

1/2012  
Nov. 2012

## **Introduction**

Dear reader,

this is the third Newsletter of the European Research Centre for Book and Paper Conservation-Restoration and the second in 2012. From now on we plan to publish two Newsletters per year, one in April and one in November. The concept of the newsletter is to

- Inform you about the past work
- Provide you each time with a never before published scientific article
- Inform about upcoming events

## **What we did for the community?**

### **The COIN5 Project "DEACIMIC" was granted.**

Book deacidification, mechanical strength enhancement and prevention of microbiological attack with supercritical CO<sub>2</sub> or volatile organic solvents in combination with multifunctional hydrophobically modified nanoparticles and functional silanes

The project DEACIMIC targets the preservation of archive materials combating its acidity, deterioration of mechanical properties and microbial degradation using the latest developments in cellulose chemistry and nanotechnology. It will develop a new paper deacidification process combining the best currently available concepts with knowledge in supercritical fluid / volatile organics solvent reactions and nanotechnology. The process will be transferred from the laboratory to the pilot scale, including construction of a process device and process optimization. The knowledge gained in Deacmic will overcome the currently existing gap in the Austrian book preservation field and substantially strengthen the position of the involved Austrian SMEs on the European market.

Partners are: Lena Adler, Institut für Chemie, Universität Graz, Natex Prozesstechnologie GesmbH, Ferdinand Berger & Söhne GesmbH, Entfeuchter.at and OmniAccess

The European Research Centre for Book and Paper Conservation-Restoration is the Leadpartner.

### **ERASMUS Students – research activity**

Cooperation with external institutions, i.e. the University of Zadar, lead to a 3 month internship of Tina Đaković and Ivana Galzina. The students worked on the topic "Laser Cleaning" and were supervised by Jörg Krüger and his team at BAM Berlin and Patricia Engel.

After an introduction in Horn the two students proceeded to Berlin where they made practical texts at BAM.

Back in Horn the evaluation of the results was performed.

The results will be published.

More students are welcome to apply under ERASMUS – we can involve them into research on water marks, mass deacidification project and history of book binding as well as other upcoming research projects.

## **ARTICLE**

# **NON-DESTRUCTIVE DOCUMENTATION OF THE**

# H. SCHLIEMANN COPY LETTERS ARCHIVE USING IMAGING TECHNIQUES

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**Abstract:** *This paper deals with the non-destructive documentation of the copy letters of the Schliemann archive (outgoing correspondence from 1845 to 1890) belonging to the Gennadius Library in the School of Classical Studies in Athens, Greece. A selection of pages has been examined in ultraviolet reflection and fluorescence conditions, as well as in the near infrared region of the spectrum using infrared reflectography techniques, in normal and macro mode. The aim of research was to outline a non-destructive methodology to record the condition of the copy letters. Six categories were set by the comparison of the quality of the copies, the state of oxidation and their optical behaviour in different wavelengths. The results of this study showed that the proposed non-destructive methodology can contribute to the legibility of the text, the distinction between the phenomena of oxidation and diffusion on the inked areas, the precise recording of the oxidised areas and the collection of indications in terms of the quality of ink. Factors influencing the outcome of the copying process are also discussed.*

## 1. INTRODUCTION

The first popular letter-copying method was invented and supplied to the market by James Watt in 1780. His basic technique consists of off-setting the ink from an original document onto a thin, unsized, dampened tissue paper after being pressed with a screw press<sup>6</sup>. The original text, written with a variation formula of iron gall ink, as in British Patent #1244<sup>7</sup>, issued to James Watt in 1780, which contained Aleppo galls, green vitriol, gum Arabic, roach alum and spring water, was transferred as a mirror image to the tissue paper in contact, while the ink penetrated the core of the paper providing a copy readable on the reverse side. A successful application of the copying method should have a result comparable to the authentic writing, leaving the original document intact. Copying was performed either in loose sheets of copy letters or readymade copy books in several forms depending on the variations of the copying procedure. The development of this widely used method, in order to facilitate the procedure, to improve the properties of the materials and the efficiency of the application, resulted in a variety of copy papers and ink formulas, as well as to several modifications of the process<sup>8</sup>. Thus, copies present differences in quality, characteristics and ageing behaviour.

Copy letters could be unique historic records as the original letters may have either been destroyed or the access to them may not always be possible, as for example in Schliemann's case where the correspondents were numerous and spread all over the world<sup>9</sup>. The structural sensitivity and the

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<sup>6</sup> Cleveland (2000), p. 23; Stroud (1985), p. 61; Kaminari et al. (2007), p. 109; Titus et al. (2006), p. 92

<sup>7</sup> Cleveland (2000), p. 25

<sup>8</sup> Rhodes/Streeter (1999), p. 206

<sup>9</sup> Kennell (2002), p. 5

chemical instability of the materials of copy letters and books have raised a lot of questions by archivists, curators and conservators, concerning the assessment of their condition and their preservation in time. This paper refers to the results of a relevant research project entitled 'Copy books; historical and physico-chemical study and documentation. Conservation treatment proposals', that has been co-funded by the European Union (European Social Fund) and Greek national resources under the framework of the "Archimedes II: Funding of Research Groups in TEI of Athens" project of the "Education & Lifelong Learning" Operational Program. The research undertaken by the Laboratory of Physical Chemical Methods for Diagnosis and Documentation of the department of Conservation of Antiquities and Works of Art at the Technological Educational Institute (TEI) of Athens focused on:

- the development and variations of James Watt's copying processes with emphasis on the quality and characteristics of the materials used and in particular the inks,
- the documentation and the investigation of the condition of copy books, especially the study of the inks behaviour and their interaction with paper by means of non destructive imaging techniques.<sup>10</sup>

## **2. THE SCHLIEMANN'S ARCHIVE**

In 2006, during the aforementioned research project, a survey carried out in private and public archives in Athens resulted in locating a significant number of copy letters and copy books, records of civil services, businesses and private individuals in Athens and other regions in Greece. The results of the survey provided enlightening information about copy books, their origin, purchase and the extent of use in Greece<sup>11</sup>. Copy books manufactured in several countries in Europe, United States of America and Constantinople were recorded. This was indicated by stationer's information printed on adhered labels or directly on the front endleaf of the books, as well as by the gold tooled titles on the front covers, describing their use either in English 'Copy book', in French 'Copie de lettres', in Italian 'Copia Lettere' or in German 'Copir Buch'. Copy books were advertised in commercial guides of the era in Athens. In some cases stationery shops ordered copy books from abroad with Greek titles and the trade mark and address of their firm printed. Copy books were used by individuals, shops, companies and banks for different purposes and in some cases there were indications that their use was imposed by law.

Non destructive examination was decided to focus on the archive of Heinrich Schliemann at the American School of Classical Studies in Athens. Heinrich Schliemann (1822-1890), significant archaeologist, known for his excavations in Troy and Mycenae, was a meticulous archive keeper. Numerous copy books are included in the great collection of his private papers. His interest in technological advances led him to adopt James Watt's method to facilitate copying his extensive correspondence with less effort. The choice of this particular archive was determined by the sufficient quantity of copy books (43 volumes belonging to the archival series BBB that contains copybooks with copies Schliemann made of his own outgoing correspondence)<sup>12</sup> that corresponded to at least three different types, dating from 1845 to 1890, when most of the developments in copying methods took place. Copy books 1 to 27 consist of loose leaves of copy paper which were later bound together, while BBB 28 to 43 are typical commercial types of copy books and "Penn Letter Books", a U.S. product for copying without the use of humidity<sup>13</sup> according to instructions found on the front endleaf of the particular copy books.

Schliemann's Copies can be characterised as of: a) excellent quality, that cannot be distinguished from originals, b) very good quality, clear with satisfying distinctness, see an example in Figures 1&2,

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<sup>10</sup> Alexopoulou et al. (2006)

<sup>11</sup> Banou et al. (2006), p. 57

<sup>12</sup> Gennadius Library (2005)

<sup>13</sup> Kennell (2002), p. 5

c) poor quality, faint and indiscernible, and d) bad quality, blurred and illegible letters with continuous writing without gaps between the letters.

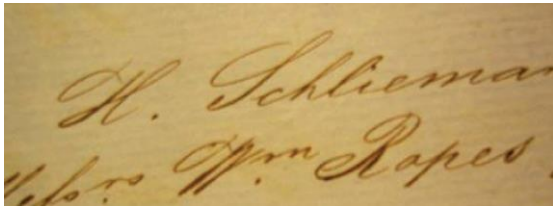


Fig 1. Excellent quality, that cannot be distinguished from originals, b in Figures 1&2,

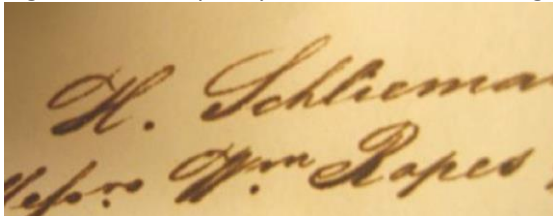


Fig 2.

Very good quality, clear with satisfying distinctness, see an example

Different qualities of copying can be observed even within one single page. The thickness, the distinctness and readability of the copied text depends on many factors, such as the copying process and methodology (wet and dry method), the quality of the writing ink and copy paper, in combination with the original writing (thick, faint). However, the copying results are also influenced by the way of application of the method (depending on the degree and uniformity of humidification of the copy paper, pressing and time) and the user's manner (precise, careful or messy). Finally, their present appearance is affected by the condition and the state of deterioration of the inked areas<sup>14</sup>.

### 3. THE APPLIED METHODOLOGY

The study of the material was based on the application of imaging techniques in order to record the optical behaviour of the inks in different wavelengths, like ultraviolet, visible, and near infrared, and through this to record and document the condition of copy letters and to detect and study the different types of inks used.

Observation in normal light, recording and documentation of the books led to the choice of several pages representative of the different types of inks, the quality and the condition of the copies. Research mainly focused on the condition of the inked areas and the related phenomena of oxidation and diffusion. Diffusion of the ink beyond the limits of the letters can occur during the copying process and it can be related to properties of the copy ink and paper, but mainly to the application of the method, usually with excess of humidity that causes lateral migration of the ink. Oxidation occurs due to the degradation that iron gall inks cause to the paper support. The stages of degradation range from the formation of a halo around the lines of the letters to discoloration that expands with gradual loss of mechanical strength of the paper surrounding the inked areas, and finally to extensive loss of the support within writing.<sup>15</sup> In order to record the optical behaviour of copy inks, usually iron-gall inks, non-destructive examination methods in the non-visible regions of the spectrum have been applied<sup>16</sup>. These methods were visible photography (VIS), ultraviolet reflection photography (UVR)

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<sup>14</sup> Banou et al. (2006), p. 59

<sup>15</sup> Reissland (2001), p. 70

<sup>16</sup> Alexopoulou/Kokla (1999), p. 2050; Havermans et al. (2003), p. 56; Attas et al. (2003), p. 129; Kaminari et al. (2010), p.168; Padoan et al. (2008), p. 6

using wavelength of 365nm, ultraviolet fluorescence photography in black and white (UVF) and colour (UVFC) as well as infrared reflectography (IR-Ref) up to 1200 nm. All methods were applied in normal and macro modes, on both sides of the pages. UVF was chosen because it yields images of high contrast and therefore high resolution, while UVFC can identify different materials exhibiting the same greylevel but different colour. Due to the importance and value of the records, as well as their condition, the copy letters were decided to be examined in situ. The instrumentation was transported from the Laboratory of Physical Chemical Methods for Diagnosis and Documentation TEI of Athens, to the Gennadius Library, where a small photographic studio was set. The instrumentation for the UV photography included a photographic camera Canon T70, with programmable back for the exposure time and a macro lens Canon 50mm with an extra ring to reach magnification up to 2:1, two UV blacklight lamps Philips MLW 220W as light sources together with the appropriate reflectors, barrier filters Kodak 2E for fluorescence and Kodak 18A for reflection, Kodak Technical Pan film and FujiFilm Provia 100 were used respectively. Visible photography was acquired using a photographic camera Nikon F80 with Nikon AF micro Nikkor 60mm lens, two tungsten lamps Osram 500 Watt as light sources, two stands with reflectors, Kodak Ektachrome 64T films, and colour compensating filter Cokin 82B. Exposure time was determined after bracketing. All black and white films were developed under the same conditions by the researchers. Infrared reflectography was carried out with a digital infrared camera CCD, ARTI S.p.A., with Pentax 50mm lens and two tungsten lamps Osram 500 Watt as light sources and two stands with reflectors. IR transmitting filter B+W 093 and the B+W 489 heat-absorbing filter were used for visible an infrared imaging accordingly. Specialized software was used to operate the system and control image and data acquisition. In all methods, a copy stand was employed for the standardised location of object, light sources and detector. Special care was given to the control and standardisation of the photographic and digitalization conditions so that the results are controlled and reproducible and can be further exploited in the future. The photographic material gathered exceeds the number of 1200 images.

#### 4. RESULTS AND DISCUSSION

Six different categories were set by the comparison of the optical behaviour of copies in 365nm (UV), in the visible region of 380-760nm and in the near infrared radiation of 760-1200nm. The first category (Fig. 3) includes the copies where ink and writing appear in good condition, as the original writing characteristics are maintained.

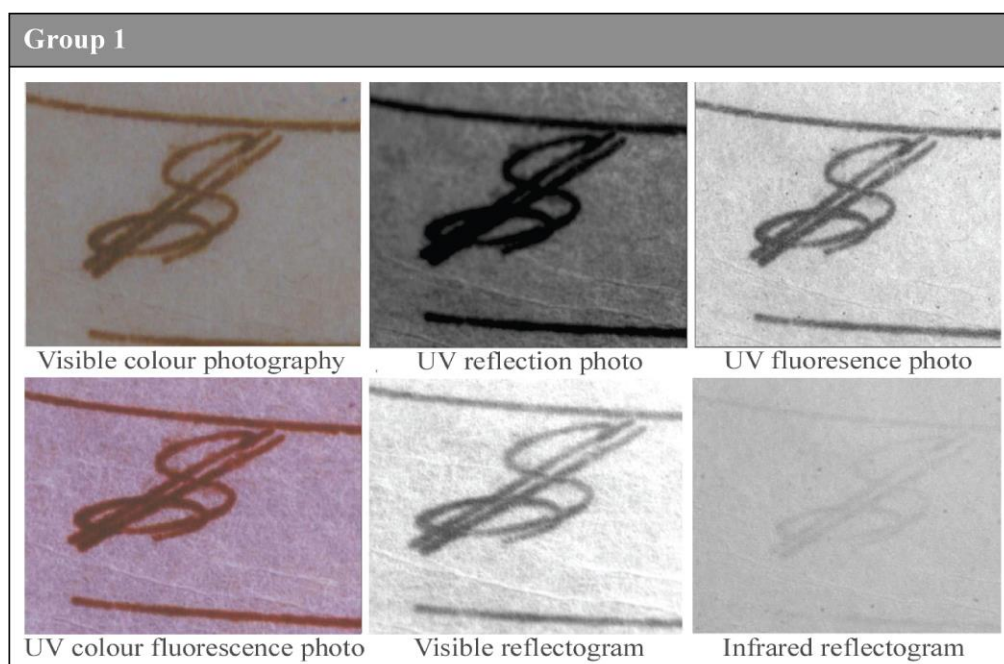


Fig.3: The copies where ink and writing appear in good condition, as the original writing characteristics are maintained

No intense oxidation or diffusion of the inked areas, and no fading is observed. It must be noted that the phenomena of oxidation and diffusion appear similarly in normal light. Diffusion of the ink can occur during the production of a copy, while oxidation gradually develops as the time goes by. In the later case, both ink and oxidation halo present an intense absorption in 365nm. In the black and white fluorescent photography, the fluorescence of the halo is very weak, so the core of the letter is clearly depicted. In UVFC, the halo is visible, presenting coloured fluorescence, even though very weak. In IR-Ref the absorption of the ink is low as it appears almost transparent, a behaviour that can be related to the chemical composition of the ink<sup>17</sup>.

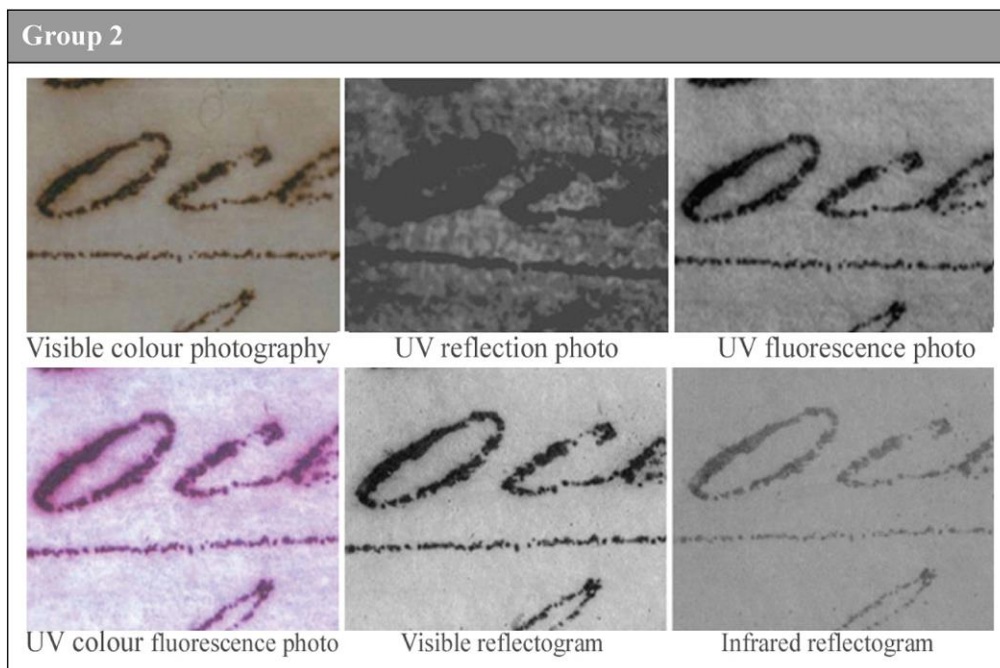


Fig. 4: This example includes copy letters in which light blurring of the ink areas is observed

The second category (Fig. 4) includes copy letters in which light blurring of the ink areas is observed, presenting gradual fading from the letter outwards, while the core of the letter remains distinct. Generally, the results of the photographic methods are similar to those of the first category.

More precisely, as it is shown in UVR, the ink and the oxidation halo present an intense absorption, while in UVF the core of the letter and the oxidation halo are recorded. In this case, as it is shown by the infrared reflectography, the ink does not show significant transparency. Furthermore, the recording of the discontinuous form of the letter is possible, especially in the near infrared region. A characteristic difference of a copy when compared to the original writing is the formation of letters by dots instead of a continuous line (see Figure 4, visible colour photography).

The third category (Fig. 5) includes copies where diffusion of the inked areas is so extended that writing is indiscernible. None of the non-destructive methods used could aid to distinguish the letters from the oxidation halo. The IR reflectogram shows high transparency and only the UVFC recorded a light fluorescence in the perimeter of the letter.

<sup>17</sup> Alexopoulou/Kokla (1999), p. 2051; Alexopoulou/Kokla (2002), p. 5; Kaminari et al. (2010), p.170

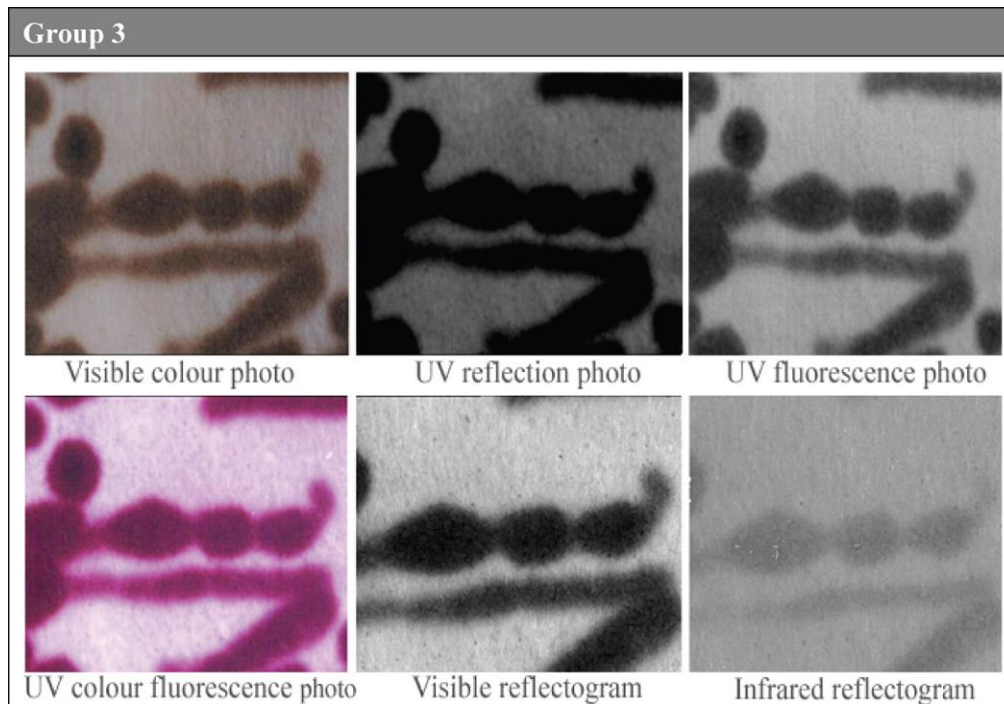


Fig. 5: This example includes copies where diffusion of the inked areas is so extended that writing is indiscernible

The fourth category (Fig. 6) includes copy letters where intense blurring of the writing is observed, due to the oxidation phenomenon. In the visible region of the spectrum and in the UV colour photography, the core of the letter can be clearly separated from the circumferential oxidation, while in the infrared region only the core is visible. In UV reflection photography, intense absorption of the core and its halo is observed to such an extent that they cannot be distinguished from each other.

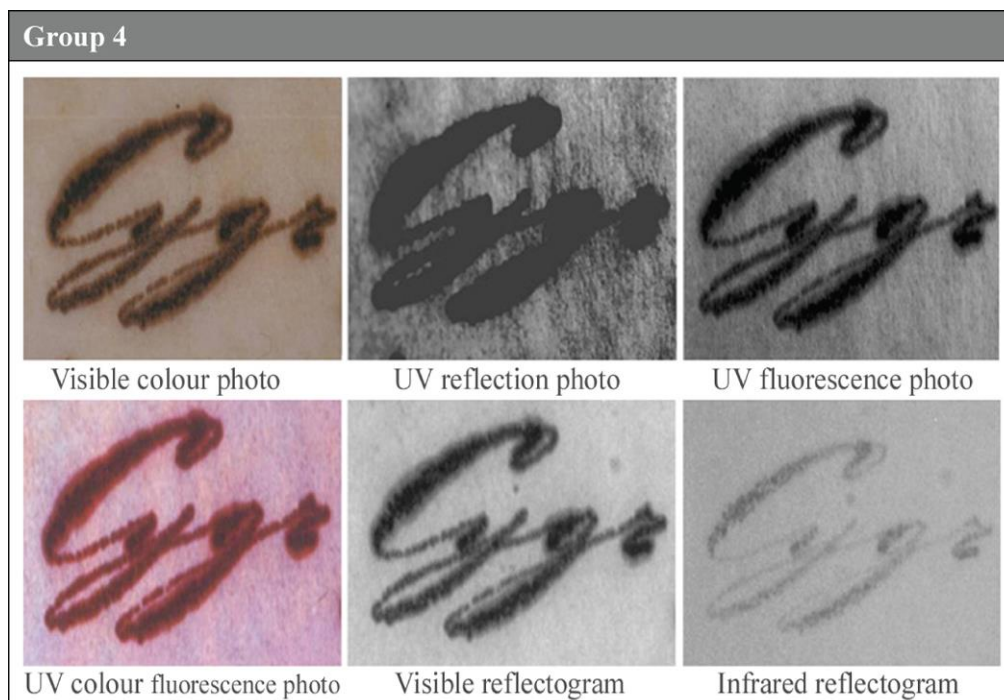


Fig.6:

The fifth category (Fig. 7) includes copy letters where several areas of diffusion and oxidation around the letters are observed. A diffusion zone, a thin border line and, a second, an oxidation zone are observed beyond the distinct core of the letter.

In this case, the visible and ultraviolet recording can contribute to better distinction of these zones. In infrared reflectogram, the core of the letter and the pale diffusion around it can be seen, while oxidation is not recorded. This is the most helpful category for distinguishing oxidation from diffusion as they present different behaviour in the infrared<sup>18</sup>.

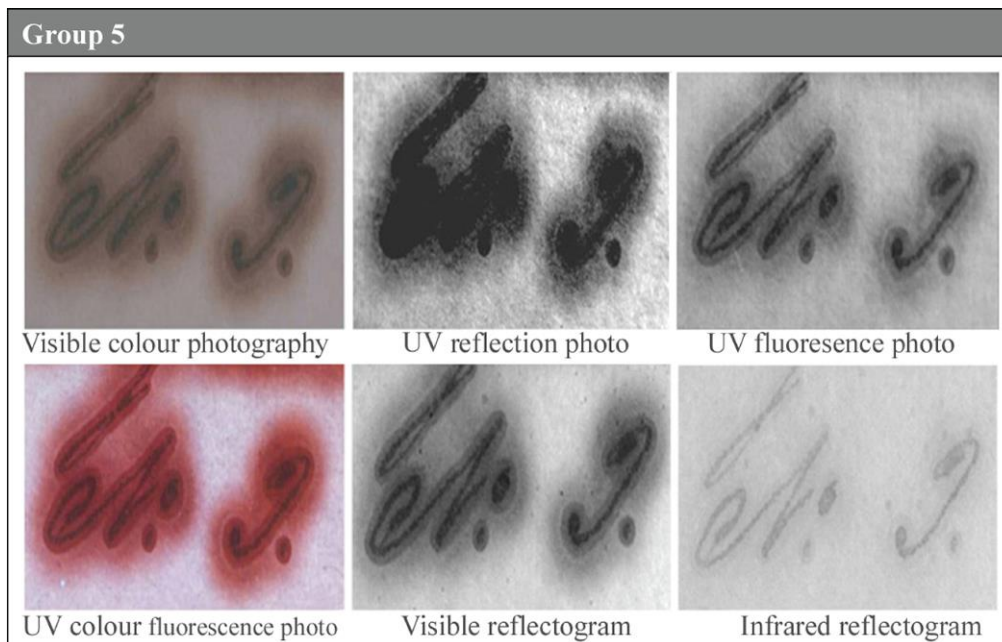


Fig. 7: Te examples include copy letters where several areas of diffusion and oxidation around the letters are observed

The last category (Fig. 8) includes copy letters with faint and blurred writing, with an extensive and gradually diminishing halo appearing around. In ultraviolet reflection photography (UVR), the letters appear very dark and they are embodied in the halo, while in the infrared reflectogram only the core of the letter, without the oxidation halo, is observed. In UVFC the letters appear profoundly dark and the circumferential fluorescence intensely red, which prevents their reading, but defines the extent and the limits of oxidation. The two photographs in the visible region simply record the pale ink with the halo, while in the UVF the core of the letter can be recorded, as the oxidation appears even fainter. The optical behaviour of the inks in each case infers to iron gall ink<sup>19</sup>, which is expected according to the composition of copy inks referred to the bibliography. Same optical behaviour is exhibited both in recto and verso sides of the copy letters.

<sup>18</sup> Kaminari et al. (2010), p.170

<sup>19</sup> Colbourne (2000), pp.38-39; Kaminari et al (2010), pp.170-171



## Group 6

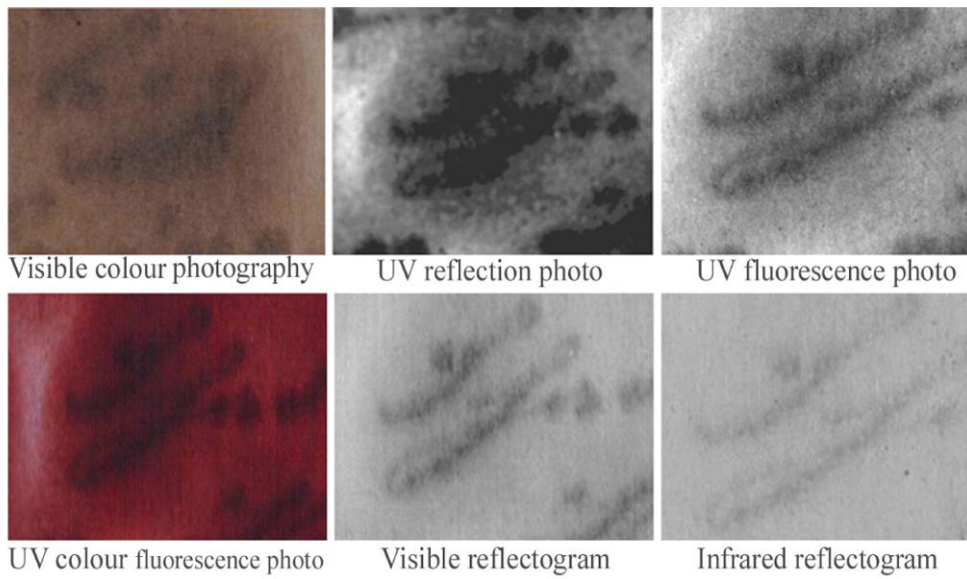


Fig.8: This example includes copy letters with faint and blurred writing, with an extensive and gradually diminishing halo appearing around

### 5. CONCLUSIONS

In the UV region of the spectrum, intense absorption of the letters-ink and oxidation halo is observed. The letters appear very dark and usually are embodied into the diffusion and the oxidation halo. This method helps to the determination of the oxidation limits, due to the high contrast. In the UVFC, the fluorescence of the oxidation can be detected more clearly and intense. In IR-Ref, the body of the letter appears distinct due to the absorption, without the halo of the circumferential oxidation visible in normal light. On the contrary, the diffusion appears as a shadow surrounding the letter. In the visible reflectogram, the borders of the inked areas can easily be distinguished.

The above methodology can be used for: a) reading of the text, b) distinguishing between the oxidation and the diffusion of the inks, c) precise recording of the oxidised areas, and d) providing indications in terms of the quality of ink and its components. Thus, the results of the non-destructive examination can contribute to the detailed documentation, the evaluation of the condition and the state of deterioration of the copy letters, the determination of the conservation and preservation approach. In addition, the results of the various photographic methods lead to the better understanding of the copying process and the factors affecting the final outcome, the quality of the copied writing.

### 6. ACKNOWLEDGEMENTS

Sincere thanks to Mrs. H. Kalliga, director of the Gennadius Library, Dr. N. Vogeikof, archive manager of the American School of Classical Studies and the Gennadius Library, and the staff of the archive section of the Gennadius Library, for their assistance during the photographic process.

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**We would like to thank the peers for their great work in double blind reviewing the article.**

#### **Next article**

We are welcoming articles in the field of book and Paper Conservation in a wide sense of it. The articles are double blind peer reviewed and as the Newsletter got a proper registration, the articles are quotable. Any authors are kindly asked to keep to the author's guidelines before they send us a text.

#### **UPCOMING EVENTS**

##### **Further education courses**

The upcoming further education courses are:

- [Endbands in the Bookbinding Traditions of the East](#) (Byzantine endbands) 20<sup>th</sup>-24<sup>th</sup> May 2013 - Lecturer: *Dr. George Boudalis*
- [The Deterioration of Leather and Parchment in the Light of the Possible Impact of Conservation, Restoration and Storage](#) 2<sup>nd</sup> to 4<sup>th</sup> July 2013 - Lecturer: *Dr. René Larsen*

- [Hyperspectral Images](#)  
29<sup>th</sup> July - 2<sup>nd</sup> Aug. 2013 – Lecturers: *Roberto Padoan and Marvin Klein* This course will take place in the USA
- [Mastering Materials, Techniques and Concepts](#)  
5<sup>th</sup> – 9<sup>th</sup> Aug. 2013 - Lecturer *Mag. Dominic Chan*
- [The Understanding and Analysis of Organic Materials in Art Capita selecta: proteins; natural organic dyes and pigments](#)  
2<sup>nd</sup> – 6<sup>th</sup> September 2013 - Lecturer: *Dr. Jan Wouters*
- [Understanding of Asian Bookbinding Techniques](#)  
9<sup>th</sup> – 13<sup>th</sup> September 2013 - Lecturer: *Lin Zhang Freund*
- [Microorganisms on Books – Detection – Identification – Conservation Measures](#)  
16<sup>th</sup> – 20<sup>th</sup> September 2013 - Lecturer: *Dr. Harald Riedl*
- [Methods for degraded book paper analysis and preventive conservation techniques with inorganic nanomaterials](#)  
30<sup>th</sup> Sept. - 4<sup>th</sup> Oct. 2013 Lecturer: *Prof. Dr. Rodica Ion*
- [Book-Bindings Conservation-Restoration after Christopher Clarksons Methods – the 18<sup>th</sup> Century Book](#)  
7<sup>th</sup>-11<sup>th</sup> October Lecturer: *Blanka Augustin MA*
- ["Der deutschsprachige Großstadtroman im 20. Jahrhundert - Sprache - Aufbau - Struktur"](#)  
14<sup>th</sup> – 18<sup>th</sup> Oct. 2013 - Lecturer: *Rudolf Aubrunner*
- [Fundamental aspects of organic chemistry and analysis for conservators](#)  
21<sup>st</sup>– 25<sup>th</sup> October 2013 - Lecturer: *Dr. Jan Wouters*
- [Decorated Paper - Recognizing, Classifying and Manufacturing](#)  
28<sup>th</sup>- 30<sup>th</sup> Oct. 2013 - Lecturer: *Mag. Ilse Mühlbacher*

Please do find more information and the registration form on our webpage  
<http://www.buchstadt.at/Courses.164.0.html>

Conference

## CALL FOR PAPERS

### **Book and Paper Conservation: Horn II conference - From Microorganisms to Mega-organisms**

Date 23<sup>rd</sup> - 25<sup>th</sup> April 2014  
Place Horn, Austria

**Organizer:** European Research Centre for Book and Paper Conservation-Restoration

The program committee welcomes original contributions on the following example **topics**:

## MICROORGANISMS

- of the use of biocides & disinfection,
- "the use of biocides and the monitoring of the effects on materials" (The topics can also include the possibility of launching a sort of web archive of data on treated collections and objects and on the best methods that can be used in monitoring (i.e. colour coordinates, pH, etc.).

## BOOKBINDING

- safe keeping assessment and database description of old manuscripts and their bookbindings. Topics may also include how our knowledge of the bookbinding structures and our appreciation of their historic (but also artistic) values conditions and guides our approach to their conservation and at the same time how the conservation of bookbindings actually enhances and improves our understanding of historic bookbinding structures. Through conservation a very privileged insight can be gained into the structures and techniques that would otherwise remain unnoticed.
- document safe keeping assessment and database description of old manuscripts and their bookbindings
- methods of investigations and related to them, practical issues of assessing the real physical state of manuscript and archive collections?

## DIGITISATION

- Safeguarding of electronic data - The storage strategies of digitised images (from books, documents, photographs, all cultural historic paper heritage) - importance of digitisation in the preservation of originals
- conservation of born digital archives, and even the very digital databases that every library, museum and archive are producing

## OTHERS

- digital library concerning the topic (book and paper conservation, restoration, preservation) in the internet? theory readiness of preservation in Europe."
- Multi Lingual Bibliography Network – present state and future
- "Innovative conservation treatments" or "New and old cleaning and reducing treatments"
- Other areas of research

## **Paper submission**

Authors are kindly invited to submit papers: preferably abstracts of about 2 pages in a 12-point font.

All paper submissions will be handled electronically. Authors should please email their abstract to

Prof. Dr. Jedert.Vodopivec (**Jedert.Vodopivec@gov.si**) or Dr. Georgios Boudalis (**geoboudalis@gmail.com**).

The deadline for submissions is 31st April 2013

#### Process of Selection

The conference board will evaluate papers and suggested panels based on quality and relevance.

A preprint will be published, therefore a deadline is set on 31st April 2013 for handing in the final

papers.

After your paper will be selected we will ask for short CVs of all authors and co-authors.

The language will be English.

Registration for the conference will open in August 2013.

## Board

Joseph Schirò (Heritage Malta, Malta)

Elissaveta Moussakova (Method and Cyril Library, Sofia, Bulgaria)

István Kecskeméti (State Archive, Helsinki, Finland)

Marzenna Ciechanska (Academy of Fine Arts, Warsaw, Poland)

Jedert Vodopivec (University and Archives of the Republic of Slovenia, Ljubljana Slovenia)

Georgios Boudalis (Byzantine Museum, Thessaloniki, Greece)

Flavia Pinzari (Istituto Centrale per il Restauro e la Conservazione del Patrimonio Archivistico e Librario Laboratorio di Biologia, Rome, Italy)

Rodica Ion (ICECHIM, Bucharest and Valahia University, Targoviste, Romania)

Patricia Engel (European Research Centre for Book and Paper Conservation-Restoration, Horn, Austria)

## Become a Friend

Become a friend of the "European Research Centre for Book and Paper Conservation-Restoration".

Individuals are wellcome to sign in for a membership called "friend". Fee is 85.00 Euros per year. Registration number and bank data will be provided after registration.

All friends receive

- two "European Research Centre - newsletters" per year,
- reduced fees for our specially marked further education courses
- information about any upcoming book related events in Horn,
- as soon as we will have installed the material quality controll, friends will be informed on the results and can gurantee the clients to use only tested material.

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## Note

The centre welcomes any ideas, wishes, requests, contributions, co-operations and suggestions. Furthermore, you are cordially invited to visit the Centre's webpage [www.european-research-centre.buchstadt.at](http://www.european-research-centre.buchstadt.at) for the latest news and the course-programme.

#### IMPRESSUM

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