during the restoration. It has become apparent that even on the seemingly intact areas the paper underneath the letters cracked and the text was lost or split open even at the slightest movement.

However, the volume's destruction was first of all due to mutilation(s), causing the loss of almost a third of the book. The first and middle part of the codex was seriously mutilated, but several other pages were missing as well throughout the whole book. The amount of missing pages can be assumed partly by content analysis, partly by the page fragments preserved in the binding.

Fig. 49. Mutilation at the beginning of the codex

Fig. 50. Fifty pages of writing were cut out from the middle of the codex, the scalloped edge of the cutting is well visible

3. Restoration of the codex

The codex was photographed, described, and limned before the restoration process began.

3.1. Removing the bookblock from the binding

Before disbinding, the pastedowns had to be steeped off the boards, therefore I made a solubility test for the notes on the pastedowns. The gift note of Zsuzsánna Apor dissolved in water, and did not dissolve in alcohol, therefore it could be fixed with an alcohol solution of Regnál.[1]

[1] Regnál S1 (polyvynil butyral acetal): "a condensation product of polyvynil alcohol and butyral aldehyd. Not all OH-groups can be acetalized, the viscosity of the solution of products acetalized in various proportions increases in direct proportion with the degree of acetalization. In restoration we use the polyvynil butyral produced by the Hoechst company under the name Mowital B, the way described by the Czech patent Regnál S1. The flexibility of polyvynil butyral is exceptional, and it dissolves well in several kinds of (polar and non-polar) organic solvents (alcohols, acetone, amine, ethyl, and butyl acetate, chloroform, toluene). It is insoluble in water, benzene, or gasoline… It is highly light resistant. It is resistant to animal and vegetal fats and oils, to acids, alkali, hydrogen-peroxide. The dried film melts well at 90–100°C, adheres well on smooth surfaces. In practice, most often its ethyl alcohol solution is used in various concentrations." Cf. Kastaly Beatrix, *Ragasztóanyagok a könyvkötésben és a papírrestaurálásban. A könyv-és papírrestaurátor tanfolyam jegyzetei* (Adhesive materials used in bookbinding and paper restoration. Notes of the course of book and paper restoration) (Budapest: Országos Széchényi Könyvtár, 1991).

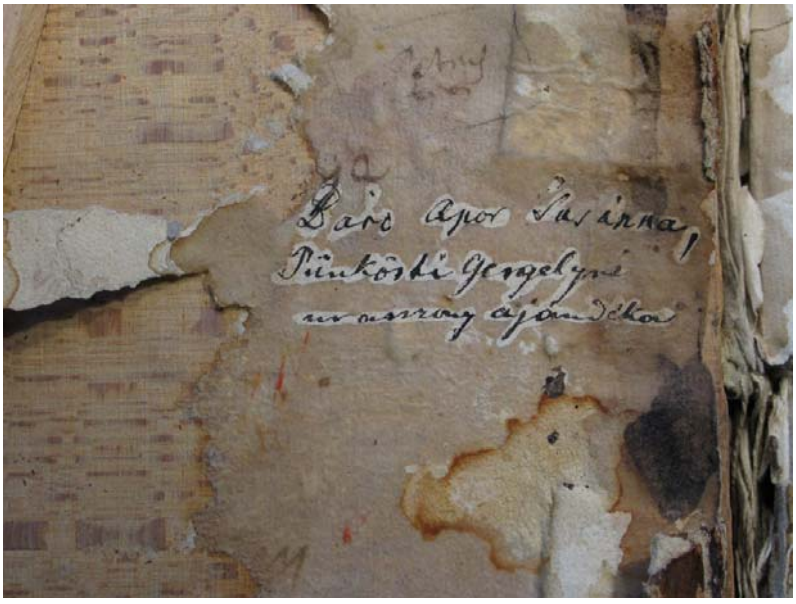


Fig. 51. Fixation protected water soluble ink from moisture

Then the removal of pastedowns was made by local wetting, by wet blotting-paper.

The removed fragments were washed in clean, lukewarm water, without the use of surfactants. Surfactants were not necessary because the paper wetted and cleaned well, while also I wished to keep the time of wet treatment at a minimum in order to protect the handwriting. Repeated rinsing necessary after the use of surfactants would have increased the water treatment time. After drying and surfacing, the cleaned fragments were put aside.

The parchment linings resting under the pastedown fragments were removed dry as they were if the paste material was weak, and by wetting if the paste material was still holding well. On its side facing the wooden board, the parchment lining contained bright reddish-pinkish stains of paint. The fragments thus removed were preserved for further research.

After removing the wooden nails fixing the back board, the board could be taken off.

The leather cover of the front board, left dry, was only raised on the level of the leather bands to have access to the fixing nails. Afterwards I removed the wooden nails attaching the leather bands to the front board, and I took off the front board as well.

3.2. Disassembling the bookblock

I removed the sheets from the bookblock one by one, I separated the individual pairs of opened leaves, divided by blank pages, and I put them into envelopes. I noted on the envelope the pairs of leaves contained in them, using the leaf numbering of the codex. Next to the pairs of leaves I noted the state of the leaf and the existence and type of the watermark, if there was any.

Then any kind of working process applied to that particular leaf was also noted on the envelope. Thus every treatment of the leaf could be easily followed.

The first sheets of the book were almost entirely torn out; their existence can be deduced from the missing contents and the fragments rolled over the sewing threads. The small preserved fragments were also deposited in separate envelopes, "sheet by sheet".

Also at the beginning of the book, there are sheets which were not numbered; I noted with them with a mark consisting of the letter T ('töredék' – 'fragment' in Hungarian) and a number.

3.3. The wet treatment of the leaves

The book was written in ink made of several mixtures and red and green paint as emphasis. The various types of ink caused different levels of corrosion on the leaves. The repeated water damage was not only a catalyst of the destructive effect of the inks, but it also started another kind of damage. The wet pages were an appropriate medium for mould fungi, their harmful effect manifested not only in the paper's turning darker and fragile, but also in the decay of the binding material of the inks. However, ink loss could have been caused by other factors as well, such as iron gall ink corrosion. This latter cause is proved by the fact that if there was no ink corrosion on the page, there was no ink loss either. However, in places affected both by ink corrosion and mould, the ink loss was even more serious. Having lost their binding material, the grains of ink fell off the written surface, leaving only a slight trace of the letters on the paper. The particles formed a brown halo on the paper around the letters, diminishing even further the sharpness of writing. Therefore it was a vital goal of the restoration to stop not only ink corrosion, but also the loss of ink.

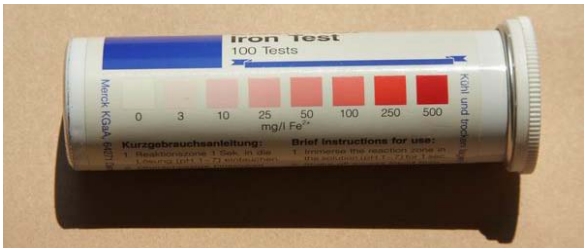
Fig. 52. Image of ink loss caused by ink corrosion; due to the halo left on the paper it looks somewhat different than ink loss caused by mould

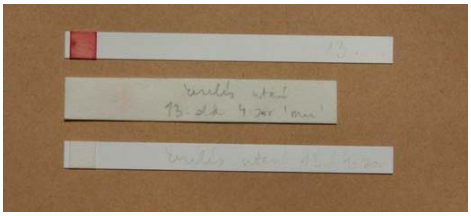
All stages of ink corrosion could be observed on the codex, but some parts of the text were not affected at all. The first and longest first part containing the psalms and canticles was damaged by ink corrosion to various degrees, but the two subsequent parts of the colligate were not affected. The damage was also influenced by the Bastarda type script of the codex, because these letter types are thick, thus the ink was applied in a thick layer, causing ink corrosion on a relatively large surface.

The treatment of the leaves affected by ink corrosion and the measurements before treatment were made after the bookblock was disassembled. Based on the results of solubility tests, neither the inks nor the paints needed any fixation before washing. The further ink loss could be avoided during treatment by careful manipulation and the elimination of rubbing effects. The fixation of the ink would have prevented the leaves to be adequately cleaned, would have decreased the efficiency of the substances used to stop ink corrosion, therefore I probably had better results applying it at the end. Orsolya Koppán measured the pH value and made tests to detect free iron ions on the detached leaves of the sheets, of variable states. The values of the measurements were a good

reference on the condition of the paper in written and unwritten areas, while they also proved the differences between visibly different levels of ink corrosion. On places with heavy ink corrosion, the values obtained by iron tests were extremely high. The measurement values can be found in a table attached to the end of this presentation. The further treatment of the leaves happened then in the knowledge of these results. The solutions used for treatment were also made by Orsolya Koppán.[1]

The processes going on during the preparation of iron gall ink account for the colour of the ink and the possible causes of ink corrosion. The extract of oak galls, tannin, was mixed with ferrous sulphate ($Fe(II)SO_4$) which resulted in light brown iron(II) gallate and sulphuric acid. On writing, the iron(II) gallate was oxidated due to atmospheric oxygen, making a dark brown iron(III) gallate. The proportion of ferrous sulphate and tannin in the mixture influences the colour and durability of the ink, and the corrosion of the paper or parchment. If there is a surplus of ferrous sulphate in the solution, it triggers redox catalytic processes which lead to ink corrosion. While the ink degrades cellulose, two important reaction mechanisms are triggered: one is the acid hydrolysis of cellulose, caused by the acidity of the ink, the other is the catalytic oxidation of cellulose, caused by the so-called non-modified ink by free Fe^{2+} ions. These two processes must be stopped during restoration. According to new research, the effect of phytate[2] of stopping oxidation is successful when combined with deacidification. The treatment with calcium phytate and calcium bicarbonate yields the best results. This treatment stops both degrading actions of ink corrosion.





Figs. 53–54. Result of the iron test on the test strip before and after treatment

[1] Cf. also Pongrácné Mikessy, *A tintamarás kezelésének újabb lehetőségei* (New possibilities in the treatment of ink corrosion) (Abstract of the presentation made on 9 December 2002, at a scientific session of the National Széchenyi Library).

[2] Phytate, myo-Inositol hexakis (dihydrogen phosphate), the salt of phytic acid. To prepare a calcium phytate solution, for 6.2 cm^3 of 40% phytic acid we dose 1.2 g calcium carbonate, then add distilled water up to 2000 cm^3, following which we set its pH to 5.8 with 3.2% ammonium hydroxide. Cf. also Enke Huhsmann and Ulrike Hähner, "Work standard for the treatment of 18th and 19th century iron gall ink documents with calcium phytate calcium hydrogen carbonate," *Restaurator – International Journal for the Preservation of Library and Archival Material* 4 (2008): 274–319.

3.4. Washing the leaves and bonding of free iron ions

Experience proves that the best way to attenuate the darkish stains left by the repeated water damage is washing with water. The wet treatment of the leaves, besides aesthetic considerations, was also required by the results of the iron test.

I washed the individual pairs of leaves, placed on a screen, with clean water for 20 minutes; the washing removed the water soluble acid components deriving from the decay of ink and cellulose.

Moving the pages on top of the screen, I placed them after the water in a bath of calcium phytate, which made a complex of the free Fe(II) ions of the ink.

Fig. 55. Washing the leaves. The picture shows the elimination of water soluble decomposition products and the uneven wetting of the mould infested paper

The phytate bath was followed by a short water rinse, which removed the surplus of phytate from the leaves.

Fig. 56. A codex leaf in phytate bath

As a next step, I placed the leaves in a calcium bicarbonate bath for 20 minutes. This bath neutralized the leaves with alkaline precipitation, securing a long protection for acid catalyzed hydrolysis. After treatment, the leaves were air dried, without pressing. For a faster drying I changed blotting paper leaves under the codex leaves placed upon the screen. The last step of phytate treatment, gelatine sizing, was only applied after the leaves were repaired, because the damp treatment of the leaves was not finished with the phytate treatment.

The cleaned leaves were scanned in this phase of the restoration work because in this state the leaves were already clean but no repairs were made yet on the original parts. Later research of the codex can best be conducted on the basis of the scanned images.

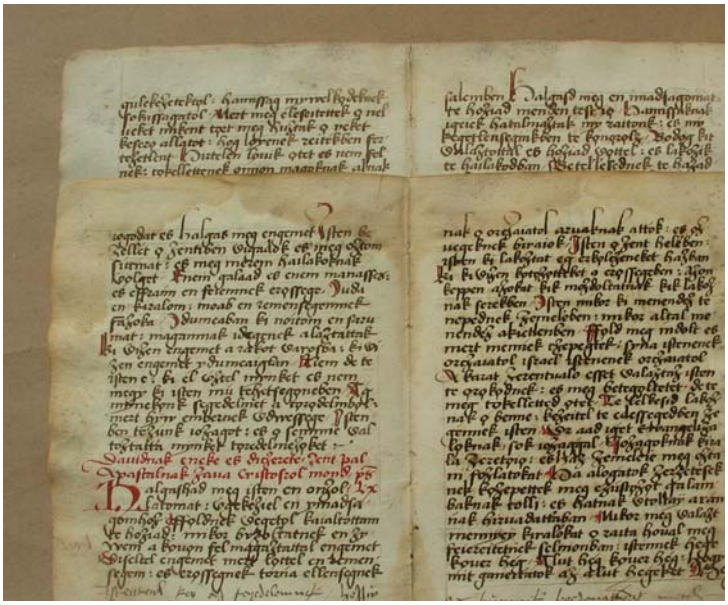


Fig. 57. In the back, a leaf cleaned by washing, in the front, a leaf before the washing; the pairs of leaves are consecutive in the sheet as well

3.5. Completion of damaged leaves

I planned to complete the leaves by manual leaf-casting, which also required the leaves to be wetted; therefore sizing was only worth doing after leaf-casting. Experience proved that manual casting yielded the best results on multiple coloured leaves, since in this case several colours of paper fibres could be used, making the completed pages look more uniform. The use of an intermediary shade appears as a disturbing spot both in darker and in lighter areas, while the colour specifically chosen for the spot to be completed fades into its environment. Therefore, after the scanning, I blended several colours of paper pulp, some of them matched to the colour of the writing on the paper, but after several trials of leaf-casting I still was not able to obtain satisfactory results. As hard as I tried, the paper pulp covered too much of the original text. Therefore I removed the cast. The failure could have been caused by the fact that the intertwined paper fibres formed too large and compact heaps on the surface and these heaps could no longer be ordered along the cracks. Due to the differences in colour between the letters and the paper, I could not choose the optimal colour for the paper mash, therefore the correction appeared on the surface as a spot.

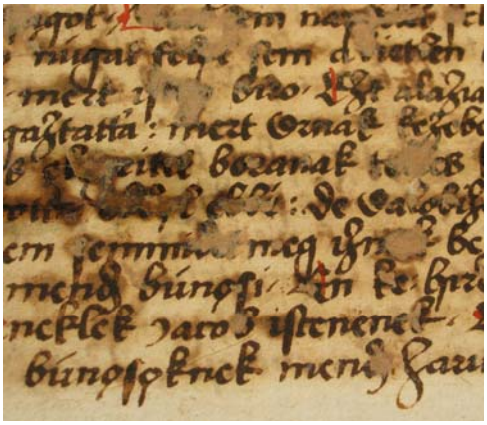


Fig. 58. Leaf-casting covered too much of the original surface and did not yield an adequate aesthetic result either

However, on the edges and larger splits of the leaves the leaf-casting completion looked well.

Then I had to find a different method to complete the cracks and splits. After repeated experiments, the best results were obtained by manual repair. The small size of the splits and cracks, and the weakness of the ink-corroded paper only allowed for special repairing techniques. I started the process of manual repair by casting thin leaves, painting them in watercolour adjusted to the colour of the inks. I tore these leaves into tiny pieces and used these little "fluffs" for manual repair. The cracks and splits were well visible after placing the leaves to repair on a light table. I used two fine brushes for the repairs, first I sized the edge of the cracks and splits. Then, wetting the other brush, I chose the right piece of fibre from among the torn-up leaves, and glued the small piece stuck to the wet brush onto the split. If the split was not larger than the letter, I tried to keep the repair within the contours of the letters. This method, although very laborious, covered and changed the writing area to the least extent.

After these successful tests I repaired the leaves in two stages. The edges and the larger cracks were completed by manual leaf-casting. The paper for leaf-casting was prepared from fibres of flax of 35 °SR degree. Colouring was made by direct dyes,[1] adjusted to the colour of the original leaves. The use of direct dyes is very important, because they attach to the fibres with secondary bonds, therefore the fibres dyed in separate vessels no longer discolour the original leaves.

[1] Direct dyes: Pergasol (Manufacturer: Giba-Geigy; Distributor: Ciba-Geigy Hungária KFT, 1056 Budapest, Belgrád rakpart, Hűvösvölgyi út 83). "Direct (subtractive) dyes – similar to acid dyes – are azo compounds containing sulpho-groups mostly in the form of sodium salt. Their particular characteristic is that they are directly attached to cellulose – without fixation substances. They attach to cellulose fibres with secondary valence-forces". See Dr. Ferenc Péter, ed., *Színezék kézikönyv* (Handbook of dyes) (Budapest: Műszaki Könyvkiadó, 1968), 420.

Fig. 59. Repair of the edges by manual leaf-casting

Then I sized the leaves with a gelatine solution of 1%; gelatine sizing does not only reinforce the leaves, but also maintains the stability of the iron complex formed during phytate treatment.

The cast leaves were air-dried on the screen used for casting, then, after drying and being removed from the screen, they were re-wetted and pressed with help of felt, Bondina,[1] and filter paper. The pressing formed the surface, thickness, and compactness of the completion.

As a second step, I proceeded to the manual repair of the ink corrosion of the leaves, which took the longest time during restoration. I used Glutofix 600[2] as a glue for repair. I flattened the corrected leaves by careful pressing. Finally, the loss of ink caused by the decay of the binding matter on the completed and flattened leaves was stopped by fixing the ink with a 2 % alcohol solution of Klucel M.[3] The red paint, despite its being cracked, stuck firmly to the surface, therefore it needed no fixation.

[1] Bondina. A non-woven polyester textile, most glues used in restoration (here gelatine) do not cleave to it.

[2] Glutofix 600 (methylhydroxyethylcellulose). "It is commercialized in the form of a white or yellowish powder or granules. The water soluble commercial product contains approx. 25–30% -$OHCH_3$ –groups, which corresponds to 1.5–2 ether groups per unit. The products containing 2 ether groups can be dissolved not only in water, but also in certain solvent mixtures as well." (Kastaly, *Ragasztóanyagok*..., 17.)

[3] Klucel M (hydroxypropylcellulose). The various letters distinguishing the types of Klucels refer to versions of various degrees of polymerization. Klucel M can best be used for the binding of cracked, scaling dyes to their carrying surface. (Ibid., 19–20.)

Fig. 60. Tearing tiny pieces from the paper used for repairs

Fig. 61. Manual repair of the leaves

Figs. 62–63. Ink corroded letters before and after repair

Fig. 64. Repair in case of a larger split

3.6. Replacing the missing leaves

The restoration work was not confined to the completion of fragmentary leaves, but it also proceeded with the replacement of the documented hiatuses in the leaves. The replacement does not only demonstrate the amount of completions, but also secured the reconstruction of the body and binding of the book.

The leaves used for completion were also manually cast, their colour was adjusted to the colour of the leaves. The colouring was made by direct dyes used in paper and textile manufacture. The leaves were also sized with gelatine. Similarly to the completed papers, the leaves used for completing the pastedowns were also produced by manual leaf-casting.

I ordered the completed pair of leaves into sheets, and I completed the sheets with the leaves made for replacement. I received major help from Edit Madas in establishing the final sheet distribution and the order of the leaves.

The completions on the cast pages extending over the edges of the leaves were cut round to size first at the head and the bottom. Once the sheets were formed, I prepared the pastedowns by the size of the codex, in the generally used form of the age, also by manual casting.

Before I began sewing, I chose a white thread similar to the original sewing thread, then dyed it, using a metal-complex dye,[1] adjusting it to the colour of the original thread.

Based on the original production technique, the sewing of the sheets was performed in parallel with the fixing of the endband support. As the original leather bands and the endband support would not support the strain of a new binding, bands and endband supports were prepared similarly to the originals from cow hide, and then stretched on the sewing press.

[1] Metal-complex dye (Irgaderm; Manufacturer: Ciba-Geigy). General characteristics of Irgaderm colouring solutions: the Irgaderm fluid dyes are primarily metal-complex dyes, homogeneous, non-saline solutions, in water soluble, environment-friendly organic solvents (except Irgaderm Black N, which contains no organic solvent). Characteristics: Irgaderm fluids can be freely mixed with each other or with water, or can be diluted with adequate organic solvents. They should preferably be diluted with soft water. If there is only hard water available, the stability of the dye bath can be increased by 1-methoxy-2-propanol. Application: Irgaderm dyes can be used for ground dying of all kinds of leather (full grain leather, nubuck), darkening, correcting, or balancing the colour of dyed leathers, dying binding materials used in leather preparation and lacquers, or refreshing the colour of leather.

After this I sewed the sheets using the original technique of double threads.

Fig. 65. The sewing of the codex

After the sewing, it became possible to cut the leaf-castings with a greater precision, as a result of which not only the size of the original leaf was taken into consideration, but also the original leaf hanging out the most from the codex. This was needed in order not to leave the margin of the leaf hanging out unprotected on the edge.

The endbands seemingly unbound as a unity could not be fastened again to the binding, and their preservation could only be possible if the original binding technique was not reconstructed. But in this case the loosened and torn endband support could not have filled its band and fixing function, and the final binding could have become much more vulnerable. That is why the original binding technique was applied and not the reuse of the different component parts. Of course, every unbound material was attached to the codex for further examination. The endband supports were produced in two stages, according to the original method: first the support was fastened, then decorative stitches were sewn using two colors. The sewing thread was colored by using metal complex dyes and the double colored endband was sown with four threads each.

Fig. 66. The endband support sown to the sheets at the start of the sewing of the endband.

Fig. 67. The colours of the threads used in sewing the endband were dyed to match the colors of the original endband

After the sewing of the endband, the spine of the codex was glued using a thin layer. The torn parchment linings were replaced by new ones and attached to the spine with animal glue.

3.7. Mending and reattaching the wooden boards

The original wooden boards considerably shrunk transversally, while the textblock stuck out of the boards. The exact measure of shrinking could not be determined before the unbinding because of the damages of the textblock. After the rebinding of the textblock, it became obvious that the boards are shrunk to such an extent that it not only hangs down to bevelled boards, but sticks out of the boards. That is why the original boards could be used only after completion. The boards not only shrunk, but also deflected and the back board is cracked in grain direction. The deflection made the measuring of the board even harder. The deflection was set back almost immediately after prolonged pressing, after the elimination of compressive force. The corners of the boards were damaged by extensive usage. The completion of the boards was possible only by cutting them along grain direction, as the corners were bevelled. The location of the cut was determined by the crack of the board and the place of the deflection. In completion, the width of the board fractured by the blade of the saw needed to be taken into consideration. For the completion a piece of beech wood was used, slightly thicker than the original wood. This was needed because the thickness of the board was not even.

Fig. 68. The book hung out both before restoration (fig. 41) and after the correction of the sheets.

Paper boards were made for the textblock, as measuring the paper boards to the wooden boards made the determination of the shrinking level of the wooden board, which was different in the case of the two boards: one was 12 mm, the other 15 mm. These wooden boards were sawn around the joint with a circular saw and the paper boards were used as a pattern in preparing the patches and in gluing. In determining the size of the patches, the loss of material caused by the sawing of the wood needed to be taken in consideration. Cutting out the insertions was also performed with a circular saw.

Fig. 69. The wooden board with the insertion placed in the cut, with the pattern used in the process of insertion under the board

The completions were made using epoxy resin[1] with the help of clamps, using the foiled paper board as joining elements.

Fig. 70. Carving the thicker insertion to measure

After the binding of the glue the insertions were carved with a chisel to fit the original boards, and the final surface was shaped with emery paper.

[1] Artiwood epoxi resin: A two-component material for filling cracks in wood, containing epoxy resin. It can be removed by using heat and solvents. After 24 hours of binding, it can easily be carved, later on polished, filed. Distributor: Szép Mesterségek Restaurátor Kft. (H-1082 Budapest, Baross u. 41).

The corners were completed by epoxy resin as well, and shaped with a file to the original shape of the corners. Next the boards were fixed in their place and glued to the parchment lining with glue. After drying, thongs were fastened with wooden pegs to the boards.

Fig. 71. Boarded binding

3.8. Replacing the missing clasps

The hook-clasp fastenings of the binding were missing, except one catch plate on the front board and one anchor plate on the back board. Due to the remaining clasp and knowing the characteristics of the types of clasps, an authentic reconstruction became possible.

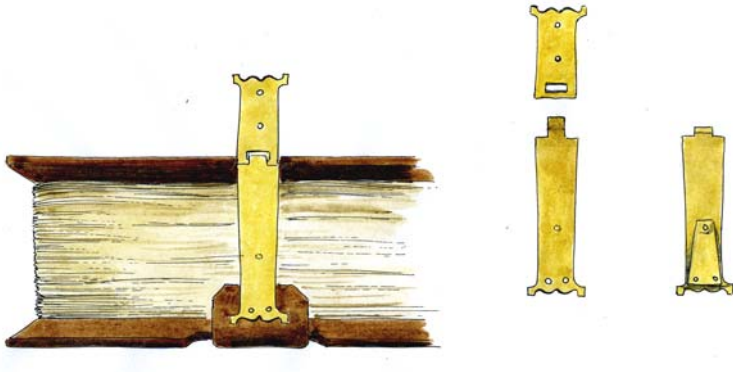


Fig. 72. The clasps designed for the size of the codex

A reconstruction plan of the fastenings was prepared by using analogies.[1] Based on the types of clasps, the fastenings were shaped from brass plate using Schlippe-salt[1] for tarnishing.

[1] Tóth Zsuzsanna: *Csatok és veretek könyvtáblákon* (Clasps on book boards), manuscript.

The fastenings used to be fixed with wire rivets, which can be well observed in removing old fastenings. Similar shapes can be achieved by filing factory wire nails or, applying the original technique, by using wires with the application of small shoulders. In the fixing of the fastenings of the Apor codex both methods were used to produce nails, and were put aside until the completion of the binding.

Fig. 73. Sawing the outlines of the clasp from the board

The leather of the original binding of the codex was damaged and mechanically weakened, so it was necessary to place a new binding underneath the original to ensure the further use of the codex. A goatskin with a grain pattern similar to the original was chosen and dyed with metal complex-based leather dyes.

3.9. Binding

The tinted skin was cut to the appropriate size and edge-pared. The new skin covering was then pulled on the volume.

Fig. 74. The new covering on the codex

[1] Surface treatment of brass: after the cautious degreasing of the fastening boiling in a watery solution of 10% sodium-thioantimoniate (Na2SbS4x·9H2O, Schlippe-salt) turns brass into dark brown.

The broken straps of the fastenings were replaced by new straps prepared according to the original technique bent and fitted in the back side.

Fig. 75. Bent stripe for replacement

Fig. 76. Line pallet of the strap

The stripes were decorated with line pallet, according to the stamp of the remaining fragment. The stamp was supplemented because this is a characteristic of binding that could be preserved in this way.

The next step was the thinning of the original cover leather.

Because of the shrinking of the cover leather and the completion of the boards, it could only be aesthetically inserted after separating it into three parts.

The original binding was humidified, softened by oil in water emulsion[1] and adhered with rice-starch paste.

Once the covering was complete, the catch plates were fixed to the front board with the prepared nails, the straps were fixed to the back board with animal glue. After drying, they were fixed with nails, as well. The nails are prevented from breaking with the help of a clamp; one of them remained on the binding, the other was newly made.

Fig. 77. Fixing the clasp plate

Pastedowns were applied using rice-starch paste. After drying, the clasps were fixed to the straps. Finally, fragments of the original paste-downs were adhered to the inner mirror of the board.

[1] Oil in water emulsion: 400 cm^3 distillated water; 30 g neat's foot oil; 40g fatty alcohol sulfate; 10g lanolin; a small amount of antioxidants dissolved in alcohol.

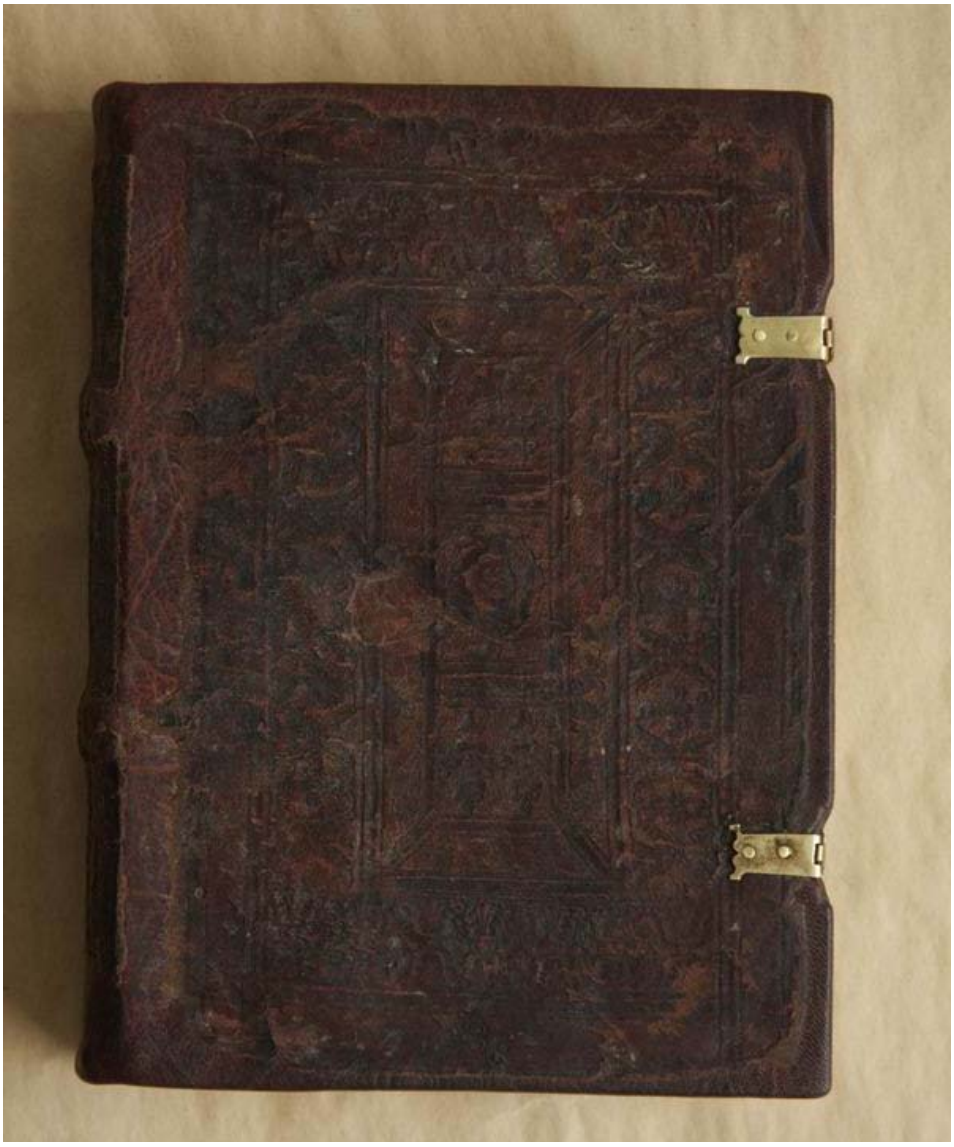


Fig. 78. The front board of the finished codex

Fig. 79. The edge

Fig. 80. The corner of the codex with the leather covering

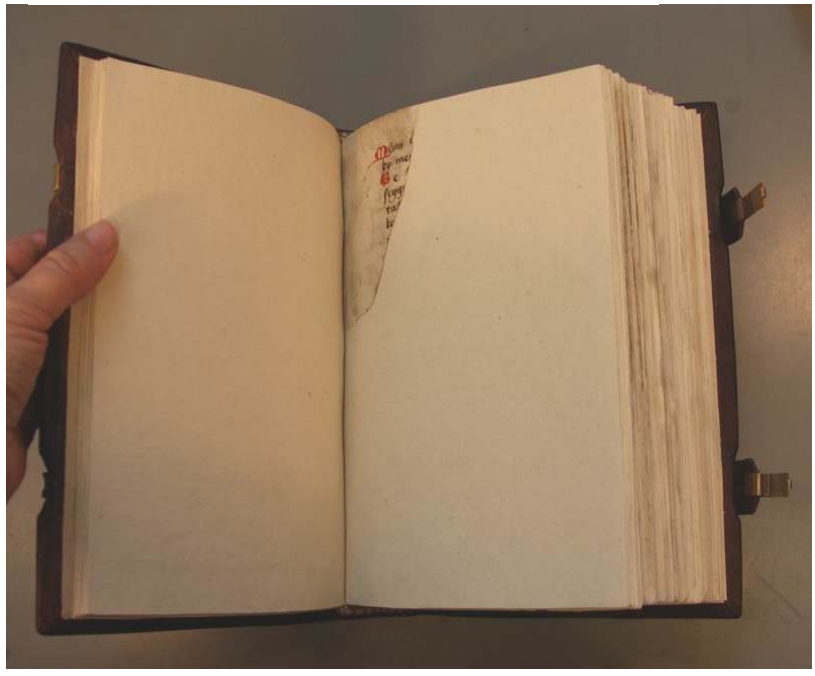


Fig. 81. The list of defects resolved in the codex

The restored codex and the unbound fragments were returned to the Szekler National Museum in Sepsiszentgyörgy (Sfântu Gheorghe), Romania.

Translated by Emese Czintos and Boglárka Németh

APPENDIX
TREATMENT REPORT

Owner: Szekler National Museum
Inventory number: A.1330
Title: Apor codex
Date: Late XVth, early XVIth century
Type of document: Manuscript on hand-made paper with red and iron gall inks
Type of damage: Water-, mould- and ink-stains, ink corrosion
Type of treatment: Ca-phytate / Ca-bicarbonate /gelatin B

Upper, inner margin of the leaf	**pH value of paper**		**pH value of inked areas**		**Fe^{2+}-test***	
	Before treatment	**After treatment**	**Before treatment**	**After treatment**	**Before treatment**	**After treatment**
F20 (fragment) inner marge On water stain	5,46 5,58	6,91 6,97	-	-	-	-
Page 3	6,05	6,84	5,58 line 3 '..setek'	6,86	3	0-3
Page 13	6,27	6,3 7,32(at head)	4,15 line 4:'mu'	6,74	**100-250 !**	0-3
Page 25	6,03	7,1	3,66 line 3:'oda'	6,64	**500 !**	0-3
Page 33 On margin with water stain	5,87 6,17	6,77	3,5 line 3:'te most'	6,29	**500 !**	0-3

Upper, inner margin of the leaf	**pH value of paper**		**pH value of inked areas**		**Fe^{2+}-test***	
	Before treatment	**After treatment**	**Before treatment**	**After treatment**	**Before treatment**	**After treatment**
Page 43	6,04	6,8	3,73 line 3: 'pokolhoz'	6,87	**100-250**	0-3
Page 61.	6,1	6,41	4,09 line 2: 'nemzetekbe'	6,43	**50**	0-3
Page69	6,14	6,9	4,36 (brown stain) line 2: 'nemzetek'	6,7	10-25	10 (?)
Page 81	5,83	6,87	4,6 line 4: 'elvitessenek'	6,9	0-3	10 (?)
Page 97	5,93	6,71	a/ 3,69 (brown stain) line 4: 'te' b/ 4,61 line 6:'beszedimet'	6,36 6,3	**100-250** 3-10	3 0-3
Page 99	5,64	6,27	4,5 line 5: 'vigassaggal'	6,04	3-10	0-3
Page 105	6,24	6,47	a/ 3,63 line 4:'neved' b/ 3,8 line 6:'nepet'	6,45 6,5	25-50 **100**	0-3 0-3
Page109	6,18	6,6	3,81 line 5:'kezedet'	6,2	**100**	0-3

Upper, inner margin of the leaf	**pH value of paper**		**pH value of inked areas**		**Fe^{2+}-test***	
	Before treatment	**After treatment**	**Before treatment**	**After treatment**	**Before treatment**	**After treatment**
Page 123	6,15	6,61	3,86 line 3: 'lelkek'	6,75	50	0-3
Page 139	6,05	6,69	5,7 line 3:'mynden'	6,59	(0-3) 1	(0-3) 1
Page 145	6,24	6,55	a/ 5,74 line 4:'fel' b/ 5,28 (ink stain)	6,95 7,03	(0-3) 1	(0-3) 1
Page 149	6,01	6,46	6,05 line 3:'fejedelemason'	6,67	(0-3) 1	0-3
Page 163	6,04	7,15	5,22 line 2:'Isten'	7,14	(0-3) 1	0-3
Page 185 (last)	5,25	6,61	5,07 line 2:'oly'	6,37	(0-3) 2	0-3

* MERCK Iron Test

a). Dipping the test strip in the sample solution for one second such a way that the reaction zone is properly wetted.

b). Removing the test strip, shaking off the excess liquid and after 10 seconds, comparing the reaction zone with the color scale.

0-500 mg/l Fe^{2+} (0: white, 3: light pink, 500: dark red)