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## Did Danish Architects and Archival Artists in the 18th and 19th Centuries Choose Paper of Similar Qualities and Origin for Their Drawings and Water Colour Paintings as the Danish Artists and Painters?

Studies of the extensive paper collection of drawings and water colour paintings at the Antiquarian Topographical Archive, the National Museum of Denmark, have resulted in valuable information about the technological development of the 18<sup>th</sup> and 19<sup>th</sup> centuries paper production. The collection of papers kept here illustrates the paper qualities, chosen by the architects for their drawings of new castles, churches and other building. Our studies of the collection also tell us about the paper qualities chosen by the archival artists for their observation and in-situ documentation of archaeological excavations and buildings restorations.

Through the macroscopic observation and registration of watermarks and traces of the technology, we can determine the qualities used by these architects and archival artists. These studies give us a good indication of the production, availability and trade of paper in this period. More information is found about the origin, availability and use of watermarked wove paper at the National Gallery of Art. Through similar comparative studies of the paper qualities used by contemporary 'Golden Age' Danish artists and painters in Denmark and on their European study tours we learn about an increasing interest, use and import of European wove paper during the first half of the 19<sup>th</sup> century.

**Keywords:** Architect drawings, archival artists, painters, laid and wove papers

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NN

03

Ingelise Nielsen,  
Niels Borring

## Early 19th Century Danish Artists and Their Choice of Paper for Drawings and Sketches

The large collection of prints and drawings at the Danish National Gallery (Statens Museum for Kunst) in Copenhagen is a valuable source for the study of paper used by Danish artists for drawings and sketches. Some years ago, a research project examined the watermarks in the works of the Danish artist Nicolai Abildgaard (1743-1809). He used both Danish paper (approx. 35 %) and paper of foreign, mainly Dutch, origin. Abildgaard was professor and director of the Royal Danish Academy of Fine Arts, and there was a striking resemblance between the Danish paper in his works and the paper used in academy documents from the same period, suggesting that he may have bought his paper from the same supplier as the academy or his paper was supplied by the academy.

The present project will focus on the works of some of Abildgaard's students at the academy, such as Kratzenstein Stub (1783-1816), Johan Ludvig Lund (1777-1867) and Christoffer Wilhelm Eckersberg (1783-1853).

After their academy time the students usually spent some years abroad, typically in Rome or Paris, as part of their training, and these travels may have had an impact on their choice of paper.

In the beginning of the 19<sup>th</sup> century the Danish paper industry was expanding with new papermills and the installation of the first Danish paper-machine in 1829 at Strandmøllen north of Copenhagen.

The aim of the present project is to investigate if the artists' travels abroad and the developments in the Danish paper industry are reflected in the artists' choice of paper for their drawings and sketches.

**Keywords:** 19<sup>th</sup> century drawings; artist's paper; papermaking in Denmark;

04

Kari Greve

## The Norwegian Printmaker Nikolai Astrup and his Papers

Nikolai Astrup (1880-1927) is one of the most well-known and beloved artists in Norway. Astrup and the 19 years older Edvard Munch were both pioneer Norwegian woodcut artists.<sup>1</sup> In recent years, Nikolai Astrup's art has been presented outside of Norway through exhibitions in Dulwich Picture Gallery, London, Emden Kunsthalle, Germany, The Clark Art Institute, Massachusetts and Prins Eugen's Waldemarsudde, Stockholm.

Astrup was inspired by Japanese woodcuts and the emerging European woodcut artists such as Felix Vallotton and Paul Gauguin, which he saw during his short period of studies in Paris in 1901-1902. A trained painter, he was self-taught as a printmaker and developed his own, very distinctive style, which will be described in more detail in the lecture. He never used a printing press but used his hands and different rubbing techniques to force the printing ink on to the paper. Astrup was very particular about the papers he wanted for his prints and had clear preferences.

His favourite was Japanese kozo paper. However, as he lived in Jølster, a beautiful, but very remote part of Norway, it was not always easy to procure the paper he preferred, and during the first world war the import possibilities were even more limited. Astrup was a prolific letter writer, and his letters give us a rare insight into his artistic practice, his choice of materials as well as his frustration with papers that did not fulfil his requirements.

The contribution will aim to make the audience acquainted with a rare artist, his originality as a print maker and his struggle to achieve his artistic goals despite many practical difficulties.

**Keywords:** Woodcut prints, Norwegian 20th century artist, paper for woodcuts

05

Abigail Slawik,            *LEOcode* Goes Live: A Dynamic Resource and Tool  
Margaret Holben        for Paper Historians, Conservators, Codicologists,  
Ellis                        and Art Historians

*LEOcode* (leocode.org) is a free, web-based resource that presents the results of detailed encoding and visualization of three internal manufactured patterns found in the papers contained in two notebooks<sup>2</sup> by Leonardo da Vinci (1452-1519): watermarks, chain line intervals, and laid line densities. Moving beyond Leonardo's papers, *LEOcode* provides easy-to-learn computational tools that can be used by anyone with an interest in precisely characterizing pre-machine European papers.

Computational "coding" is the process whereby a researcher examines and transforms a digital image of the watermark and chain lines in a sheet of paper into a numerical code that can be compared to codes derived from other papers. Computational coding is straightforward and uses readily available digital photographs of the recto and verso and a transmitted light digital photograph of the paper in question. The scale and resolution of the images do not need to be the same. The procedure involves:

- enhancement of the paper's internal structure (watermarks, chain line intervals, laid line densities) by the virtual removal of surface writing and drawing,
- marking and measurement of unique watermark features and chain line intervals and the generation of the codes,
- comparison and matching of the codes to identify paper moldmates and their probable twins.

The results of coding, i.e., moldmate matches, can be presented via static visualization graphs or by animated overlays. Dynamic looping videos appeal to the close looking skills of users. Their temporal nature, however, makes sharing animated overlays via traditional scholarly journals problematic. A resource like *LEOcode* allows for active engagement and decision-making on the part of the researcher. The site contains links to general information on the various aspects of the project, as well as line drawings of each moldmate group, every watermark type found in and shared between the two notebooks, and a growing accumulation of animated overlays. In addition, instructions for the use of the software suite are included, and available to researchers. The authors hope that increasing interest in the software will engender more opportunities for collaboration with other researchers.

**Keywords:** watermarks, moldmates, Leonardo da Vinci, animations, chain lines, laid lines

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<sup>1</sup> Greve, Kari, Øystein Loge and Oda Wildhagen Gjessing: *Nikolai Astrup. Woodcuts*. Oslo 2010

<sup>2</sup> The Codex Leicester (Gates Collection) and the Codex Arundel (British Library MS 263).

Ilse Mühlbacher

## Biedermeier revived - Artist Micheline de Bellefroid and the Invention of Kromekote Papers

From 1966 to 1987 Micheline de Bellefroid (1927-2008) was head of the bookbinding section of the Ecole Nationale Supérieure des Arts Visuels (ENSAV) in Brussels, usually known as La Cambre. She and her predecessors Jules-Karl Van West and Vladimir Tchékéroul influenced several generations of bookbinders and it is due to their teaching that Belgian bookbinding is still held in such worldwide esteem. Micheline de Bellefroid was renowned for her use of decorated Kromekote paper for wrappers, slipcases and end papers. Inspired by the glossy decorated papers of the Biedermeier period, and her desire to produce more contemporary designs she discovered Chromolux paper and developed a method for treating and coloring the sheets without altering the polished surface. This sophisticated and original process was to enhance the technical perfection of her morocco leather bindings.

**Keywords:** decorated paper, Kromekote, Biedermeier

07

Natalie Coural

## Papers Under Attack - The Case of Some French Artists at the End of the 20th Century

For centuries, artists have cherished beautiful papers which they chose with great care for various purposes. However, as early as the Middle Ages, there were works made on poor paper, or on scrap paper when it was necessary to study, or to practice, to be able to save money. In the twentieth century, the rules were turned upside down. From the moment of Cubism with the diffusion of glued papers: cut, torn, folded, crumpled, sometimes ruined, an irreversible evolution occurred. Barely later, with the avant-garde artists of the Dada and Surrealism movement, the reclamation of papers of all kinds will triumph.

This contribution concerns several French artists of the last quarter of the XXth century and the beginning of the XXIst century who transfigure the material paper in its structure, denaturing it deeply. Some burn it (Christian Jaccard), scrape it (Daniel Chompré), and perforate it in multiple ways (Dominique de Beir). Others, like Claude Viallat, glue it and play on its deterioration in the light. The artist Pierre Buraglio assembles hundreds of blue cigarette packets, the popular Gauloises, with scotch tape.

Artists have been questioned about their choice of paper, such as Canson paper, wrapping paper, blotting paper, and waste paper. They were also asked what tools they use to treat and abuse the papers. The approach of certain artists led them to foresee the passage of time which transforms or often deteriorates the paper.

They were also questioned on how these atypical works could be presented, preserved and restored.

**Keywords:** Recycled paper, burnt paper, Christian Jaccard, Pierre Buraglio, Claude Viallat, Dominique De Beir, Daniel Chompré

08

Sabine Zorn,  
Martina Ingold

## Coloured Paper Grounds as Base for Metalpoint Drawings. A Materials-Technological Examination of Twelve Drawings from the Period c.1460 – c.1502 from the Holdings of the Hamburger Kunsthalle

The Hamburger Kunsthalle holds various metalpoint drawings on paper with coloured grounds, which have been attributed to different Italian Renaissance artists including Andrea Mantegna, Filippino Lippi, Leonardo da Vinci and Raphael. Twelve drawings were examined in detail using microscopy, X-ray fluorescence analysis, VIS spectroscopy and multispectral photometry. The examination aimed to analyse the composition of the paper grounds, to investigate the way in which the ground was applied to the paper and to gain a better understanding of how the grounding to be applied determined the choice of paper. The results have not yet been fully evaluated at the time

of writing this abstract. In the further course of the research project, it is planned to compare the results of the optical and analytical examinations with recipes and instructions described in historical sources. The comparison of the recipes and instructions, with the results of the optical and analytical examinations, aim to find out, if and how paper supports are described, to what extent the analysed ingredients correspond to the recipes from the historical sources and how they differ. On this basis, conclusions will be drawn on the artists' working methods and materials.

**Keywords:** Artist papers, paper grounds, drawing, Italian Renaissance, materials-technology

09

Sarah Eycken                      Colour Samples: the Use of Coloured Paper in  
Belgian Avant-Garde Circles After 1917

Coloured paper was omnipresent in artworks, periodicals, pamphlets, and catalogues produced by the Belgian avant-garde.

Proof prints for magazines like *Het Overzicht* were made on coloured paper (mostly yellows and reds). Remarkably, some proof linocuts by Jozef Peeters and other (inter)national artists featured in *Het Overzicht* were even printed on gold leaf stock papers. These prints were marked by a 'luxe-uitgave' or 'luxury' stamp, which indicated that these prints were collector's items.

The eccentric farmer-artist Felix De Boeck consistently used coloured paper as the mount for his monochrome drawings. This choice of material as an alternative passe-partout or frame is an interesting practice, which might indicate his high esteem for drawings as autonomous works of art.

In the same vein as the Theo Van Doesburg's Dadaist magazine *Mécano* with its red, yellow, and blue issues, Belgian Dadaist and Surrealist periodicals made significant use of a coloured support. In every issue of the review *Correspondance* (instigated by Paul Nougé, a Surrealist poet, artist, and theorist who was greatly admired by Magritte), a colour code was included, which matched the colour of the pages. One was even called 'Nankin', a type of pale yellow.

The Belgian avant-garde also did not consider paper solely as a support for other media. At times, the material was able to transcend its 'materiality' to become a medium. The draughtsman, painter, and collagist Paul Joostens created practically three-dimensional sculptural collages, where the coloured material served as a 'building component'.

By looking at these examples and others, the main objective of this paper is to explore the versatility of the use of paper in Belgian avant-garde circles. In doing so, it hopes to highlight the importance of art on paper in the quest for experimentation in this highly colourful period in art history.

**Keywords:** Belgian avant-garde, materiality, collages, drawings, avant-garde magazines

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Javier Jurado                      Outside the Normative: Other Perspective to the  
García                                      Role of the Paper in the Print Collection of the  
Faculty of Fine Arts of Complutense University of  
Madrid

The Complutense University of Madrid is the University with the largest and most important heritage collection in Spain. One of the most special collections inside of this institution is The Prints Collection of the Faculty of Fine Arts. The history of this centre started in the 1752 with the creation to the Fine Arts Royal Academy of San Fernando. After different avatars, the Royal Academy of San Fernando was divided into different institutions; The Academy of San Fernando and the School of Fine Arts which in 1978 adhered to the Complutense University of Madrid, founded in 1499.

Apart from The Prints Cabinet in the centre, there are also two other collections related to print: The Drawing Cabinet, that includes a digital prints section and the Art Book Cabinet.

The Print Cabinet is composed of more than 4000 ancient, modern and contemporary works by renowned authors such as Durer, Rembrandt and Goya and relevant contemporary authors such as José Luís Alexanco, Mitsuo Miura

or Salvador Victoria, making it a fundamental source of studies for the understanding of graphic artwork and its teaching in Spain.

This contribution is connected between the world of Printmaking and the world print history, conservation and restoration in one historical collection. The cause of this scene is the response to the typology of the collection of the Faculty of Fine Arts.

The importance of choosing the ideal paper and the significance of this choice on the final print works will also be discussed using artworks examples.

**Keywords:**

Complutense University of Madrid      Cabinet Prints      Print      Printmaking      Paper

11

## Claude Laroque      Prints and Drawings by Auguste Beuret, Auguste Rodin Sculptor' Son: Study of the Papers.

The Rodin Museum in Paris has a collection of around 600 drawings and prints by Auguste Eugène Beuret, illegitimate son of the sculptor Auguste Rodin. A study of the papers used by this artist started in 2019 alongside the conservation work on the collection.

The systematic examination of this corpus clarifies several elements concerning both the author's biography and his artistic production.

The macroscopic study of the two corpuses, prints and drawings, has shown the interdependence and differences between the production of drawings and prints, both within Beuret's own corpus and his father' corpus. It shows that prints and drawings are made of very different papers especially suitable for the final goal, drawing or etching. The macroscopic characteristics of the papers and the watermarks which have been identified, made it possible to group the papers by families and to identify the paper mills.

Thus, this study brought to light interesting elements both in the history of paper techniques and in the production of an etcher artist. It led to some considerations concerning the papers used by artists in Paris in the second half of the 19th century.

**Keywords:** watermark, artist paper, paper examination

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## Patricia Engel      The Paper Used by Martin Johann Schmidt

Martin Johann Schmidt, also known as „*Kremser Schmidt*“, (\* 25. September 1718 in Grafenwörth; † 28. Juni 1801 in Stein an der Donau) was one of several outstanding painters of the late Baroque era, famous far beyond his local area. As any artist of his time, he did not only paint, but prepared larger works by making sketches on paper. These sketches served him as memory aids and training exercises and were most probably shown to potential clients to make them see what they were going to get and express their requests for changes, if any.

These sketches and drawings are owned by numerous museums and collections in the area today, including Krems Museum that holds a substantial number of these works and has recently re-catalogued them and arranged for their preservation according to the latest standards. During her preservation work the author was able to survey, describe and document the paper used for each and every sketch. The next step was to identify the paper mill it came from. Finally, based on all the data collected she suggested that Schmidt actually used any paper he could get hold of, the only exception being the coloured paper he used for artistic purposes. In two cases paper produced in nearby Rehberg Paper Mill was identified. This new insight adds some new perspective to the research into the art on this important artist conducted to date.

A survey of other collections of sketches and drawings is recommended to be conducted as a follow-up, with the same focus on the material.

**Keywords:** Martin Johann Schmidt, prints and drawings



Aldona Stępień, Investigation of Paper Fillers in Japanese Woodcuts  
 Julio M. del Hoyo- from the Taishō Period  
 Meléndez, Anna  
 Ryguła, Ewa  
 Sobiczewska

The main aim of this research was to determine the physico-chemical characteristics of papers by identifying mineral and organic fillers found in Japanese woodcuts made in the early Taishō period. In order to understand the changes in paper production methods used for printing *ukiyo-e*, a comparative analysis of woodcuts was carried out using Jens Wiebel's collection created in the above-mentioned period and originals from the Feliks Jasiński collection both owned by the National Museum in Krakow. The techniques employed include Fourier transform infrared spectroscopy (FTIR), X-ray fluorescence spectrometry (XRF), Raman spectroscopy (RS), optical microscopy (OM) and scanning electron microscopy (SEM). These techniques allowed the identification of chemical compounds and elements present in the samples. In order to develop the best measurement methodology, an analysis was also performed for contemporary Japanese handmade paper standards with a known filler composition. The conducted research allowed to characterize the paper substrates and identify the following compounds: silica, talc, mica, chalk, gypsum, starch, cellulose and protein, as well as elements, i.e. calcium (Ca), silicon (Si), magnesium (Mg), aluminum (Al), potassium (K), sulfur (S), sodium (Na) and various pollutants. Based on the analyzes, it can be concluded that the papers used in the graphic artworks from the Wiebel collection contain a series of characteristic features that distinguish them from the works from the Feliks Jasiński collection. The results concluded that papers used in papermaking from the Taishō period have features characteristic for this period and are consistent with historical records and the current knowledge about the technologies and materials used at that time.

**Keywords:** ukiyo-e, fillers, paper properties, mineral products

D. Francine Farr Paper-Rock-Scissors and Ku-Ke-Chu:  
 A Buddhist View of the Japanese Paper Hanging  
 Scroll, Contemporary Art and the Study of Paper  
 from the Pacific Ocean Region

Handmade paper, works of art using paper and Buddhist paper traditions are steeped in shared cultural and scientific histories. To connect these histories to contemporary art and distinguish between secular works of art and the enshrined paper scroll as an object of worship, this presentation will be an overview of research findings. A sacred Japanese hanging scroll of a lay Hokkeko Lotus Group member of the Nichiren Shoshu sect of Buddhism, a contemporary paper relief sculpture and other artworks will be discussed. Artists' thoughts, words and works may include those of Leonardo da Vinci, Paul Gauguin, Felix Angel, Xu Bing, Chris Burden, Sue Coe, Gajin Fujita, Cai Guo-Qiang, David Hammons, William Kentridge, Nikki Lee, Mariko Mori, Senga Nengudi, Echiko Ohira, Howardena Pindell, Paula Rego, Alison Saar, William Singleton, Nancy Spero, Hiroshi Sugimoto, Rufino Tamayo and Kara Walker.

Paper's plasticity, porosity, portability, blankness, weightlessness, double-sidedness, palimpsests and properties of adsorption will be interpreted from art historical and lay Nichiren Shoshu Buddhist perspectives of cycles of life, power, karma, sentience and insentience, the Invisible World and the Three Truths of ku-ke-chu (non-substantiality, temporary existence and the middle ground). Paper and its precursors will be understood to have developed out of necessity from nature's functional morphologies into biomimicked, invented and combined forms, images, tools, materials and skeuomorphs, some memorialized into symbolic entities of reverence and sublimity.

Concluding remarks note the imperative to broaden the scope of current scholarship, scientific inquiry and public education on paper through global interdisciplinary collaboration and museum exhibitions that encompass

barkcloth (tapa), the Austronesian migration, the ancient maritime Silk Route, Portuguese and Dutch East Indies trade and exploration as well as horticulture, surface science and Oceanic studies.

**Keywords:** Austronesian, Nichiren Shoshu, skeuomorph, tapa

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## Agnieszka Helman- The Choices of Paper for Calligraphic Art in Asia Ważny

Many varieties of paper have been used in the creation of various types of calligraphic art in Asia at different times, dependent on local technological know-how, the availability of materials, tools, preferences of the artists to match their creative impetus, and the intended function of the artwork. The different types of paper required different manufacturing processes and different raw materials. It is challenging to make solid conclusions about the relationship between material and aesthetics because so many of these observations are subjective. Beyond the raw materials, there are other aspects of the papermaking process which influence the nature of the resultant paper, such as the degree of fibre blending, the type of papermaking mould used, and the preparation of the paper surface before a calligraphy is set upon it. Sometimes the differences in ink drawings come from basic paper properties such as absorbency. Notwithstanding, specific material choices can imply a greater sense of control over media during the creation process and thus the final result. This presentation will discuss technology, raw materials and all other aspects of papermaking which make paper the best choice for calligraphy art, using the case studies from China, Tibet and Southeast Asia.

**Keywords:** calligraphy, papermaking, material choices, Asia

18

## Luisa Martínez Leal The Aztec Paper and their Graphic Art Books

To keep a record of their trade and conquest, the Aztecs needed precisely written tribute-lists.

Paper fashioned into rolls, about nine metres long, was used by the scribes, to record the profits of conquest. Paper folded like a miniature screen, formed the sacred books called *tonalamatl* (which were preserved in library form in the Aztec archives). And finally, paper became itself an important article of tribute.

In one of the most famous of tribute-charts of Moctezuma II, the Codex Mendoza we find a significant item: "Twenty-four thousand reams of paper are to be brought yearly to the storehouses of the ruler of Tenochtitlan." These are now about 480,000 sheets. Judging by the standards of a primitive civilization, this is an enormous amount of paper.

The Aztecs made two kinds of paper, *Amate* and *Agave* papers. *Amate* was so much more resistant than *Agave* which had a papyrus like consistency.

The Books of the Aztecs were entirely pictorial. Events, dates, names, and ideas were all conveyed through conventionalized images.

Aztec art and science grew up and developed while they had painting and pictographic writing as their aids. Their writing signs were not phonetic, but symbolic.

The image-based system was a composite and flexible one in which pictograms, ideograms and logograms could all be combined. As the Aztecs conquered peoples from different language groups, this efficient pictorial system made it possible for the educated to read documents without having a common spoken language.

The pictographic symbols became of the utmost importance in primitive Mexican sacred books which were beautiful works of art.

**Keywords:** Aztec paper, Aztec pictorial books

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Jos De Gelas

## Paper Carrier of Playing Cards and Tapestry Cartoons, 1450-1800. Provisional Status and Intermediary Conclusions of an Ongoing Study

The study of the products produced at the Herisem papermill and the other papermills in the area around Brussels generated the material for this lecture. Tracking paper from a production that started around 1440 revealed links with the tapestry weaving industry and the production of playing cards. The link between the crafts was paper, the product used as carrier of printed or painted images. The presentation will focus on the present knowledge of the cartoon paper and the inner layers of playing cards, and covers the timeframe from 1440-1800. The data are a compilation of primary and secondary sources. In contrast with prints and archival documents, the remaining materials are rather scarce and difficult to study.

Special attention will be paid to the 16<sup>th</sup> century cartoon preserved at the Brussels city museum and known as “The martyrdom of St. Paul”. This masterpiece on paper, as the authors of a recent publication called it, has been restored over the period 2014-2017. The experiences of the team that conducted the restoration have been published and the author will add some personal views and conclusions to the published data.

**Keywords:** Play cards, tapestries cartoons, stained glass cartoons, watermarks, grey paper

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Alexa McCarthy

## The Significance of Blue Paper for Figure Studies in 16th-century Venice and 17th-Century Amsterdam

The material of handmade blue paper exists as a support for drawings throughout international public and private collections. However, it has received relatively little attention in art historical scholarship to date. Through its inherent tonality, blue paper is a particularly efficient and effective means to render figures and figural compositions, which serve to inform the colouristic details of paintings. Combined with the friable materials of black chalk and/or charcoal and white heightening, blue paper enables artists to capture the tonal complexities of the human body in space. This research explores the use of blue paper for figure studies by artists working in mid-sixteenth-century Venice and mid-seventeenth-century Amsterdam. Close examination of the material support of a selection of drawings by artists working in Venice and Amsterdam, including members of the Veronese and Tintoretto family workshops, and by Jacob Backer (1609–1651), Govert Flinck (1615–1660), and Jacob van Loo (1614–1670), demonstrate the significance of the use of blue paper for figure studies in these two entrepôts. The drawings examined in this presentation are those that were studied in person when Alexa McCarthy was a Research Fellow during the summer of 2021 at the German Center for Art History, DFK Paris. In addition, the presentation will include drawings examined first-hand at the Rijksmuseum, Amsterdam, where the material was studied together with conservators. Considering what lies beneath the surface of the drawings, this presentation sheds new light on questions of function, practice, and stylistic development through the use of blue paper.

**Keywords:** Blue paper, Amsterdam, Venice, Drawings

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Darko Cafuta

## Supplement to Dr. Šorn's Study about Paper Mills in Slovenia (*Papier Geschichte*, Jg. 6, H. 3; July 1956)

Dr. Jože Šorn was the first Slovenian historian who studied old Papermills on the territory of the modern Republic of Slovenia. His first research was done in 1954 and then he added a supplement to it in 1959 in the Slovenian history magazine »Zgodovinski časopis«. He published a summary of his study from 1954 in *Papier Geschichte*, Jg. 6, H. 3 in July 1956: *Ältere Papiermühlen in Slowenien (Old Papermills in Slovenia)*.

After 37 years of the author's research on Papermills in Slovenia it was time to add a supplement to Dr. Šorn's summary in Papier Geschichte. It will be 65 years after his only published article in a foreign language. At that time Dr. Šorn was an IPH member, the only one from Slovenia.

In the paper Dr. Šorn's statements from Papier Geschichte from July 1956 and the results of the author's latest research for each Papermill will be listed. These are:

- 1) Papermill of dominion Fužine (Herrschaft Kaltenbrunn): 1580-1596
- 2) Papermill of dominion Vipava (Herrschaft Wippach): 1669-1694
- 3) Papermill of dominion Žužemberk (Herrschaft Seisenberk): 1701-1874
- 4) Papermill of dominion Radeče (Herrschaft Radtschach): hand Papermill 1723-1845, machine Papermill after 1845
- 5) Papermill of dominion Loka (Herrschaft Laak): 1740-1785
- 6) Papermill of dominion Ajdovščina (Herrschaft Heidenschaft): 1767-1829
- 7) Papermill of dominion Goričane (Herrschaft Görtshach): hand Papermill 1788-1872, machine Papermill after 1872
- 8) Papermill of dominion Fala (Herrschaft Faal): 1836-1867

After adding Dr. Šorn's article as supplement to this Paper, watermarks from Dr. Šorn's study and from the author's research (for those Papermills which were not known to Dr. Šorn) will be added.

**Keywords:** History of Papermaking, Papermills, Watermarks, Slovenia

22

Ariadna Olivé                      New Method for the Study of Watermarks and its  
Soler, María                        Application as a Control System for Restoration  
Dolores Díaz de                   Processes  
Miranda y Macías

From 1736, the study of watermarks, has been gradually gaining recognition among researchers and scholars. In the last few decades, thanks to the new technologies in paper studies applied both for recording watermarks and other physical characteristics of paper and for the archiving and dissemination of the generated data, the interest in the study of watermarks and their fields of application has increased.

The work of the group of researchers presented here provides with a new watermark obtainment, replica and study system based on a USB microscope use.

The use of this system is shown to:

- offer results as valid as other photography systems.
- be faster and more direct than the traditional photography systems, given the fact that it allows in situ watermarks and laid paper measurement
- has a lower cost in comparison to other systems as well as its smaller size.

In the graphic document restoration field, it can be proven, through a wide variety of tests with different papers from different periods (XIV to XX centuries), subjected to various "wet" restoration processes, that the microscope application to watermark study, allows us to analyse the existence or non-existence of dimensional changes after the mentioned restoration processes.

**Keywords:** watermark replica, preservation-restoration.

23

Christiane Maria                   Watermarks in Viennese Opera Scores: Toward a  
Hornbachner,                      Comprehensive Database of Music Paper 1760–  
Constanze Marie                   1774  
Köhn

Hundreds of works by Haydn, Gluck, and other Viennese composers are known solely from contemporary copies. These manuscripts, mostly consisting of Italian paper and written by professional copyists, normally remained

undated. Thus, determining the chronological position of the works and the significance of the source is difficult. As professional copyists changed papers relatively often, a survey of datable paper allows for dating manuscripts written by Viennese copyists. The aim of the research project "Paper and Copyists in Viennese Opera Scores" is to provide a database for the period 1760 to 1774, analyzing about 300 volumes of opera scores from the Habsburg collections of that time.

To capture the identified watermarks, for the first time in musicology, transmitted light photography is used on a grand scale. With this inexpensive method, which forgoes elaborate equipment, two photos of single pages are made, using front light and transmitted light respectively. By digitally subtracting the images and rescaling the colour hues, the watermark is rendered accurately visible in its form. The procedure is carried out utilizing Matlab and Photoshop for post processing. Using this method, not only the isolated watermark is captured, but the entire paper sheet as well as its twin are depicted.

The resulting images are made available in a database which can also be accessed through the metadatabase Bernstein as well as the International Inventory of Musical Sources (RISM). In addition to the paper, however, the database also records the individual handwritings of copyists and further characteristics of the scores (quires, staff ruling). Rather than single elements, the combination of these features is the most valuable clue to dating. Based on this integrated database, it is also possible, for example, to draw conclusions on the processing and distribution routes of music paper.

**Keywords:** music paper, transmitted light photography, online database

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## Frieder Schmidt      Paper and its History in the German-Language Wikipedia - An Inventory

Wikipedia has been online as a non-profit project since January 15, 2001 and provides lexical knowledge as a donation funded free encyclopedia, which is developed according to the principle of collaborative writing. There are now over 300 language versions with over 55 million articles. Of these, 2.6 million are written in German. By their own account, Wikipedia ranks seventh among the most frequently visited websites in Germany, sixth in Austria and fourth in Switzerland in January 2021. It has become a mass medium in terms of audience demand and distribution and has brought about the end of the great printed general encyclopedias.

How has the topic of paper and its history been expressed in this information system within the last two decades? How much have paper history research and filigranology contributed to this? In which places can those who are interested in paper history benefit from the work of third parties found in surprising places? How can the German-language Wikipedia benefit from other language versions, and what can the German-language Wikipedia offer to other language versions? Where are the deficiencies to be found, be it missing lemmas or inadequate content? Specifically, some of the tools will be presented that allow the bundling of relevant articles and thus allow easier access. Additionally, some examples of visualization methods that highlight technical or historical relationships will be shown. This will also include a look at the Wikimedia files, where interesting images are made available.

**Keywords:** Paper History, Filigranology, Electronic encyclopedias, Wikipedia

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## Daniel Haberler-      The Rehberg Paper Mill and the Tradition of its Maier                      Products in Lower Austria

The paper mill in Rehberg, nowadays a northern district of the city of Krems, has only been marginally researched so far. Emperor Leopold I granted Heinrich Count of Salburg a privilege to establish a mill for manufacturing paper in June 1703. Through the centuries, the paper mill changed hands multiple times, until it went out of business in the 19<sup>th</sup> century. Yet the Rehberg mill has not been the only place for paper manufacture in the wider geographical area, particularly as there were about a dozen more paper factories in the Waldviertel region in Lower Austria, which Rehberg had to vie with. Today written evidence of the paper mill is only sparsely recorded. Besides, the usage of products from Rehberg is hardly detected. Based on documents in the Municipal Archives of Krems this

paper hopes to show the use of paper from Rehberg in administration records in the 18<sup>th</sup> and 19<sup>th</sup> century. In addition, business relations between the cities of Krems and Stein and the Rehberg paper mill will be demonstrated, based on the vast written traditions of the municipalities. Records in the Regional Archives of Lower Austria and the Austrian State Archives that have not been evaluated to date will be used to document the state's impact on the paper mill.

**Keywords:** paper, manufacture, records, archival sources

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Aleksandra Balachenkova,  
Andrei Bogdanov

Security Papermaking in Russian Empire (1769 – 1917) - A Brief Historical Account

It is recalled that paper as a substrate for the state securities – these artifacts of special printing and graphic art – is their most inimitable feature. In the recent decades different aspects of security papermaking became the subject of paper historians' special interest.

Russian banknote papermaking, being at first a private business (unlike that of timber paper), was later transferred to a state paper mill and from 1818 it was spatially consolidated with the security printing house in St. Petersburg at the Imperial Russian State Paper Manufactory. Designed and erected under the supervision of major-general Augustine Betancourt, a highly-educated and talented engineer of Spanish origin, the State Paper Manufactory went through two total technical re-equipments (including one performed by "Bryan Donkin and C<sup>o</sup>"), ongoing technological transfers and in-house innovations, caused by permanent standing against counterfeiters, developed its papermaking to sophisticated and artistic levels.

This brief account is based mainly on archival records, photographs and samples of secure printing, such as banknotes, bonds, timber paper etc., from the collection of Goznak JSC (modern name for the Imperial Russian State Paper Manufactory) museum, and focuses on the highlights of the security papermaking in Imperial Russia. The authors will consider the following issues: introduction of wove paper as a security feature (1802); early use of light-and-shadow watermarks (c.1820), implementation of electrotypes for making dies for pressing the wire for paper moulds and also for metal overlays to be sewn on its surface (1839); adaptation of moulds for double dipping (c.1866); active implementation of portrait and other artistic watermarks made from wax models (from 1870s); using chain-mould machines (from 1880's); incorporation of silk mesh into machine-made paper (1887); and academic approach to paper testing (from 1890s). Besides, some unrealized innovations are reviewed.

**Keywords:** state securities, papermaking, watermarks, Imperial Russian State Paper Manufactory

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Julia Rinck

Super Adornatus – Decorated Papers and their Carriers. Historical and Contemporary Examples from the Collections of the German Museum of Books and Writing of the German National Library

Since the invention of papermaking, papers have not only been written, printed or painted on, but have also been refined using a wide variety of decorative techniques. Decorated papermakers or bookbinders designed handmade or machine-produced sheets with patterns or decorations; craftsmen and designers then processed these as binding or endpapers, as cover papers for paper goods or on furniture and instruments. Almost all printmaking techniques (such as copperplate engraving, lithography, or woodcut) were also used to produce decorated papers. The techniques of paper decoration (e.g. marbling, paste paper and sprinkle techniques or block printing) each require different carrier papers: for example, absorbent and wet-strength papers are needed for marbling, paste papers require a coated surface and embossing techniques need particularly resistant paper.

In the decorated paper collection of the German Museum of Books and Writing of the German National Library in Leipzig, there are numerous examples of different decoration techniques on a wide variety of carrier papers: Brocade papers of the 18th century on handmade rag paper and lithographed reproductions of the late 19th century on smooth machine paper, marbled Japanese papers from around 1900 or marbled papers, paste papers or stencilled papers by contemporary designers and artists.

The lecture will present examples of the connection between decorated paper techniques and the material aspects of the designed papers: from Japanese printed crepe papers to handmade sheets for traditional decorated paper techniques and modern industrial finishing techniques. Specific characteristics and properties of the papers used (materials such as rags or plant fibers, typical paper formats, surface structure, watermarks) are highlighted. A look at the current paper market and the problems faced by decorated paper makers in finding suitable papers for the various processes will eventually provide an insight into the present day.

**Keywords:** applied arts, decorated paper as well as the techniques, marbled paper, brocade paper, paste paper, paper history, paper finishing

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Silvia Pugliese,                    Printing Maps on Large Size Paper: The Hajji Ahmed  
Silvia Merigo                    Heart-Shaped World Map, Venice 1795 and the  
Paper Mills in the Toscolano District

In 1795 Giovanni Antonio Pinelli, from the dynasty of Venetian printers acting as official Ducal printers of the Republic of Venice, was granted the honour to print 24 copies of a heart-shaped World Map from six ancient wooden blocks discovered in the Republic Archives in the same year. The blocks had been made in Venice in 1559-1560, and then had disappeared for more than two centuries. They depicted the world in the Turkish language by the so-called Hajji Ahmed, but it was actually a project designed in Renaissance Venice and intended for the Ottoman market.

Pinelli used six sheets of large size paper, and their union gave a square of c.115 x 112 cm. The watermark was that of Gaudenzio Fossati papermill in Toscolano on lake Garda, a district with tens of mills producing paper for Venice and abroad since the 15<sup>th</sup>-16<sup>th</sup> century.

Two copies of the World Map are kept in the Marciana National Library in Venice.

While the paper production of the Toscolano district and its watermarks in the first centuries have been investigated, little is known about the end of the 18<sup>th</sup> century. This research aims to study the paper issued by Gaudenzio Fossati papermill in the period close to the Republic fall from a double point of view.

On one side the material production: the paper quality, different formats and watermarks - through the physical examination of the documents kept in the Toscolano City Archives, written on local paper - and the economic management of the mill emerging from notary documents. On the other side the use and spread of Toscolano papers in the Venice printing market with special attention to large size papers – through other cartographic works, such as those by Antonio Zatta, and the prolific production of the Pinelli publishing house itself.

**Keywords:** Hajji Ahmed heart-shaped World Map, Toscolano, Gaudenzio Fossati, Giovanni Antonio Pinelli, Large size paper

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Robert Fucci, C.                Searching for Watermark Identification in  
Richard Johnson,              Seventeenth-Century Dutch Papers  
William A.  
Sethares

Marking watermarks as a type-specific sequence of points allows the creation of overlay videos for examining potential watermark matches and permits the automatic search of a database of similar-marked watermarks. In this presentation, the authors will describe how open-source software introduced in an article for the *Journal of Historians of Netherlandish Art* is being used as the foundation for a searchable library of watermarks in 17th-century Dutch papers. A demonstration of the utility of this searchable watermark library will focus on modules for foolscaps with five- and seven-point collars popular in 17th-century Dutch papers. The watermarks cataloged are drawn from Erik Hinterding's catalogue of watermarks in Rembrandt's prints, and from the Laurentius catalogues of watermarks in historic documents in the Zeeland archives (1600-1700). The presentation will begin by describing a collaborative process which was undertaken with a typical researcher who had a suitable image of a foolscap watermark and if it was a match for one of the 100-plus catalogued foolscaps or a 'new' foolscap not yet in the library. Following a procedure annotating the watermark at a set of precisely locatable points (using a *watermarkPointMarker*) and then using the library search module (*watermarkLibrarySearch*) the closest match within the database would be revealed. An overlay video can then be rendered to assess the identity of the trial foolscap. If it is a new variant, the researcher will be encouraged to add it to the database. It is planned to build an ever-expanding library of watermark types across media including prints, drawings, and other documents. The presentation will conclude with examples of the benefits such analysis can offer through a variety of new results on watermark matches among 17th-century Dutch papers.

**Keywords:** watermarks, searchable image database, overlay video creation, Rembrandt

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Henk Porck,                      How Identical are 'Identical' Papers? A Study of an  
Gangolf Ulbricht,              Intact Ream of Paper in the Collection of the  
Birgit Reissland,              Koninklijke Bibliotheek in The Hague  
Carsten  
Wintermann and  
Uwe Golle, Bas van  
Velzen

The claim that different works of art are made on 'identical paper' can have a fundamental impact on our insight into an artist's studio practise, especially in establishing a chronological sequence or an artistic connection between individual artifacts. Comparison of works of art on paper, and heritage on paper in general, therefore requires clarity about the definition of what we perceive as 'identical paper'. The project presented here improves our understanding.

The Paper History Collection of the Koninklijke Bibliotheek (KB) holds a rare object preserved from the period of traditional paper making: a complete, intact ream of paper of the Dutch firm Pannekoek, dating from the early 19th century. The KB allowed us to open the ream and study its contents in full detail.

This offered the unique opportunity to investigate the construction and composition of an authentic ream, and compare the findings with data in the literature. The objective of the study was the verification of the alleged low paper quality in the outside quires of a ream as well as to determine the differences between a ream's individual sheets. Important properties such as weight, dimension, fibre composition, opacity, mould structure, watermarks, traces of sheet formation and further processing were determined by applying common techniques of paperhistorical research. These were combined with advanced imaging techniques, recently developed by the Klassik Stiftung Weimar.

As suggested in the literature, papers of low quality indeed were concentrated in the two outside quires, showing a variety of interesting defects. The range of variation we observed within the ream's 481 sheets of paper clearly demonstrated the limitations of uniformity. Intriguing was the difference in paper dimensions and altering position of the watermarks. Differences in the watermarks and mould structures allowed to estimate the number of vats and (twin) moulds operating in the Pannekoek mill. The results improved our insight in the concept of 'identical paper' and helps us to judge more reliably on the significance of differences found between individual sheets

**Keywords:** Ream composition, watermark comparison, (twin) moulds, paper analysis

Georgios Magkanas, Medieval Papermaking Characteristics and Similar  
 Inés Acevedo Muñoz, Recording Qualities Required for Art Working  
 Victòria Rabal, Papers  
 José F. García, Núria  
 Ferrer Felis, Jordi  
 Bernadet Munné,  
 M Carme Sistach

This work develops the study of medieval paper samples, in particular those showing Hispano-Arabic characteristics produced before 1350 in the Iberian Peninsula, and those showing new Italian characteristics produced after 1350 from Italian improved production. The quality of the paper obtained with ancient recipes has meant that these manufacturing procedures are preserved for the production of papers for artistic purposes. The good paper quality shown in the early Hispano-Arabic or in the early Italian paper was later required for art paper purposes.

The study of both types of papers from original ancient samples is complemented by making and reproducing sheets following the two procedures, taking into account the wide and detailed description offered by Józef Dabrowsky in "The Genuinely European Technique of Making Paper by Hand Developed in Fabriano: an Interpretation through the Mirror of Paper Technology".

The original medieval samples will be compared to the new sheets obtained when applying the making process described above, by using material characterization techniques. The principal techniques applied are Scanning Electron Microscopy with Energy Dispersive X-ray Spectroscopy (SEM-EDX) and Infrared analysis (IR Spectroscopy). SEM allows seeing microscopic surface structures and topography of the samples with high precision.

Complementary light microscopy images for both types of samples were also used. EDX allows the detection of elemental composition in the SEM image surface of the sample.

Infrared analysis (IR Spectroscopy) allows inorganic and organic compounds identification in both types of ancient samples due to the different functional groups. Fourier Transform Infrared (FTIR) analysis of fibres from both types of samples mostly allows the determination of the functional groups in fibres and other materials in papers. FTIR allows easy identification of starch characteristic sizing for Arab paper, or gelatin sizing used in the novel process from Italy.

**Keywords:** Hispano-Arabic, Italian, paper, analysis

Enrico Pigorsch, Spectroscopic Investigations for Dating of Paper  
 Hanna Obenaus from the 19th Century

The knowledge of the detailed material composition of old papers can be important and useful for different purposes. It can help paper conservators to find suitable measures for paper conservation and restoration or can give paper historians information on historic paper making practices. Furthermore, the chemical analysis of paper can help to determine the age and origin of a paper and reveal forgeries of works of art or documents.

Papermaking technologies have changed over time and the initial uses of certain paper components are well documented. Hence, the identification of a specific substance in a paper can determine the earliest possible date when it was produced. The more detailed the analysis of the paper composition, the more accurately the paper can be characterized and its date of production can be determined.

Spectroscopic methods like infrared (IR) and Raman spectroscopy have great potential for the specific and comprehensive chemical characterization of paper. They have a high chemical specificity and with a Raman microscope, single fibres, small particles and substances in low concentrations can be detected and identified.

The dating of paper by the identification of specific paper components is especially applicable to paper of the 19<sup>th</sup> century. During this era many changes in the paper production technology occurred and new raw materials were introduced in relatively short time intervals.

The presentation will demonstrate the application of infrared (IR) and Raman spectroscopy for the analysis of papers of the 19<sup>th</sup> century. Special emphasis will be made on the Raman microscopic identification of different fibre types, like straw, esparto, mechanical and chemical pulp, which were introduced in paper production during the second half of the 19<sup>th</sup> century.

**Keywords:** paper composition, fibre analysis, infrared spectroscopy, Raman microscopy

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Moshe Rosenfeld, Quantifying Paper-Ink-Type Interaction  
Eyal Naimy,  
Elyakim Kassel

Printed paper is key evidence to study the early history of printing in the fifteenth century. No written description of the new craft was left by the early pioneers. On the contrary they sought to keep secrecy. Printed paper of early books were examined by generations of historians leading to fierce debates regarding printing dates and printing methods.

Traditional print was created by the interaction of paper, ink, and type, each of which is made in a very different material by its own manufacturing process and subsequent wear. No wonder that great variability in the result can be expected. The variability carries information that can be attributed to either of those three components. The assumption is that the elucidation of this variability can shed light on some of the questions debated among historians.

The authors propose to add on existing approaches taking advantage of the progress in digitization and image processing; techniques that are now ubiquitous. The goal is to provide quantitative metrics extracted from printed texts in order to reveal systematic patterns of variability or, to the contrary, singular values of that variability. Historians started with naked-eye inspection of printed works. Facsimile reproductions extended the options to examine works. Different optical tools were later used. Lastly computers were introduced. Here the proposal is to extract characters from very high-resolution scans of printed texts in a statistically representative quantity, then to aggregate the presumably identical letters in what the authors call “a master signature”. The next step is to quantify for each character the departure from the “master signature”.

The authors demonstrate their methods on early printed Hebrew works, since the idea of those methods came as a tool to evaluate such works. However, the methods are likewise applicable to gothic Latin characters.

**Keywords:** early prints, image processing, statistical investigation

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Enami Kazuyuki, Scientific Study of Paper Used for Pictorial Books  
Okada Yoshihiro, and Ukiyoe Pictures Published during the  
Sato Satoru, Xu Premodern Edo-Era from the 17th to 19th  
Xiaoji Centuries in Japan

After the long-lasting Sengoku period (warring states period) of the 16<sup>th</sup> century, Japan re-entered a peaceful state from the mid-17th to mid-19th centuries under the pre-modern feudal system, without waging war against any foreign countries. As peace prevailed, people from the new citizen class started a new economic system based on the commodity market, and this spread widely throughout Japan. They, and others – merchants, artisans, wealthier farmers and even “ordinary” citizens – began to crave for knowledge of varying subjects, to learn about their own country, and to find their own cultural identity. To meet their demands, book publishing became big business in the big cities, first in Kamigata (Kyoto, Osaka), then Edo and finally Nagoya. During the 200 years, 300,000 to 500,000 printed books were published with a minimum of 300 to 1000 copies per book, that is, a sum total of 100 million or

more copies had been printed and sold. In addition, over 200 million sheets of full colour Pop art, Ukiyoe of various artists, had also been printed and sold.

In the present study analysis of paper used for picture books (around 100 items) and Ukiyoe (over 100 works) using Keyence VHX 5000 high resolution digital microscope was made, by observing and analyzing the morphology of paper, microstructure of fibres, and identifying plants used for paper making.

It was found that paper used for picture books was made from Kozo paper mixed with Mitsumata fibres and/or rice straw fibres, with a certain amount of rice powder (not glue but starch) used as a filler. For Ukiyoe pictures, Kozo paper mixed with Mitsumata fibres (no rice straw fibre was found) and filled with a rich amount of rice powder (as above) was used. Authors, artists and publishers chose not any commonly available paper but suitably-prepared sheets for use on books with fine illustrations and beautifully-prepared paper densely filled with rice powder for full colour Ukiyoe, to give the citizens full enjoyment.

**Keywords:** Picture book, Ukiyoe, Kozo, Mitsumata, Rice straw, Rice starch

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### Francesca Carnazzi    A Census of Watermarks in Humanist Manuscripts in the Biblioteca Capitolare di Verona: Between Philology and Digital Humanities

The aim of the talk is to present the first results of the study of watermarks in the humanistic manuscripts of the Biblioteca Capitolare di Verona. The precious codicological patrimony of the oldest library in Europe still in use contains a large number of codices (about 20%) dating back to the 15<sup>th</sup> century, and about 48% of them are paper-based. As part of the digitization project promoted by the “Laboratorio di Studi Medievali e Danteschi” of the University of Verona, and in the light of ongoing research on manuscripts from the humanistic age, a census of the watermarks found during the cataloguing of the codices has been prepared, to be digitally transposed to complete the catalogue of manuscripts of the library itself, which is currently being planned. The study of this codicological element has already led to some interesting results, both from the point of view of the philological, literary and historical study conducted on humanist manuscripts, and from the point of view of their digital reproduction and visualization, which has immediately been oriented towards the acquisition of photo-reproductions of the watermarks using new techniques. The intention is therefore to present some examples of how this study of watermarks has so far increased the information available on manuscripts that are essential for the study of humanism – such as CCLVII (229) containing the works of Domizio Calderini – and at the same time to show the first records of the census of the marks of ancient paper mills on the supports of these specimens. This also highlights the importance of the study of watermarks and their conservation as a meeting point between different disciplines.

**Keywords:** watermarks, philology, codicology, digitization, visualization.

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### Alesson Ramon        Data Mining as Analytics for Research in History Rota

This communication proposal will show some of the methods used for research in digitized collections produced from physical documents (paper). That is, how to do a big data search from historical documents. As an example digital collections for online consultation will be used, such as the Hemeroteca Nacional (Brazil), the Ibero-Amerikanisches Institut (Germany) and the Archivo General de Indias (Spain). The methods originate from the relationship between computing and the humanities, sometimes discussed as digital humanities. Techniques for downloading large amounts of information (called web scraping), will be discussed, as well as algorithms to convert the images of physical documents into digital text. Data meaning techniques are used to find what is considered relevant, making it possible to build new forms of data representation and analysis.

**Keywords:** Digital Humanities, Digitization, Data Mining, Image Processing

Ernst Brunbauer      The History of Lenzing PAPIER

Maria Stieglecker      Vinzenz Werl OSB: Beginn of Watermark Research  
in Austria

Vinzenz Werl is the first watermark collector we know from Austria. In 1828 he joined the Benedictines of Göttweig Abbey nearby Krems, where he took care of the well-known graphic collection as well as the library. Beside his position as priest and professor of the monastery he wrote within the years 1842-1844 a catalogue of the graphic collection in two volumes, a catalogue of the incunabula and a three-volume catalogue of the 250 medieval manuscripts of the library. In the first volume he offers 306 tracings of watermarks. The reason for this was the request of the scientific community of the time for watermark collections of dated manuscripts as reference material for undated codices.

At the Austrian Academy of Sciences two projects are concerned with the medieval manuscripts of Göttweig Abbey. Also, watermarks are analyzed with modern methods. Results of this research and a comparison with Werl's studies will be the subject of the paper.

**Keywords:** watermarks, medieval manuscripts, methods