

Research of Identical Incunabula Deposited on Long-term Basis in Different Environmental Conditions

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Summary:

The objectives of the specific research of identical incunabula on a long-term basis deposit in different environmental conditions were to find out to what degree the different quality of ambient air was reflected in degradation of paper. The Selection of identical incunabula from the collections of the National Library in Prague, the South Bohemia Research Library in Ceske Budejovice and the library of the Regional Museum in Teplice, was performed according to the Incunabula Short Title Catalogue database, in which a unique numeric identifier of the bibliographic record ISTC is assigned to each of the publications, which enables to interconnect all preserved copies. SurveNIR measuring system was used for comparison of naturally aged paper, in view of investigation of effects of dust particles and gaseous pollutants on historical paper, attention was paid also to protective elements and damages of bookbinding. All recorded data – outputs of spectrometric measurements of mechanical and chemical properties of paper, microscopic snapshots of the analyzed places, and photographic documentation, are deposited in ResIS (Restoration Information System). No verifiable correspondence between degree of damage of historical paper and closeness of book block was found, it was evident from the results of measurement that sub-micron dust particles are able to permeate even among sheets of the book block.

Keywords: identical incunabula, conservation survey, SurveNIR, dust particles, gaseous pollutants, ISTC identifier, ResIS system

Introduction

A chemist-technologist, a restorer, and a historian effectively collaborated on this interdisciplinary examination of the so-called identical incunabula, that is *identical books printed during the time period beginning with Gutenberg's invention in mid-fifteenth century and ending in the year 1500*). Our research determined to establish with precision the extent to which the qualities of diverse depository environment affect the characteristics and the degree of degradation of paper stored for a long period of time, while also attempting to determine the exact relationship between the physical condition of the paper and damages to book binding. Our examination of identical incunabula, that is of multiple copies of the same edition, printed on the same paper but deposited for a long time period in dissimilar environmental conditions, was performed as a part of *Methodologies of Assessment of the Effects of Air Quality on Library and Archive Collections* research project (DF11P01OVV020, 2011-2015), sponsored by Department of Collections Preservation of National Library of the Czech Republic, Institute of Chemical Process Fundamentals of the Academy of Sciences of the Czech Republic, v.v.i., and by the Department of Care of Physical Condition of Archived Records of the National Archive in Prague. Examination of the proportional relationship between damages to the library collections and negative environmental effects is conducive of new findings that help generate preventative measures to improve the quality of the interior environment of the depositories. Emphasis is placed particularly on development of advanced monitoring, and on methods of assessment of the effects of gas

pollutants (reactive chemical gas matter), dust particles, and microbial contamination of the environment (pollution caused by microorganisms) on library collections.

So far, adverse effects of dust causing degradation of library material has not been examined as extensively as have other degrading agents, e.g.; temperature, humidity, light, and varying gas pollutants.¹ Dust particles vary greatly in size and composition; these characteristics determine the manner in which they travel to the surface of the materials and their potentially harmful effect. Large mineral particles are abrasive (i.e.; they wield an abrasive effect); secondary atmospheric sub-micron particles are of an acid nature, while also being highly hygroscopic (they absorb and retain humidity). Increased humidity inside a book block may activate microbiologic activity, and may also work as a catalyst for cellulose hydrolysis. Carbon black soils the surfaces and adsorbs (retains on its surface) organic gas acids and volatile substances.²

When examining identical incunabula, naturally aged books are selected. Similar examination of the so-called “identical books”³ has been performed in the past: demonstrably identical books were either selected for experimental purposes, or identical books were selected that had been long-term deposited in locations with different qualities of their environment (temperature, humidity, and cleanness of air). The condition of the paper is usually determined visually, by tactile measurement of pH, and via destructive physical testing and laboratory examination (e.g.; measurement the breaking strength when pulling and bending, determination of fiber composition, of lignin and sulphur content, of average polymerization degree, and of pH value upon maceration). *SurveNIR*, a newly developed measurement system that uses a non-destructive analytical spectrometric method in the area of near infrared wavelength of the light spectrum (near infrared NIR) and chemometrics, applying statistical and mathematic methods for calibration and validation of measured values and for inference of the maximum amount of experimental data, was used for our comparison of identical incunabula.⁴

1 Identical Books versus Identical Incunabula

So far, studies involving “identical books” have only compared nineteenth and twentieth century books printed on modern paper. This study has selected a group of incunabula. However, during our examination of “identical incunabula,” fundamental differences from the preceding “identical books” studies have surfaced, underwritten by the nature of the material, manufacturing, and use of the books. What, then, are the differences between modern “identical books” and “identical incunabula”?

1 KOPECKÁ, Ivana a kol. *Preventivní péče o historické objekty a sbírky v nich uložené (Preventive Care of Historical Buildings and their Collections)*. Praha: Laurus press servis, 2002. 106 s. Odborné a metodické publikace; sv. 25. ISBN 80-86234-28-2.

2 MAŠKOVÁ, Ludmila a Jiří SMOLÍK. Prach v knihovně (“Dust in Library”). In: *Fórum pro konzervátory-restaurátory 2013: konference konzervátorů-restaurátorů, Hodonín 2013*. Brno: Technické muzeum v Brně, Metodické centrum konzervace, 2013, pg. 77–79. ISBN 978-80-86413-98-3. ISSN 1805-0050.

3 SOUČKOVÁ, Magda, Kamil BOLDAN a Jan NOVOTNÝ. Průzkum identických inkunabulí měřicím systémem SurveNIR (“Examination of Identical Incunabula via SurveNIR Measuring System”) In: *Fórum pro konzervátory-restaurátory 2013: konference konzervátorů-restaurátorů, Hodonín 2013*. Brno: Technické muzeum v Brně, Metodické centrum konzervace, 2013, p g. 67–71. ISBN 978-80-86413-98-3. ISSN 1805-0050.

4 *SurveNIR: Near Infrared Tool for Collection Surveying* [online]. © 2008 SurveNIR [cit. 2013-10-10]. Web source: <http://www.science4heritage.org/survenir/>.

The products of the printing press, dating from the second half of the fifteenth century, in many aspects imitated the manuscript *format* that had been well-established by then. So far, nearly 30 000 editions of these books have been identified and bibliographically described. Some are known only from single exemplars, others number tens of copies. *Incunabula manually bound by book binders* have authentic artistic, craft, and historical value. They usually come in the form of large books printed on relatively thick, hand-made paper, with massive bindings whose wooden cover boards are bound together with clasps, and feature protective metalwork. The examined volumes have changed their owners many times in the course of more than five centuries. The various kinds of damage the books have suffered evidence the frequency and the manner in which the books have been used and deposited — uncut pages, battered edges, cracked cover boards, bent corners, missing metalwork and malfunctioning clasps. In cases where the book binding had no longer served its original purpose due to bad craftsmanship, mechanical damage or aesthetics, some volumes were cropped and re-bound in the past. Surface aesthetic alterations, decorations and marks of origin of the binding are not, however, the subject-matter of this study, and so they will not be further considered.

2 Selection of Identical Editions of Incunabula

The Gesamtkatalog *der Wiegendrucke* (GW) containing detailed descriptions of the fifteenth century printing, gradually published by the Berlin State library since 1925, represents the core source of bibliographic reference. However, the printed version of the library work has so far only reached the letter H. For this reason, since 1980, the British Library in London has been successfully building up its *Incunabula Short Title Catalogue* (ISTC) database that features only basic, short-title references, including citations of specialized literature on the one hand, but maps out all of the so-far known fifteenth-century printing, Czech and Moravian included, on the other. Moreover, the database strives to gradually identify individual copies preserved in world institutions, fulfilling thus the role of a comprehensive catalogue.⁵ The ISTC database assigns each edition a unique numeric identifier of its bibliographic record, which makes it possible to trace all existing copies of a given edition.⁶

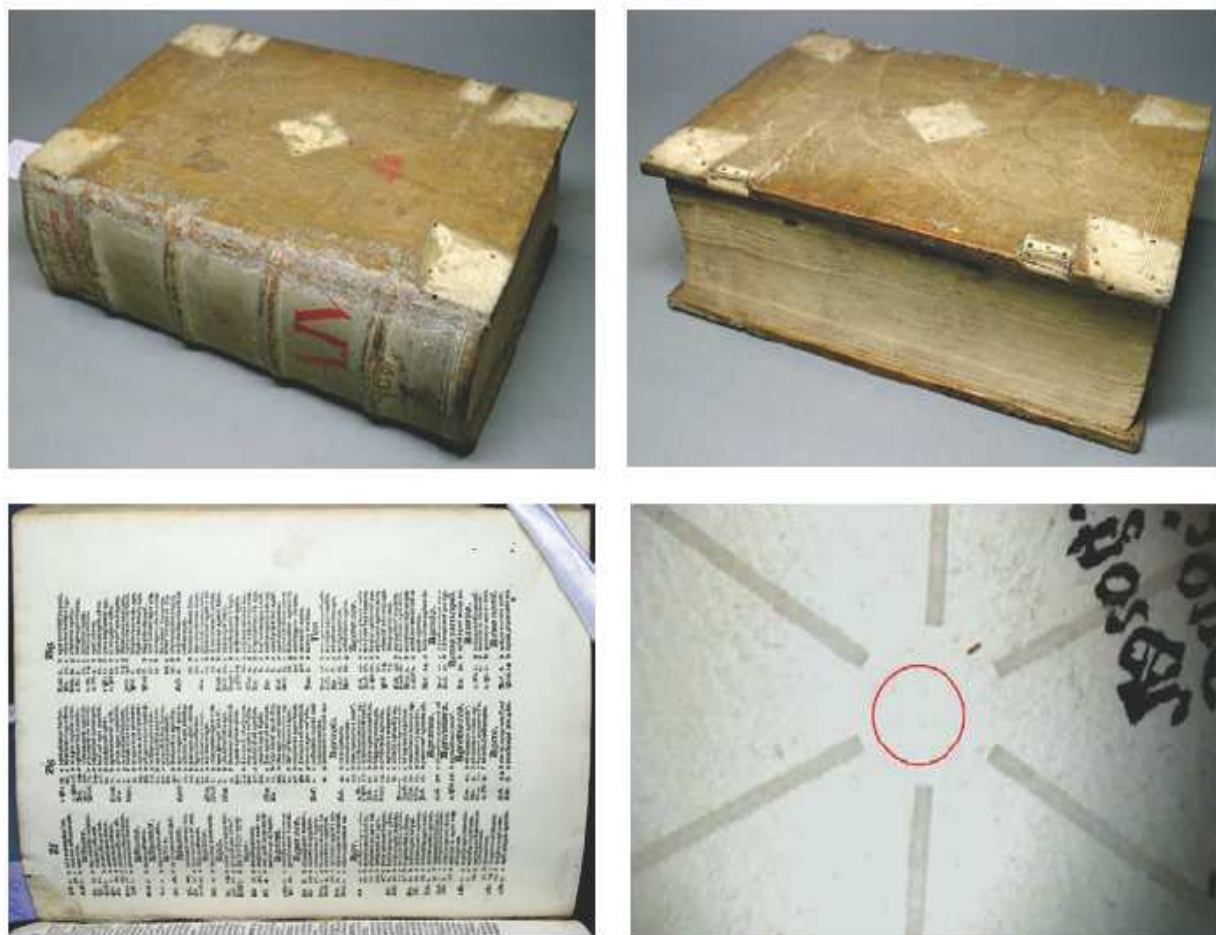
In order to compare identical editions, we selected copies held in all three of the following locations: the *National Library of the Czech Republic* (NK CR) located in Clementinum of Prague: its 4 200 items of fifteenth-century printing make the collection the most numerous in the Czech Republic, being at the same time the largest collection of early printing in central Europe; the historical collections of the *Research Library of South Bohemia* in the monastery of Zlatá Koruna, and the library of the *Regional Museum of the City of Teplice* where a part of the Cistercian library of the Osek monastery is now deposited. However, in accordance with the bibliographic records, only six groups of identical incunabula held in all three locations were found; therefore, we decided to include other incunabula in our research project that are held in two locations only, either in Clementinum and Zlatá Koruna, or in Clementinum and Osek.

Pursuant to the excerpts from bibliographic sources, a list of duplicate and triplicate incunabula was generated. Because of *difficulties* in handling, large-size incunabula were removed from

5 *Incunabula Short-Title Catalogue* [online database]. © The British Library Board [cit. 2013-10-03]. Web source: <http://www.bl.uk/catalogues/istc/>.

6 For example, identifier ISTC ic00853000 reveals the work *Concordantiae Bibliorum* of Conrad de Alemania, printed and published by "impresori" Johann Froben a Johann Petri on 5. September, 1496 in Basel. Three identical copies were found in the below given locations.

the list, while incunabula featuring several identical copies (the so-called multiplicity edition) were included, because those may be compared both with one another, and within a single institution. Let us now briefly outline the genesis of each collection.



Pict. 1 Identical incunabula ISTC ic00853000 – binding (spine, fore edge) and the examined folio b1a of a copy call number 43 C 9 from Clementinum (photo: authors' archive)

2.1 Identical Editions of Incunabula from Clementinum of Prague

The core part of the collection of incunabula of the former *Imperial Public and University Library* in Prague, the predecessor of today's NL CR, was constituted as early as in the last third of the eighteenth century when the collection of the Clementine Jesuit library, already expanded after the Battle of White Mountain (1620) by volumes of Prague university libraries, was further enlarged by collections of other Jesuit colleges and, upon their abolition during the reign of Joseph II (1780-1790), by collections of many other Czech monasteries. In the nineteenth century, the collection did not significantly expand, holding about 2 500 incunabula at the beginning of the twentieth century. The collection was enlarged to a greater degree in the period between the two World Wars, most importantly by more than 300 incunabula from the Lobkowitz library in Prague; new additions to the collection have also been made in the last decades. However, only incunabula from the original historical collection were examined: those have remained in Cle-

mentinum for over two centuries,⁷ having been assigned to the stacks under the call numbers 39 — 44, in force to this day, by the librarian *Karel Rafael Ungar* at the turn of the nineteenth century. Moreover, we have ascertained that the bookcases containing the incunabula were for the most part located in rooms situated in near proximity to their current location. However, the fact that the vast area of Clementinum has served more than one institution since the abolishment of the Jesuit order must also be taken into consideration. The former *Imperial Public and University Library* only disposed of limited space on the first floor situated around the central, so-called maintenance courtyard, and in the long northern section, along Platnéřská street. As early as the end of the eighteenth century, the incunabula were first given a room directly next to the so-called Mozart auditorium (today's room No. 115). This is corroborated by an 1801⁸ plan of the University Library. Three years later, the emperor Franz Joseph II⁹ stopped by the incunabula bookcases during his visit. Two small printed plans, dating from 1842 and 1851, locate the incunabula collection merely two rooms further down (today's room No. 112).¹⁰ An earlier, hand-drawn small plan dating from 1838 (re-printed in the Appendix¹¹) documents the same location. Not until the directorship of *Ignác Jan Hanuš* (1860–1869) were the incunabula moved from the “shabby bookcases” of the north-wing room. A space, formerly belonging to the old-time reading room near the front entrance to the Baroque Book Hall, having originally been but a corridor bridging the yard between the Astronomy Tower and the Seminářská street wing, was trans-

7 BOLDAN, Kamil. Oddělení 39–44. (“Section 39-44. Incunabula typographica”). In: FALTYSOVÁ, Vlasta, ed. *Rukověť tištěných knihovních fondů Národní knihovny České republiky od prvotisků do konce 19. století*. Praha: Národní knihovna ČR, 2006, s. 106–109. ISBN 80-7050-456-0.

MAREK, Jindřich. Historické fondy Národní knihovny ČR. Stručné dějiny jejich zpracování (“Historical Collections of the National Library of the Czech Republic: Short History”). *Knihovna – knihovnická revue*. 2007, roč. 18, č. 2, pg. 99–104. ISSN 1801-5948.

8 The plan is held in the v *National Archive*, collection of maps and plans, inv. No. 1482, and was also published in the Appendix to the following work: PAVLÍKOVÁ, Marie. Pražská Universitní knihovna za správy K. R. Ungara (“Prague University Library Under the Directorship of K. R. Ungar”) In: *Ročenka Universitní knihovny v Praze 1957*. Praha: Státní pedagogické nakladatelství, 1958, příl. č. 3. The relevant room is marked as “*Incunabula typographica*.”

9 MAREK, Jindřich a Iveta CERMANOVÁ. *Na rozhraní křesťanského a židovského věku. Příběh hebrejského cenzora a klementinského knihovníka Karla Fischera (1757–1844)*(*At the Turn of The Christian And Jewish Ages*). Praha: Národní knihovna ČR, 2007, pg. 88. ISBN 978-80-7050-5.

10 SPIRK, Anton. *Geschichte und Beschreibung der k. k. Universitätsbibliothek zu Prag*. Wien, 1844, in the Appendix, “Grundriss des k. k. Bibliotheks-Gebäudes zu Prag. 1842.” HANSLIK, Joseph A. *Geschichte und Beschreibung der Prager Universitätsbibliothek*. Prag, 1851, s. 472 and the article published in the Appendix. The room is marked as “*Inkunabelzimmer*.”

11 National Library Archive, collection VUK (1522) 1777–1918 (1919), inv. No. 325. Marked here as “*Alte Drucke aus den ersten Perioden der Buchdruckerkunst*.”

formed into the incunabula hall.¹² Upon the remodeling of Clementinum, designed by architect Ladislav Machoň at the end of the nineteen-twenties, a set of safe deposit rooms was introduced into the northern wing, thus providing the call number stacks of incunabula with their current location in the smaller safe deposit room (room No. 113) that directly connects to the space in which the incunabula were deposited in mid-nineteenth century.



Pict. 2 Identical incunabula ISTC ic00853000 – binding (spine, fore edge) and the examined folio b1a of copy call number 2 N I 14 z from the depository of Zlatá Koruna (photo: authors' archive)

2.2 Identical Editions of Incunabula from the Cistercian Monastery of Zlatá Koruna

The historical collection of the *Research Library of South Bohemia in České Budějovice* numbers over 320 incunabula that have mostly come from south Bohemian monasteries and other church institutions. The incunabula are indexed, their book bindings are thoroughly described, and notes on their provenience are provided in a 1974 printed catalogue.¹³ Within the examined group, the majority of volumes came from Bechyně Franciscan library, Český Krumlov and Jindřichův Hradec Friars Minor order, and Nové Hradý Friar Servants order. According to the

¹² PRAŽÁKOVÁ, Běla. Ignác Jan Hanuš a jeho činnost v pražské Universitní knihovně v letech 1860–1869 (“Ignác Jan Hanuš and His Activities in Prague University Library, 1860–1869”). In: *Vědeckoteoretický sborník Knihovna*. Praha: Státní pedagogické nakladatelství, 1967, pg. 25 and 29.

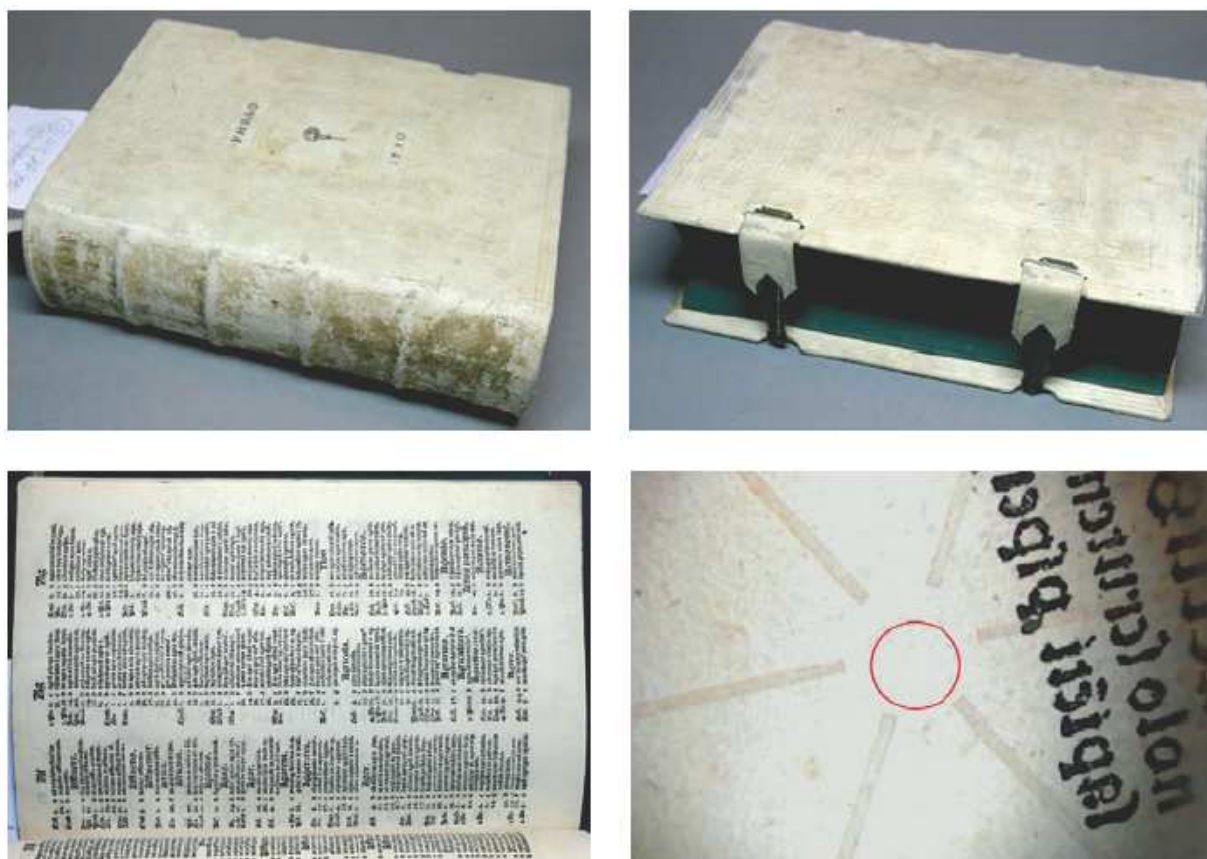
¹³ RIEDL, Mirko. *Katalog prvotisků jihočeských knihoven (Catalogue of Incunabula in Libraries of South Bohemia)*. Praha: Státní pedagogické nakladatelství, 1974. 478 s. The catalogue registers incunabula that are no longer administered by the Science Library of South Bohemia; we are referring particularly to the fifteenth-century early printed books from the interior monastery library in Vyšší Brod that was restituted to the ownership of the Cistercian order after 1990.

notes on provenience, the majority were deposited in south Bohemia no later than the seventeenth or eighteenth centuries when they found their way to the above-mentioned monastery or other non-secular libraries. However, there is evidence that most of the volumes belonging to the Friar Minors order were deposited in Český Krumlov as early as in the fifteenth century. This also applies to certain volumes in the prelate's library situated in the same location.

Concerning later religious institutions, the bishop's library and the library of the seminary, both located in the town of České Budějovice, were the the most represented institutions in the group. Should the former owners of the selected incunabula, the titles of which naturally reflect a broader spectrum of religious literature, be traced as far as the fifteenth and sixteenth century, we would find that the incunabula were mostly used by non-monastic clergy living in the many small towns of south and southwest Bohemia. Besides the predominant German typographic books, there is also a larger group of printed Italian copies of the early editions of the ancient classics that the humanist and later a Krumlov priest, *Martin Mareš*, brought back from his studies in Italy. After his premature death in 1499, those printed books and his entire collection were inherited by his brother-in-law, *Václav z Rovného* (1448–1531), a long-time secretary to the house of Rožmberk. The majority of the collection later became a part of the chaplain library of Krumlov. One of the examined volumes comes from the famous Rožmberk library.

Since the mid-twentieth century, the historical library collections that are currently administered by the *Research Library of South Bohemia* have been situated in the former Cistercian monastery of Zlatá Koruna. Concretely, the section of manuscripts and early printed books is located in the building of the abbey. In mid-nineteen ninety, the most valuable part of the historical collection — its core, consisting of manuscripts and incunabula — was placed in a safe deposit room set up in the spectacular interior of the first level of the early gothic chapel of *Guardian Angels*.¹⁴

¹⁴ ŠPINAR, Jindřich. Nový depozitář rukopisů a prvotisků ve Zlaté Koruně ("New Depository of Incunabula and Prints in Zlatá Koruna"). In: *Muzejní prezentace k dějinám knižní kultury: sborník příspěvků z celostátního semináře knihovníků muzeí a galerií České republiky*. Jindřichův Hradec: Okresní muzeum, 1996, pg. 40–41. ISBN 80-901575-1-3.



Pict. 3 Identical incunabula ISTC ic00853000 – binding (spine, fore edge) and the examined folio b1a of a copy call number Osek HH 7/11 z from the depository of the Regional Museum of Teplice (photo: authors' archive)

2.3 Identical Editions of Incunabula from the Cistercian Monastery of Osek

The beginnings of the Cistercian monastery date back to the last decade of the 12th century. The monastery was forcibly closed down in 1950. The baroque abbot's library was at first under the administration of the State Library of Czechoslovakia (the predecessor of NL CR) that passed the library on to the care of the Museum of Teplice in 1969, under whose administration the library has remained to this day.¹⁵ The library hall, showcasing a gallery and a beautiful baroque Baroque furniture, dating from the 1720s, is located in the south wing of the prelature. Nearly seventy incunabula form a part of the collection. The director of the museum library, *Jana Mich-*

¹⁵ On the convoluted post-war history of the monastery library, see BOLDAN, Kamil. Bohemikální iluminované rukopisy knihovny cisterciáckého kláštera v Oseku z pohledu kodikologického ("Bohemical Illuminated Manuscripts from the Library of the Cistercian Monastery of Osek"). *Miscellanea oddělení rukopisů a starých tisků* 16, 1999–2000, s. 52–56. ISBN 80-7050-401-3. Medieval manuscripts and a some incunabula and post-incunabula were moved to the National Library where they have remained even after the re-discovery of the monastery in the nineteen-nineties. Due to the current process of restitution, the books will most probably be handed over to the Cistercian order in 2014. The early printed books from the convent library, demolished in 1950, when the monastery was converted into internment camp for nuns and monks, are today mostly held in the collection of *Památník národního písemnictví*.

lová,¹⁶ prepared their inventory list which she published together with a sketched-out history of the monastery library.

However, only a few individual pieces come from the original, gothic lectern library. The monastery ceased to exist during the Reformation and was re-opened shortly after the Battle of White Mountain (i.e.; after 1620). By the same token, the monastery also evidently obtained the majority of the examined volumes as late as in the second half of the seventeenth and in the eighteenth century. However, we may ascertain that similarly to the Clementine incunabula, the north bohemian Osek volumes had remained in their place of deposit for at least over two hundred years. These days, the incunabula have been removed from the historical library hall and transferred to the town of Teplice about ten kilometers away, and deposited there in a book depository of one of the wings of the Clary-Aldringen castle where the regional museum is now located. However, this fact has no bearing on our premise that the third group of volumes was deposited for a long period of time in a polluted environment.

3 Methodology of Examination

Prior to the actual measurement, the following identification data on the edition of the incunabulum is entered into the *SurveNIR* system under the call number of the copy: ISTC bibliographic identifier, place and year of publication, and the signature marks of the folio under investigation (the selection process of the place of measurement is detailed in the following section). In order to be able to assess all possible causes of paper damage due to dust and environmental pollution, additional criteria are defined and entered into the *SurveNIR* system pursuant to the below-given methodology, according to which data on the physical condition of the individual copy is provided. Moreover, photographic documentation of the binding of the book and of the examined folio is provided for each volume.

3.1 Selection of the Place of Measurement

The same page of each identical edition was selected for our examination since it may be assumed that the same paper was used for the printing of each copy. However, fifteenth-century prints rarely contained numbered pagination or foliation. Printed signature marks therefore represented the most frequently used, and essential device to identify the order of folding of individual sheets and the order of the foldings. Signatures were devised to help the printers to correctly gather the printed sheets into complete gatherings, and the bookbinders to monitor the correct order of the folds. *The folds were marked with letters or, as the case may be, with other marks.* The marks were most frequently placed onto the face side of the sheets in their right-hand corners. According to the most common practice, lower-case letters were used first; in the event that there were more folds to be marked, “z” was followed by the usual abbreviation marks of the time (e.g.; “et,” “con,” “rum”), upper-case letters, doubled letters, etc. The order of the sheets in each fold was indicated by arab or roman numerals (e.g.; k1, k2, etc.). Given the frequency of defects and missing sheets, especially at the beginning and end of the 500 year-old prints, the first sheet of the second fold was selected, usually marked by b1 signature, while measurements were performed on the bottom edge of its recto side. Identical editions of incunabula were often bound together with other incunabula editions into one text block and that is why their placement in the book block may not be identical with each individual copy.

¹⁶ MICHLOVÁ, Jana. Knihovna kláštera cisterciáků v Oseku (“The Library of the Cistercian Monastery of Osek”). In: *800 let kláštera Osek. Jubilejní sborník*. Osek: Cisterciácké opatství, 1996, pg. 200–211. ISBN 80-85 204-30-4.

3.2 Physical Condition of Selected Copies

The quality of the binding is the core prerequisite for exact assessment of the quality of the paper; that is, it is necessary to determine whether the *binding is modern, historical, or a contemporary rebinding of a restored book*. Paper rebinding in dark-grey and dark-brown starch paper was used on a part of the Clementinum collection regardless of the age and value of the books. In cases of hanging rebinding, the original sewing was usually preserved, while the damaged bands were replaced with twine.¹⁷ Thus rebound incunabula comply with the criteria of intactness of the book blocks: the volumes have evidently been deposited in one location for more than 200 years, having aged in natural conditions; that is why they were subjected to experimental measurements pursuant to the selected methodology, and included in the overall assessment. To this day, the majority of the Clementinum incunabula have retained their late-gothic bindings.

However, removal of damaged parts, causing substantial damages to the historical integrity of book bindings, *occurred* both upon rebinding, and in the course of their complete restoration in the nineteen sixties and seventies, as evidenced by some of the examined copies from the depository of Zlatá Koruna. In order to provide the best-functioning binding and maximum protection of the valuable textual content, the original binding often became irreparably destroyed, the paper block was taken apart, and individual sheets were bathed and chemically preserved. The radical intervention has changed the physical and chemical structure of the historical materials originally processed by their contemporary technology and aged for extensive periods of time in natural conditions. The degree of such changes made it impossible to include the results of the examination of the treated paper in the overall assessment pursuant to the selected methodology. The empirical results of the examination performed by *SurveNIR* on a set of paper samples from the collections of the National Archive in Prague have moreover demonstrated that the pH values of the paper that has been run through the conservation intervention makes *SurveNIR* process the data incorrectly.¹⁸

17 VNOUČEK, Jiří. Konzervátorský průzkum nejvzácnějších rukopisů uložených v Národní knihovně České republiky ("Conservation Survey of Rarest Manuscripts Deposited in National Library of the Czech Republic"). *Národní knihovna: knihovnická revue*, 1998, roč. 9, č. 2, pg. 61. ISSN 0862-7487.

18 PAULUSOVÁ, Hana a Lenka BARTLOVÁ. *Průzkum souboru vzorků z archivních fondů Národního archivu Praha pomocí SURVENIR (Survey of Set of Samples from Archive Collections of National Archive)* [online]. Praha: Národní archiv, Oddělení péče o fyzický stav archiválií, prosinec 2010 [cit. 2013-10-08]. Web source: <http://www.nacr.cz/Z-files/survenir.pdf>.



Pict. 4 Historical late baroque re-binding of a Clementinum copy call number 40 E 30 and a completely restored copy call number 2 CK I 32 from Zlatá Koruna, restored in the Center of Art and Craft of Hodonín in 1967(photo: authors' archive)

It is presumed that the degree to which dust particles permeate the book block is affected by the type of binding and the technology used for its manufacture, mechanical damages, and the manner in which the block has been deposited. Therefore, there are two categories of bindings: soft cover binding, and hard, board cover binding. Additional data about the board material (wood or pasteboard) and its cover (leather, parchment, paper) is also provided. Damages to the binding caused by improper use and handling affect the compactness of the book block, which in turn damages the historical paper. Since the first and last folds tend to be the most impacted, the next successive folds are examined instead (featuring the signature b1, or, as the case may be, B1) as given above. It is also important to check whether the volume has functioning clasps and protective metalwork. So far, research has corroborated that the inside of the book is protected from the damaging effects of air and light by tightly clasped hard boards, and by the massive headband tightly attached to the spine with a manually in-sewn band. Closed clasps prevent dust particles and mold spores from penetrating between the sheets of the book block while also preventing the wooden boards from warping. Warping may be partially caused by the shrinking of collagen surface material (leather, and parchment) in an environment with relatively low humidity. The cover boards gradually open in the direction away from the block, the effect of an inadequately strong pull being felt the most in the area of the hinge, where too dry a leather breaks during the handling of the book; the board then hangs on the inadequately stressed bands and spine liner.¹⁹ Breakage of hinges may also be caused by the toughness of the spine due to historical repairs and aesthetic adjustments; low flexibility of a heavily glued spine liner may then be the cause of damage to the binding structure.

When examining the incunabula we found that metal parts were missing from the vast majority of Clementine volumes. The beginnings of the mass removal of metalwork and clasps with

¹⁹ NUSKA, Bohumil. Spony knih jsou k zavírání ("Book Clasps Are Meant for Closing"). In: *Historická knižní vazba. Sborník příspěvků k dějinám vazby a k metodice ochrany historických knižních vazeb, 1966–1970*. Liberec: Severočeské muzeum, 1970, pg. 177–178. Odborné a metodické příručky Severočeského musea; Sv. 5–9.

belts may be dated to the first half of the eighteenth century²⁰ when the books were placed vertically into the newly constructed cases of the baroque library hall.²¹ Therefore, it is evident that due to the removal of the clasps, the Clementine volumes were not provided with the protective function of a tightly clasped book block.

3.3 Results of Examination of Physical Condition

Pursuant to the criteria for the assessment of the physical condition of the books given in *table 1*, 153 books from Clementinum (NL) and Zlatá Koruna (ZK) have been examined, forming together 72 groups of two or more identical editions of incunabula. 22 groups that contained restored copies from ZK had to be exempted from the overall assessment (the total of 26 volumes); therefore, 50 groups of identical incunabula have remained (number of NL copies 71 = 100 %, number of ZK copies 51 = 100 %).

The next phase of our study examined the total of 110 Clementinum (NL) copies and copies from the depository of the Regional Museum of Teplice (RMT) that together formed 43 groups of two or more identical incunabula (number of NL copies: 65 = 100 %, number of RMT copies: 45 = 100 %); none of the groups contained restored volumes.

Pursuant to the additional criteria included in *SurveNIR*, functionality of the book clasps was key for the assessment of the degree of the tightness of the closure of the book block; in order to assess the compactness of the book block, excessive undulation of the sheets, undesirable (convex) bending of the spine, and damaged binding structure — in the event of loose folds and leaves — were also considered.

Tab. 1 Physical condition of identical incunabula from two different locations, mutually compared.

	Klementinum (NK)	Zlatá Koruna (ZK)	Klementinum (NK)	Teplice (RMT)
Historická převazba	37 %	31 %	28 %	47 %
Funkční spony	1 %	29 %	2 %	49 %
Chybějící desky	3 %	2 %	2 %	7 %
Nekompaktní knižní blok	31 %	31 %	14 %	11 %
Prachové znečištění	1 %	22 %	8 %	11 %
Poškození struktury vazby	8 %	16 %	5 %	2 %
Ohnuté rohy	17 %	18 %	6 %	9 %
Trhliny v knižním bloku	23 %	33 %	5 %	0 %

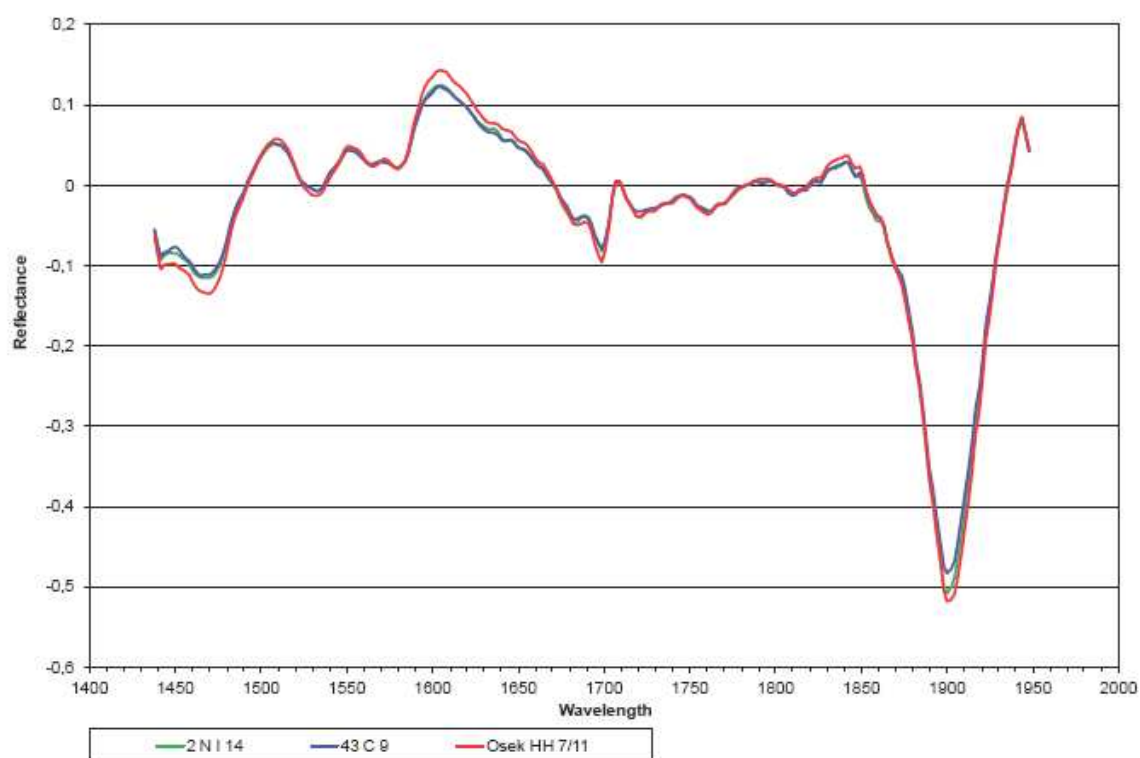
20 NOVOTNÝ, Jan. Barokní úpravy knižních vazeb v klementinské jezuitské knihovně (“Specifics of Documenting of Physical Condition of Rare Library Books”). In: *Bibliotheca Antiqua 2013*: sborník z 22. konference 30.–31. října 2013, Olomouc. Olomouc: Vědecká knihovna v Olomouci; Ostrava: Sdružení knihoven ČR, 2013, pg. 77–82. ISBN 978-80-7053-301-7. ISBN 978-80-86249-69-8. Also available at: http://www.vkol.cz/data/soubory/import/konf22/jan_novotny.pdf.

21 PAVLÍKOVÁ, Marie. Pražská univerzitní knihovna za správy K. R. Ungara (“Prague University Library Under the Directorship of K. R. Ungar”). In: *Ročenka Univerzitní knihovny v Praze 1957*. Praha: SPN, 1958, pg. 5–47.

So far, it has been presumed that data on the physical condition of the copies marked in green and red in *table 1* should indicate that the negative impact of dust particles and pollutants on naturally-aged paper would be lower in comparison with the corresponding second location, the only significant difference between the two compared groups being the protective function of the clasps.

4 Measurement of Degree of Paper Degradation via SurveNIR

The non-destructive *SurveNIR* method compares infrared spectra of the analyzed samples of paper²² against a vast library of reference spectra and samples of historical paper analyzed and tested in laboratory conditions, whose pH of cold leach, average polymerization degree, molecule weight, lignin, protein and resin content were established in advance, as were the values of tension strength, tension strength after bending, and the presence of optical brighteners. The chemical and physical characteristics of the paper of each copy have been derived chemometrically from the average of eight spectrometric measurement results. *SurveNIR* automatically takes microscopic snapshots of the analyzed spots.²³



Pict.5 Spectral graph of three identical incunabula editions ISTC ic00853000 – copy from ZK call number 2 N I 14 (pH 7,3; PPS 1,6), from NK call number 43 C 9 (pH 6,9, PPS 1,4) and from RMT call number Osek HH 7/11 (pH 6,3, PPS 1,4)

22 Spectra in the area of wavelengths of 1 100–2 500 nm of electromagnetic rays NIR (Near Infrared).

23 SOUČKOVÁ, Průzkum identických inkunabulí..., (“Examination of Identical Incunabula via SurveNIR Measuring System”) pg. 67–71.

4.1 Results of Measurements

When examining a group of identical incunabula (number of NK copies: 71 = 100 %, number of ZK copies: 51 = 100 %), particularly the chemical and physical properties of their paper given in *table 2*, we found that the paper pH of 73% of ZK copies was higher (and thus undesirable) by at least 0.5 pH in comparison with NK, where a higher pH was recorded with only 0.1% of copies; the rest showcased differences below 0.5 pH. 53% of ZK volumes featured a level of polymerization of no less than 500.²⁴ 29% of copies also showcased higher tension strength of no less than 10 N (Newton) and, similarly, 27% showcased higher tension strength upon bending.

The same procedure was implemented for the assessment of another group of incunabula (number of NK copies: 65 = 100 %, number of RMT copies: 45 = 100 %). The pH of 16% of RMT copies was higher in comparison with 12% of NK; however, nearly 72% of copies from both locations identically yielded values of less than 0.5 pH. A higher level of polymerization was detected with 18% of NK volumes, their tension strength being 34% and their tension strength after bending being 31% .

Tab. 2 Results of measurements of identical incunabula from two different locations, mutually compared.

	Klementinum	Zlatá Koruna	Klementinum	Teplice
pH studeného výluhu	1 %	73 %	12 %	16 %
průměrný polymerační stupeň	8 %	53 %	18 %	9 %
pevnost v tahu	10 %	29 %	34 %	4 %
pevnost v tahu po ohybu	13 %	27 %	31 %	9 %

The green and red data in *table 2* shows a better quality of naturally aged paper in comparison with the other location. Higher values of chemical and physical-mechanical qualities of the paper were detected both in ZK and NL copies. Identical NL and RMT copies were deposited for a long period of time in environments polluted by gas and solid pollutants, which is corroborated by lower pH values of cold leach, average polymerization degree, tension strength and tension strength after bending. High concentrations of sulphur dioxide SO₂ and nitrogen oxides NO_x were monitored in both locations for an extended time period both by the accredited testing agency, *SVÚOM, Ltd.*,²⁵ and by the *Czech Hydrometeorological Institute*.

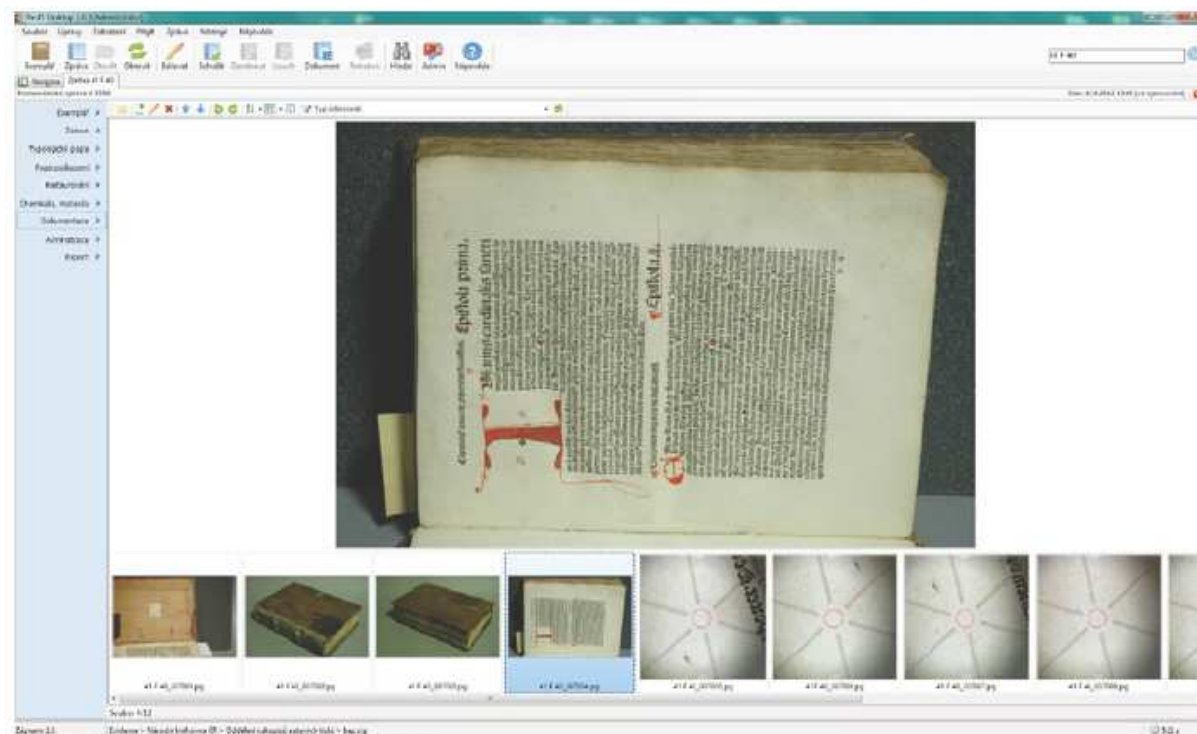
5 Data Archiving in ResIS Information System

ResIS system has been designed for comprehensive processing and storing of data from the areas of restoration and protection of historical library collections. The system may also be used in a retrospective manner when processing documents and records from different time periods. The digital ResIS archive also contains a series of macroscopic, microscopic and spectral snapshots from conservation surveys and research projects that have used modern spectroscopic

²⁴ The degree average of polymerization determines the length average of the cellulose macromolecule; the lower the degree, the higher the damage of the paper.

²⁵ *SVÚOM, Ltd.* continues the activities of State Research Institute for Protection of Materials.

and spectrometric apparatuses.²⁶ Our examination of identical incunabula via *SurveNIR* method has focused on the physical condition of actual books; for this reason, all identification and bibliographic data, the results of spectrometric measurements of the chemical and mechanical qualities of the historical paper, and microscopic snapshots of the analyzed spots have been uploaded into the Restoration Information System (ResIS) under the call number of each book.



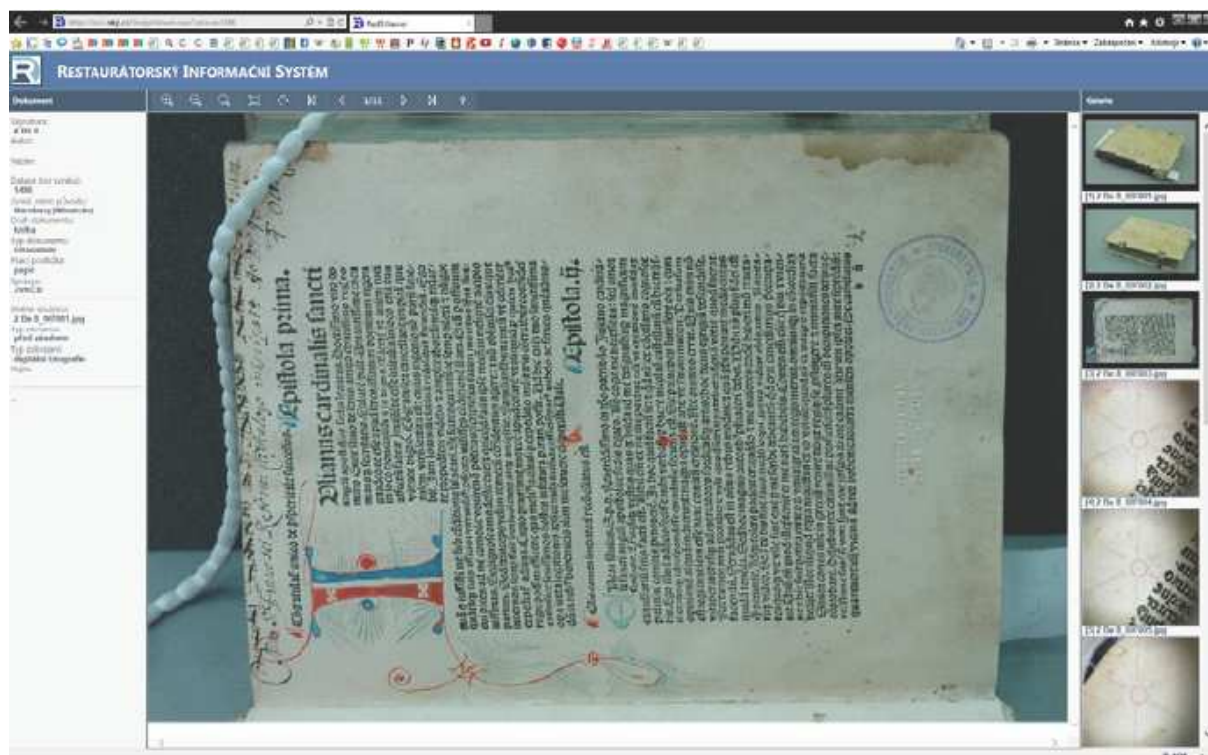
Pict. 6 User interface of client application of ResIS Desktop 1.0.3 with the entry on folio b1 and an identical ISTC ip00719000, copy call number 41 F 40 deposited in Clementinum

The developers of ResIS system have placed emphasis on mutual compatibility of data both inside the system and of data exchanged with similarly designed information systems. Metadata interoperability is fully supported by newly developed XML schema generator that includes comprehensive processing of details and documentation concerning the physical condition of examined books. The metadata schema follows the international TEI P5²⁷ standard for description of manuscripts and old printed books. The description schema of TEI_RESIS is further implemented in METS metadata container that stores descriptive, technical, administrative and structural metadata. Long-term storage and protection of archived data is one of the advantages of ResIS.²⁸

26 NOVOTNÝ, Jan. Specifika dokumentace fyzického stavu vzácných knihovních exemplářů (“Specifics of Documenting of Physical Condition of Rare Library Books”). In: *Interdisciplinarita v péči o kulturní dědictví. Sborník z konference*. Pardubice: Univerzita Pardubice, 2013,pg. 249–263. ISBN 978-80-7395-594-6.

27 <http://www.tei-c.org/Guidelines/P5/>

28 NOVOTNÝ, Jan. Restaurátorský informační systém ResIS (“ResIS: Restoration Information System”). In: *Výzkum a vývoj nových postupů v ochraně a konzervaci písemných památek (2005–2011): sborník příspěvků závěrečného semináře k výzkumnému záměru MK00002322103*. 1. vyd. Praha: Národní knihovna ČR, 2011. pg. 93–116. ISBN 978-80-7050-603-5. Also available at: http://wwwold.nkp.cz/restauratori/2011/Novotny_2011_ResIS.pdf.



Pict. 7 Advanced search interface of ResIS system with the entry on folio b1a of identical edition ISTC ip00719000, call number 2 Be 8 deposited in Zlatá Koruna depository.

The server setup includes database and application servers installed in a single virtual server.²⁹ The web application of the search interface makes the documents easily accessible; visual documentation may be viewed as new window in ResIS Viewer editor. Internal access is made possible via NL CR intranet through the web address <http://resis.nkp.cz/>, public access is made possible via the internet address <http://toc.nkp.cz/ResIS/>.

Conclusion

The nondestructive SurveNIR method was novelly tested out for the purposes of comparison of the physical condition of paper that had aged naturally in locations of different environmental quality. The SurveNIR system has so far been mostly used for statistical analyses of the conditions of library and archive collections. The results of the quantitative measurements of identical incunabula given in *table 2* show that the quality of the environment significantly affects the chemical and physical-mechanical qualities of the paper.

The color-marked values in *tables 1 and 2* show that there is no evidence of a relationship between a book block closed with clasps and a lower degree of degradation of its historical paper. Particles of the size of 100 nm–1 µm that move around in the form of aerosol via free convection, slowly setting down on differently oriented surfaces through the combination of sedimentation and diffusion, form a substantial part of the suspended particles found in the interior environment of libraries. The proportion of sedimentation and diffusion is contingent upon the size of the dust particles: bigger particles of the diameter of > 1 µm tend to sediment on horizontal surfaces due to gravitation, while smaller particles of < 100 nm diameter deposit themselves onto all surfaces

²⁹ COMDAT s.r.o. *Restaurátorský informační systém RESIS: analýza systému (RESIS Restoration Information System: System Analysis)*. Version 1.0 Draft. 2010. 15 s. Technická dokumentace.

via diffusion motion.³⁰ The results of the model measuring evidence that sub-micron particles of the diameter of $> 1 \mu\text{m}$ may penetrate into the spaces between the volumes and between the sheets of the book block.³¹

In order to provide long-term protection of books from the negative effects of dust particles and gas pollutants, the internal environment of the depositories must be adjusted in order to secure a stable and regularly monitored environment with clearly defined quality of clean air. Partial protection of original copies from dust pollution and sulphur and nitrogen oxides may be facilitated by a system of protective boxes and wrappers; it is important to use non-acidic archive cardboard with sufficient alcalic reserve in order to slow down the chemical degradation processes inside the deposited materials.³² However, an airtight protective wrapper might generate an interior microclimate. As evidenced by experimental testing of vacuum-packed books and newspaper containing high levels of wood pulp, volatile chemicals released from the materials accelerate the chemical reactions related to degradation.³³

This study took place in 2011–2013 as a part of Methodologies of Assessment of the Effects of Air Quality on Library and Archive Collections (DF11P01OVV020, 2011–2015) research project funded by Program of Applied Research and Development of National and Cultural Identity NAKI, a grant program of the Ministry of Culture of the Czech Republic.

30 MAŠKOVÁ, Prach v knihovně (“Dust in Library”), pg. 77–79.

31 SMOLÍK, Jiří, Ludmila MAŠKOVÁ, Naděžda ZÍKOVÁ, Lucie ONDRÁČKOVÁ a Jakub ONDRÁČEK. Deposition of Suspended Fine Particulate Matter in Library. *Heritage Science*, 2013, 1:7. doi:10.1186/2050-7445-1-7. Web source: <http://www.heritagesciencejournal.com/content/pdf/2050-7445-1-7.pdf>.

32 SOUČKOVÁ, Magda. Krabice jako ochrana před negativním působením okolního prostředí (“Box As Protection From Negative Environmental Effects”). In: *Výzkum a vývoj nových postupů v ochraně a konzervaci písemných památek (2005–2011): sborník příspěvků závěrečného semináře k výzkumnému záměru MK00002322103*. 1. vyd. Praha: Národní knihovna ČR, 2011. s. 21–36. ISBN 978-80-7050-603-5. Also available at: http://wwwold.nkp.cz/restauratori/2011/Souckova_2011_krabice.pdf.

33 VÁVROVÁ, Petra a Martina OHLÍDALOVÁ. Umístění knihovních fondů do obalů ze speciálních fólií bez přístupu vzduchu jako možnost jejich ochrany před degradačními vlivy – ano či ne? (“Airtight Wrapping of Library Collection Books in Special Foils As a Way of Protecting Them from Degrading Elements: Yes or No?”). In: *Výzkum a vývoj nových postupů v ochraně a konzervaci písemných památek (2005–2011): sborník příspěvků závěrečného semináře k výzkumnému záměru MK00002322103*. 1. vyd. Praha: Národní knihovna ČR, 2011. s. 37–53. ISBN 978-80-7050-603-5. Also available at: http://wwwold.nkp.cz/restauratori/2011/Vavrova_Ohlidalova_2011.pdf.

Sources and Works Cited:

National Library Archive, VUK (1522) collection 1777–1918 (1919).

BOLDAN, Kamil. Bohemikální iluminované rukopisy knihovny cisterciáckého kláštera v Oseku z pohledu kodikologického ("Bohemical Illuminated Manuscripts from the Library of the Cistercian Monastery of Osek"). In: *Miscellanea oddělení rukopisů a starých tisků 16*. Praha: Národní knihovna ČR, 1999–2000, pg. 52–56. ISBN 80-7050-401-3.

BOLDAN, Kamil. Oddělení 39–44. Incunabula typographica. In: FALTYSOVÁ, Vlasta, ed. *Rukověť tištěných knihovních fondů Národní knihovny České republiky od prvotisků do konce 19. století*. Praha: Národní knihovna ČR, 2006, pg. 106–109. ISBN 80-7050-456-0.

COMDAT, Ltd. Restaurátorský informační systém RESIS: analýza systému (RESIS Restoration Information System: System Analysis). Version 1.0 Draft. 2010. 15 s. Technická dokumentace.

HANSLIK, Joseph A. Geschichte und Beschreibung der Prager Universitätsbibliothek. Prag, 1851, pg. 472.

Incunabula Short-Title Catalogue [online database]. © The British Library Board [cit. 2013-10-03]. Web source: <http://www.bl.uk/catalogues/istc/>.

KOPECKÁ, Ivana a kol. Preventivní péče o historické objekty a sbírky v nich uložené (Preventive Care of Historical Buildings and their Collections) Praha: Laurus press servis, 2002. 106 s. Odborné a metodické publikace; sv. 25. ISBN 80-86234-28-2.

MAREK, Jindřich a Iveta CERMANOVÁ. Na rozhraní křesťanského a židovského věku. Příběh hebrejského cenzora a klementinského knihovníka Karla Fischera (1757–1844) (At the Turn of The Christian And Jewish Ages). Praha: Národní knihovna ČR, 2007, pg. 88. ISBN 978-80-7050-5.

MAREK, Jindřich. Historické fondy Národní knihovny ČR. Stručné dějiny jejich zpracování. ("Historical Collections of the National Library of the Czech Republic: Short History") Knihovna – knihovnická revue. 2007, roč. 18/2, pg. 99–104. ISSN 1801-5948.

MAŠKOVÁ, Ludmila a Jiří SMOLÍK. Prach v knihovně ("Dust in Library"). In: Fórum pro konzervátory-restaurátory 2013: konference konzervátorů-restaurátorů, Hodonín 2013. Brno: Technické muzeum v Brně, Metodické centrum konzervace, 2013, pg. 77–79. ISBN 978-80-86413-98-3. ISSN 1805-0050.

MICHLOVÁ, Jana. Knihovna kláštera cisterciáků v Oseku ("The Library of the Cistercian Monastery of Osek"). In: 800 let kláštera Osek. Jubilejní sborník. Osek: Cisterciácké opatství, 1996, pg. 200–211. ISBN 80-85 204-30-4.

NOVOTNÝ, Jan. Barokní úpravy knižních vazeb v klementinské jezuitské knihovně ("Baroque Treatment of Book Bindings in the Jesuit Library of Clementinum"). In: Bibliotheca Antiqua 2013: sborník z 22. konference 30.–31. října 2013, Olomouc. Olomouc: Vědecká knihovna v Olomouci; Ostrava: Sdružení knihoven ČR, 2013, pg. 77–82. ISBN 978-80-7053-301-7. ISBN 978-80-86249-69-8. Also available at: http://www.vkol.cz/data/soubory/import/konf22/jan_novotny.pdf.

NOVOTNÝ, Jan. Restaurátorský informační systém ResIS ("ResIS: Restoration Information System"). In: Výzkum a vývoj nových postupů v ochraně a konzervaci písemných památek (2005–2011): sborník příspěvků závěrečného semináře k výzkumnému záměru

MK00002322103. 1. vyd. Praha: Národní knihovna ČR, 2011. pg. 93–116. ISBN 978-80-7050-603-5. Also available at: http://wwwold.nkp.cz/restauratori/2011/Novotny_2011_ResIS.pdf.

NOVOTNÝ, Jan. Specifika dokumentace fyzického stavu vzácných knihovních exemplářů (“Specifics of Documenting of Physical Condition of Rare Library Books”). In: Interdisciplinarita v péči o kulturní dědictví. Sborník z konference. Pardubice: Univerzita Pardubice, 2013, pg. 249–263. ISBN 978-80-7395-594-6.

NUSKA, Bohumil. Spony knih jsou k zavírání (“Book Clasps Are Meant for Closing”). In: Historická knižní vazba. Sborník příspěvků k dějinám vazby a k metodice ochrany historických knižních vazeb, 1966–1970. Liberec: Severočeské muzeum, 1970, s. 177–178. Odborné a metodické příručky Severočeského musea; Sv. 5–9.

PAULUSOVÁ, Hana a Lenka BARTLOVÁ. Průzkum souboru vzorků z archivních fondů Národního archivu Praha pomocí SURVENIR (Survey of Set of Samples from Archive Collections of National Archive) [online]. Praha: Národní archiv, Oddělení péče o fyzický stav archiválií, prosinec 2010 [cit. 2013-10-08]. Web source: <http://www.nacr.cz/Z-files/survenir.pdf>.

PAVLÍKOVÁ, Marie. Pražská Universitní knihovna za správy K. R. Ungara (“Prague University Library Under the Directorship of K. R. Ungar”). In: Ročenka Universitní knihovny v Praze 1957. Praha: Státní pedagogické nakladatelství, 1958, příl. č. 3.

PAVLÍKOVÁ, Marie. Pražská universitní knihovna za správy K. R. Ungara (“Prague University Library Under the Directorship of K. R. Ungar”). In: Ročenka Universitní knihovny v Praze 1957. Praha: SPN, 1958, pg. 5–47.

PRAŽÁKOVÁ, Běla. Ignác Jan Hanuš a jeho činnost v pražské Universitní knihovně v letech 1860–1869 (“Ignác Jan Hanuš and His Activities in Prague University Library, 1860–1869”). In: Vědeckoteoretický sborník Knihovna. Praha: Státní pedagogické nakladatelství, 1967, pg. 25 and 29.

RIEDL, Mirko. Katalog prvotisků jihočeských knihoven (Catalogue of Incunabula in Libraries of South Bohemia). Praha: Státní pedagogické nakladatelství, 1974. 478 s.

SMOLÍK, Jiří, Ludmila MAŠKOVÁ, Naděžda ZÍKOVÁ, Lucie ONDRÁČKOVÁ a Jakub ONDRÁČEK. Deposition of Suspended Fine Particulate Matter in Library. Heritage Science, 2013, 1:7. doi:10.1186/2050-7445-1-7. Web source: <http://www.heritagesciencejournal.com/content/pdf/2050-7445-1-7.pdf>.

SOUČKOVÁ, Magda, Kamil BOLDAN a Jan NOVOTNÝ. Průzkum identických inkunabulí měřicím systémem SurveNIR (“Examination of Identical Incunabula via SurveNIR Measuring System”). In: Fórum pro konzervátory-restaurátory 2013: konference konzervátorů-restaurátorů, Hodonín 2013. Brno: Technické muzeum v Brně, Metodické centrum konzervace, 2013, pg. 67–71. ISBN 978-80-86413-98-3. ISSN 1805-0050.

SOUČKOVÁ, Magda. Krabice jako ochrana před negativním působením okolního prostředí (“Box As Protection From Negative Environmental Effects”). In: Výzkum a vývoj nových postupů v ochraně a konzervaci písemných památek (2005–2011): sborník příspěvků závěrečného semináře k výzkumnému záměru MK00002322103. 1. vyd. Praha: Národní knihovna ČR, 2011. pg. 21–36. ISBN 978-80-7050-603-5. Also available at: http://wwwold.nkp.cz/restauratori/2011/Souckova_2011_krabice.pdf.

SPIRK, Anton. Geschichte und Beschreibung der k. k. Universitätsbibliothek zu Prag. Wien, 1844.

SurveNIR: Near Infrared Tool for Collection Surveying [online]. © 2008 SurveNIR [cit. 2013-10-10]. Web source: <http://www.science4heritage.org/survenir/>.

ŠPINAR, Jindřich. Nový depozitář rukopisů a prvotisků ve Zlaté Koruně (“New Depository of Incunabula and Prints in Zlatá Koruna”). In: Muzejní prezentace k dějinám knižní kultury: sborník příspěvků z celostátního semináře knihovníků muzeí a galerií České republiky. Jindřichův Hradec: Okresní muzeum, 1996, s. 40–41. ISBN 80-901575-1-3.

VÁVROVÁ, Petra a Martina OHLÍDALOVÁ. Umístění knihovních fondů do obalů ze speciálních fólií bez přístupu vzduchu jako možnost jejich ochrany před degradačními vlivy – ano či ne? (“Airtight Wrapping of Library Collection Books in Special Foils As a Way of Protecting Them from Degrading Elements: Yes or No?”). In: Výzkum a vývoj nových postupů v ochraně a konzervaci písemných památek (2005–2011): sborník příspěvků závěrečného semináře k výzkumnému záměru MK00002322103. 1. vyd. Praha: Národní knihovna ČR, 2011. s. 37-53. ISBN 978-80-7050-603-5. Also available at: http://wwwold.nkp.cz/restauratori/2011/Vavrova_Ohldalova_2011.pdf.

VNOUČEK, Jiří. Konzervátorský průzkum nejvzácnějších rukopisů uložených v Národní knihovně České republiky (“Conservation Survey of Rarest Manuscripts Deposited in National Library of the Czech Republic”) Národní knihovna: knihovnická revue, 1998, roč. 9, č. 2, pg. 61. ISSN 0862-7487.

