European Journal of Science and Theology, April 2015, Vol.11, No.2, 129-140

ETHICAL AND TECHNICAL CONCERNS DURING THE CONSERVATION PROCESS OF A RELIGIOUS BOOK

THE BOOK OF HOURS FROM THE LIBRARY OF PALÁCIO NACIONAL DE MAFRA

Rita Araújo[1,*], Conceição Casanova[1, 2], Maria João Melo[1, 3] and Ana Lemos[4]

[1] *Universidade Nova de Lisboa, Faculdade de Ciências e Tecnologia, Departamento de Conservação e Restauro, 2829-516, Monte da Caparica, Portugal*
[2] *IICT (Instituto de Investigação Científica Tropical), R. Junqueira 86-1º, 1300-344 Lisbon, Portugal*
[3] *Universidade Nova de Lisboa, Requimte, Faculdade de Ciências e Tecnologia, 2829-516, Monte de Caparica, Portugal.*
[4] *Universidade Nova de Lisboa, Faculdade de Ciências Sociais e Humanas, Instituto de Estudos Medievais, Avenida de Berna 26-C,1069-061 Lisbon, Portugal*

(Received 15 January 2015, revised 27 January 2015)

Abstract

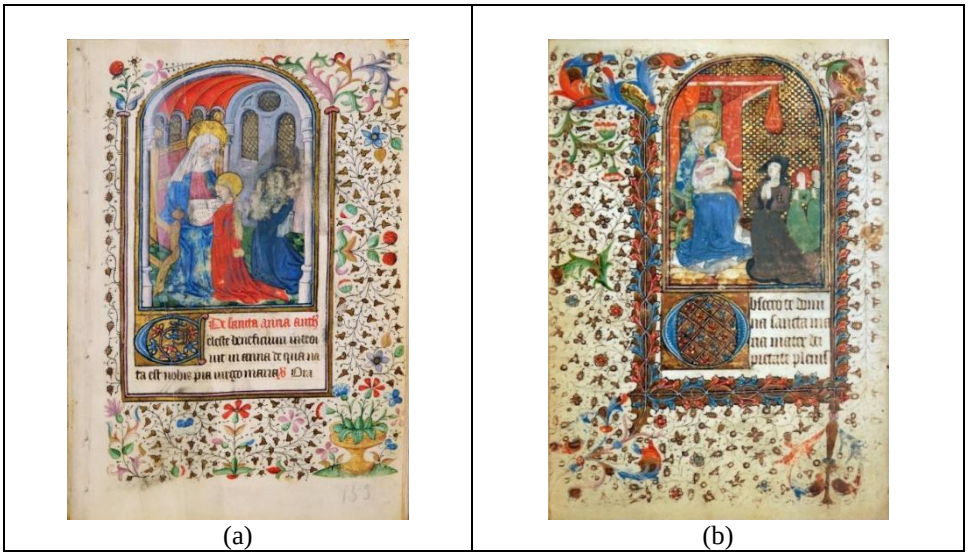
This paper discusses the ethical approach and decision making for the conservation of a French book of hours (*cofre no.24*), currently stored in the 18th century library of Palácio Nacional de Mafra (PNM), in Lisbon, Portugal. This book of hours, named *cofre no.24*, has the manuscript's original text block dated from ca. 1420 and three folios were added later, in the second half of the 15th century. The conservation decision was taken based on the study and full comprehension of the techniques and materials present in the book and bearing in mind the significance and the role of this symbolic book, throughout its life. The main aspects of diagnosis of the condition of the book are presented and the conservation treatment briefly described. The colours analysed reveal the artist's original trace and no other alteration, reinforcing the proposed minimal intervention for the text block. As opposed, the binding of the late 18th/early 19th centuries was in very poor condition, requiring the rebinding of the whole book. Treatment decisions are raised and discussed, namely the choice of maintaining the binding found versus recovering old bookbinding features, as the main theme of an ongoing research.

Keywords: book of hours, bookbinding, silver leaf, pigment identification

[*]E-mail: araujo.ritaa@gmail.com, tel.: (+351) 962880650

1. Context of production and meaning

The books of hours are inseparable from the medieval spirituality, congregating in themselves the divine word and imagery, allowing a direct and privileged contact with divinity. Intended for private devotion of the laity and reflecting the importance of the Marian cult at the time, these small manuscripts were produced on a large scale during the 14th and 15th century, in studios/workshops of urban centres of France and Flanders [1]. The workshops were led by a master who worked occasionally in the most important illuminations, plus a group of artists who executed his orders. The selection of some texts, the choice of the iconographic program and the ornamental richness, varied according to the taste and economic power of the commissioners, representing their artistic and spiritual needs as well as their social prestige [1, p. 33; 2]. The ornaments would typically combine images of the natural world and medieval evocations of daily living, and may contain very rich and very expensive pigments such as lapis lazuli and gold and/or silver leaf. One of the main features of these books was the fact that they were being produced for a particular person, reflecting the new way of thinking of the medieval society of the 14th and 15th century: the *Devotio Moderna* [1, p. 27; 2].



(a) (b)

Figure 1. (a) PNM, cofre no. 24, fl. 17v, Virgin with Child and donor, probably with her daughters, illumination above 4 lines of text, 92x64 mm, approx. 1420; (b) PNM, cofre no. 24, fl.153, Saint Anne teaching the Virgin to read and donor, illumination over 4 lines of text, 97x71 mm, 2nd half of the 15th century.

The *cofre no.24*, one of eight French books of hours, dating from the 15th century, which integrated the collection of the PNM's library during the second half of the 18th century, confirms this specificity. Two illuminations (Figure 1)

illustrate that this book of hours belonged to a woman, which enters the space once reserved for the sacred and makes part of the sacred scene, representing herself side by side with the saints of her devotion [A. Lemos, R. Araújo and C. Casanova, *O cofre nº 24: um livro de horas do Palácio Nacional de Mafra. Um caso de estudo e de intervenção*, Invenire, 2014, in print; 3].

The book of hours was used and carefully kept by its owner, who usually wrapped it in a brocade fabric, being preserved in the families during several generations [1, p. 40; 3]. For this reason, many copies of Books of Hours have survived to present days, although mostly with later bindings. This reason is related with the fact that when the new owners received these books, they modified images, added or removed prayers and full illuminations and consequently, the books were rebound. Moreover, in posterior times, the institutions where these books were kept changed the binding and sometimes literally cut up the manuscripts so as to fit into existing bindings available at the institution. This is the case of *cofre no.24* showing several changes of the text block and binding. This newer bookbinding was probably produced later in Portugal, displaying decorative features and materials of the late 18th/early 19th centuries, similar to other books bound in the bookbinding workshops of PNM's library.

All the bindings of this particular set of books of hours show common features, suggesting they arrived at the same period to the PNM's library and were done in the same bookbinding workshop. This is noticeable in the materials chosen (pasteboards, calf leather and end-papers) and the technique applied: the two-up sewing on raised cords, the simple laced in process and endband, the skin turn-in that includes cutting along the endband and the corner shape with skin overlapping, as well as the decoration with the technique of stippling over the skin cover and the gold-tooling of the spine. All these books have 'MAFRA' inscripted in gold on the tail of the spine, which reinforces the assumption that all the books were rebound at PNM's library, except *cofre no.24*, where it is impossible to see such inscription due to a gap of leather. Regarding the rebinding process, in later bindings, from the 18th century onwards, less attention was given to the choice of materials and to the inner elements and structure stability. Thus, the entire set of books of hours of this collection reveals damage caused by subsequent bindings, associated to the technological features and this is visible by the frequent damage and deterioration in the same areas. In general, the text blocks are also not very well-preserved due to the poor protection provided by the bindings, which allow the penetration of humidity and pollutants, and also show evidence of extensive use. The major conservation problem observed in the manuscript *cofre no.24* was precisely related to the poor condition of the binding, contributing to the overall deterioration of this luxurious manuscript [A. Lemos, R. Araújo and C. Casanova, Invenire, 2014, in print].

2. Preservation condition

For an appreciation and understanding of the work involved in the construction of the book of hours, it is essential to know what materials and techniques were used, determine its preservation condition and document previous interventions preformed along its history. Concerning the development of a conservation strategy, a full study and the systematic conservation condition survey of the *cofre no.24* was carried out [A. Lemos, R. Araújo and C. Casanova, Invenire, 2014, in print]. The techniques and the conditions of analysis used, as well as the characterization of the different materials that compose the manuscript, can be found in the publication 'A Spectroscopic Study of Brazil wood Paints in Medieval Books of Hours' [4, 5].

2.1. Binding

The manuscript *cofre no.24*, measuring 197 mm x 135 mm x 50 mm, was found with pasteboards composed of flax, covered with a full calf brown leather binding, with sprinkling decoration, gold-tooling and an inscription ('Heures Devotes') on the second panel of the spine, that corresponds to the inscription on the fly-leaf in the beginning of the manuscript (Figures 2). As the Figure 2b shows, the last panel of the spine had a gap of leather, however, as referred previously, probably this book had the same inscription in gold 'MAFRA' as the other books of hours of this collection. The strengthening of the spine was made with strips of paper, with printed Portuguese characters, in the panels between the nerves. The head and tail of the spine were reinforced with strips of parchment. This manuscript has four later end-papers of manual production with flax and cotton fibres, with different filigree. One of the end-papers had a watermark associated to the papers of Genoese production and another one with a crowned coat of arms similar to the Portuguese monarchy coat. The manuscript presented a dismantled sewing structure supported on 5 raised cords, both in flax. The headband had the inside in rolled paper wrapped with silk fibres with two colours, white and yellow. The yellow colour was identified as a yellow vegetable dye, of the flavonoids family, belonging to the genus *Reseda*, part of the Weld species (*Reseda luteola L.*), which was of the most commonly used species in dyeing yellow fibres due to its stability [6].

Regarding the condition of the binding, the main damage consists on the broken sewing and partial cutting of cords, affecting the headband; the tearing and loosing of the spine cover, especially along the joints. The condition of the binding also affected the text block, which is not well-preserved due to humidity and pollutants that penetrated into the text block (Figure 3). This is particularly relevant for a manuscript on parchment, which is a very hygroscopic material, changing dimension and shape with relative humidity oscillations, resulting in loss of adhesion of the pictorial layer and oxidation and darkening of silver leaf applied in the illumination, as discussed below in

this article. Oxidized animal glue was found in the strengthening of the spine as well as in the end-papers.

(a) (b)

Figure 2. (a) PNM, cofre no. 24, front and back boards of the binding with sprinkling decoration and showing wear and gaps in the leather and in the pasteboards, before treatment and (b) the spine cover with gold-tooling and an inscription ('Heures Devotes') showing wear and gaps in the leather, before treatment. Probable date: late 18th/early 19th centuries.

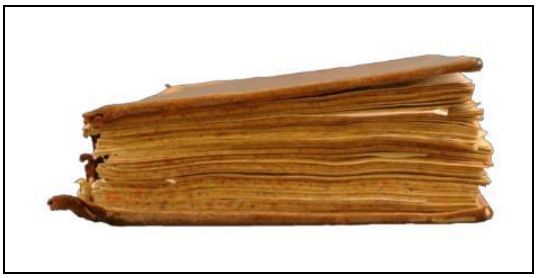


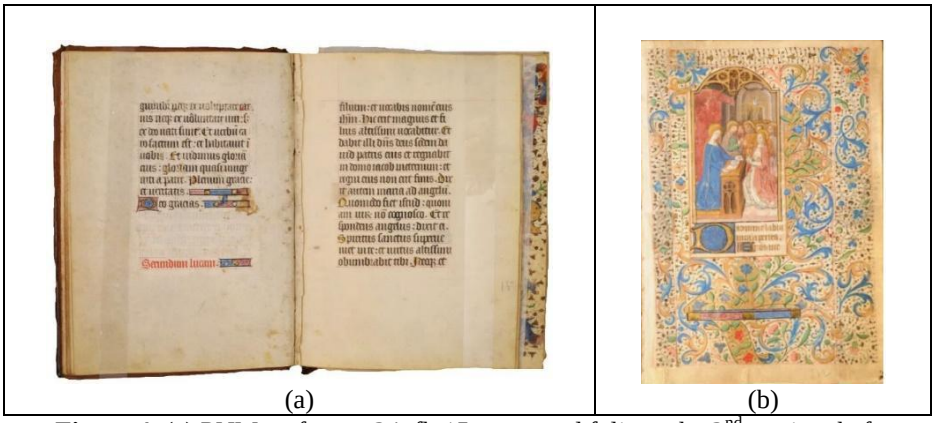
Figure 3. PNM, cofre no. 24, deformation of the text block and loose sections and folios, before treatment.

2.2. Text block

The text block on parchment consists of 23 sections in a total of 181 parchment folios, written in Latin and French, generally organized in 14 lines of text and 14 illuminations. The writing is done with an apparently quite stable gall ink, which only presents a few areas of ink fading.

The tight binding and the tension in the sewing line and the stitching, characteristic of the production period [7, 8], were easily affected by handling, causing holes and tears on the fold of the folios and, eventually, breaking the sewing line. An additional technical problem to the bookbinding structure is related with the modifications of the sections and old restoration procedures on the text block. Through the studied of the texts and images as well as the structure of the manuscript it was possible conclude that in the second half of the 15th century, some original folios were replaced by new ones with thicker parchment, and along its existence some original folios were removed, resulting in a discontinuity of text and the imbalance of the text block

composition, contributing to the deformation and degradation of the manuscript (Figure 4) [A. Lemos, R. Araújo and C. Casanova, Invenire, 2014, in print].



(a) (b)

Figure 4. (a) PNM, cofre no. 24, fl. 15, truncated folio at the 2nd section, before treatment, ca. 1420 and (b) PNM, cofre no. 24, fl.112, Pentecost, 1470, illumination above 3 lines of text, 86x50mm. See margins decoration, done by pieces pasted.

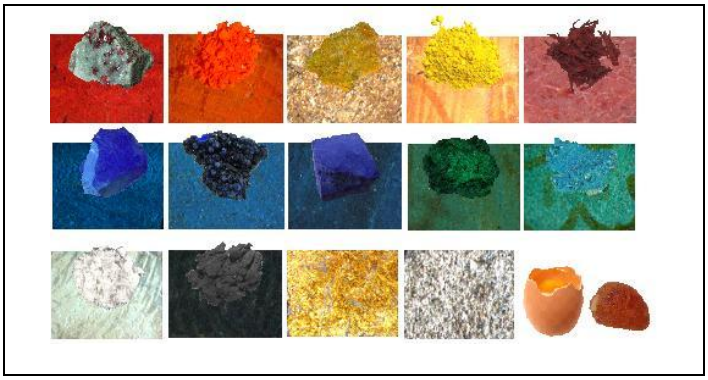


Figure 5. The molecular palette of cofre no. 24. From top to bottom and left to right: vermillion, minium, mosaic gold, lead-tin yellow, brazilwood laque, lapis lazuli, azurite, indigo, malachite, basic copper sulphate, lead white, carbon black, gold, silver, egg white and Arabic gum.

2.3. Illuminations

The illuminations, the noble and artistic part of the text block, were also fully analysed for a better understanding of the pictorial surface composition, as well as the construction techniques, and to gather information about its preservation condition. To the pigments already in use in medieval illuminated manuscripts of the 12th-13th centuries were added a new dye, the brazilwood lake, two synthetic yellow pigments, the lead-tin yellow and mosaic gold, and also a green basic copper sulphate, which could be a brochantite ($Cu_4SO_4(OH)_6$), or a mixture thereof with langite ($CuSO_4 \cdot 3Cu(OH)_2 \cdot 2H_2O)_2$ [4, 9].

Figure 6. PNM, details of the colour construction of coffer no. 24 (first horizontal line); details of detachment of the pictorial layer (second horizontal line); details of oxidation of the silver leaf and wear of gold leaf (third horizontal line).

These new pigments were supplemented with the classic vermillion, minium, lapis-lazuli, azurite, indigo, malachite, carbon black and lead white (Figure 5). Under the gold leaf was found a chalk ground, sometimes mixed with gypsum; the silver leaf had a chalk ground. As binder, a protein (e.g., egg white or parchment glue) and/or a vegetable binder (polysaccharide, such as Arabic gum) were identified for all colours [4].

In general, the colours analysed are the original ones, not having undergone any restoration intervention. Although in acceptable condition, the illuminations showed areas of loose pigments due to poor adhesion of the different pictorial layers to the support, related with the bookbinding condition and the parchment deformation, but also due to material composition and application technique. The most damaged colours are: green (malachite and a basic copper sulphate), blue (lapis lazuli and azurite) and white (lead white), probably due to the grain size of these pigments or to the low amount of binder [4]. Silver leaf, widely applied in the backgrounds of the illuminations, presents extensive degradation and darkening due to its oxidation, related to the lack of protection provided by the binding, totally distorting the original appearance of the whole decorated areas (Figure 6) [4]. This validated the proposed intervention, focused on the recovery of the binding, maintaining the integrity and preserving all traces of the historical process of the book.

3. Conservation treatment

The whole book was disassembled, the text block of the 15th century was dry cleaned only, and the 18th/19th centuries bookbinding structure fully

recovered, involving the reinforcement of the same back folds of the folios and the re-sewing of sections. It was decided to recover the $18^{th}/19^{th}$ century bookbinding structure, since no other original binding traces were found. It should also be pointed out that such structure is already part of the history of this artwork.

3.1. Text block

The folios were dry cleaned and stacked dirt or traces of adhesive in the fold of the folio were removed with a pointed instrument. Occasionally, the traces of adhesive were smoothened with a slightly moistened cotton swab dipped in a solution with 50% water and 50% ethanol. The most damaged folds of the folios were locally reinforced, allowing the re-sewing process on raised cords. The outer fold of the last folio of the section was reinforced with thin parchment and the inner part of the first folio of the section with synthetic collagen and a thin layer of purified wheat starch. The latter is stable, good reversibility, no significant colour changes with aging, and it has an appropriate adhesive power to the materials in question [10]. In sections where some original folios were removed, it was decided to insert a sheet of parchment, signalling the absence of folio, while restoring the equilibrium of the whole section. Hence we replace three truncated folios with three new sheets of parchment with similar characteristics to the original, but in a perfectly recognizable form, respecting the authenticity of the artwork and its individual history (Figure 7).

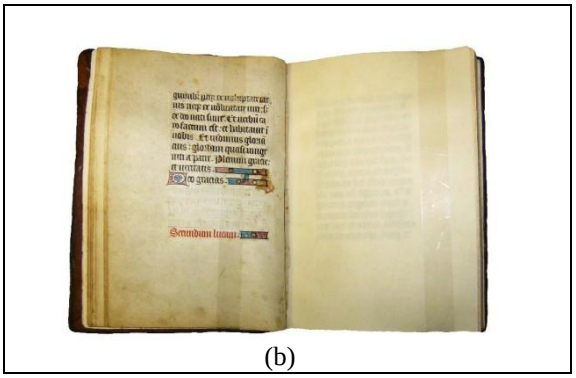
3.2. Binding

After the gathering of the text block, each section was sewn two-up on five raised cords, using the same holes of the previous sewing system, with a thin cotton thread. The first and the last sections were sewn all along. Following the traces of the previous headband fragment found in the manuscript, a new endband was placed on the head and tail of the spine, with silk thread in two colours (white and yellow), which was tied in the last hole of the stitching, alternating every four sections. Following the technique used in the previous binding process, manual western paper strips were glued with starch paste, between panels, to smooth the spine.

Next step consisted of mechanical cleaning of calf skin and consolidation with a 2% solution of Klucel G® (hydroxypropylcellulose) in ethanol. This step was preformed due to the fragile state of the leather which was becoming powdery from 'Red Rot' [10, p. 61, 128, 232]. Therefore, it needed to be consolidated before any repair, so as to make it more resistant to handling, mechanical damages, moisture and discoloration during the use of aqueous products, such as starch paste. The next step was to join the binding with the text block, lifting up the leather along the joint, to allow the laced-in process of the five cords on the pasteboards through two holes. Afterwards, a new leather with similar features to the binding calf was used to cover the spine area, as

well as to fill the gaps of the pasteboards corners. To finish the external conservation work, the previous spine cover was added on the top of the newer one. Purified wheat starch adhesive was used in the entire process (Figure 8b).

Finally, Leather Dressing®, composed by lanolin, neatsfoot oil and beeswax, was applied for final protection once the skin had dried (Figure 8a).



(b)

Figure 7. PNM, cofre no. 24, fl.14v, new sheet of parchment inserted in truncated section, in order to re-establish the balance of the manuscript, approx. 1420.

(a) (b) (c)

Figure 8. (a) PNM, cofre no. 24, front and back boards of binding after the intervention; (b) spine of book after the intervention; (c) the tail edge of book after the intervention.

4. Results and discussion

The decision making process for conservation took into account the urgent need of stabilizing the book and re-establishing its equilibrium, by intervening in its structure, while maintaining material integrity and cultural evidence of the whole object.

Important structural elements for the characterisation of a binding are types of end-leaves, sewing systems, including raised bands and holes, lacing-in paths, board shape and materials, types of endband, covering material, turn-in technique and decoration methodology but no signs of original features

survived in the case study. In fact, in the 15th century, there was a wide variety of binding styles, but they rarely survived for a long time. In this period, an illuminated book should contain protective and functional materials, as well as expensive and luxurious decoration [11]. However, with the few bindings of the 15th century, which lasted to the present day, it is difficult to determine whether the decoration and techniques used are representative of a certain period and the past practices cannot be described with certainty. Most books of hours have bindings of the 17th-18th century and part of the 19th century, being very rare the ones that preserve their binding without any modification. In that context, it was decided to recover the previous binding because no original traces or records were found related to the original. The fact that this book belongs to a collection of books of hours that contain all the same type of binding, also contributed to this decision.

The re-binding procedures done were targeted at a major goal: avoiding the increase in size of the manuscript's spine while allowing the suitable opening of the book (Figure 8c). Another important decision was reaching the equilibrium of the text block by eliminating the irregularities. Only with a balanced text block was it possible to create a rather stable binding. This was achieved by including new parchment sheets in the truncated sections, while the faults were signalised for future evidence and total comprehension of the conservation process.

All the exterior features of the binding as well as the materials and structure pointed to a period between the late 18th and early 19th centuries. The raw material found in the paper fibres of the end-papers and the pasteboards as well as the natural yellow dye contributed to the same conclusion. The materials and techniques found in the illuminations are in agreement with what we know from the 15th century illuminated manuscripts, and are consistent with recipes found in medieval treatises [12-16]. As reported earlier, the colours analysed reveal areas where the pigments are cracked and fragile, however no intervention was attempted in the illumination, due to its primitive character and incomparable beauty. In addition, the systematic study of illuminations allowed the diagnosis of another critical point for the conservation of these books: the degradation process of the silver leaf, which has an important aesthetic impact on these artworks. In fact, the study of the degradation of silver leaf in illuminations, its stabilization and the development of preventive and curative treatments, will be also a main topic of research on the ongoing investigation that involves the full study of 15th century books of hours, kept in Portuguese institutions.

5. Conclusions

This case study is a good example of the challenges that conservation raises in relation to decision-making. Conservation and restoration decisions cannot be taken without first having a full understanding of the text, history of ownership, in-depth analysis of materials and techniques, as well as the

technological and artistic features of the book. Treatment decisions resulted from a critical approach based on the research done and bearing in mind that each alteration may be an evidence of a different ownership step, thus being part of its individual history.

Through these studies it was also possible to realize the lack of information available concerning: (i) maintaining bindings found versus recovering old bookbinding features, a difficult task for books involving an intricate history in terms of ownership and a long past; (ii) the stabilization of pigments and reversibility of silver degradation, keeping in mind the singularity and aesthetic value of these manuscripts. Recognizing the need of further studies, these are in fact the main themes of the ongoing research project recently set up and already mentioned.

Although we still have to be careful with handling this precious book of hours, since the binding is not the ideal one for a book on parchment from the 15th century and we still have areas of loose pigment, with this approach we kept the integrity of *cofre no.24* and we preserved all moments of its existence, including the curious puzzle like collage on folios no. 39v and 112. Considering the recovery of a relatively recent binding, we decided to motorize the book, every six months, regarding its behaviour, in terms of openness and resistance to cracking along the spine. So far, the usage is very restricted and its performance is excellent. The manuscript is now carefully kept in an acid-free box with alkaline reserve inside a safe at the library of Palácio Nacional de Mafra, which has a low and stable temperature. All binding materials that were not used in the intervention were documented and stored in the box containing the book. With this treatment it is now possible to contemplate, exhibit and handle this book of hours, following the general rules of preventive conservation for works of art.

Acknowledgment

The authors thank the financial support of Science and Technology Foundation by the project SFRH/BD/52314/2013 and REQUIMTE by the project PEst-C/EQB/LA0006/2011. They would like to thank Solange Muralha, Tatiana Vitorino, Cristina Montagner for their contribution to this project; as well as the PNM team and the director Mário Pereira dos Santos for their generous support.

References

[1] R.S. Wieck, *Time Sanctified: The Book of Hours in Medieval Art and Life*, Sotheby's Publications, London, 1988, 28.

[2] C. De Hamel, *A History of Illuminated Manuscripts*, Phaidon Press, Oxford, 1986, 164.

[3] A. Lemos, *As iluminuras nos livros de horas quatrocentistas da biblioteca do Palácio Nacional de Mafra*, in *Catálogo dos Livros de Horas do Palácio Nacional de Mafra*, A. Lemos (ed.), Mafra: Instituto de Estudos Medievais da FCSH-UNL/Palácio Nacional de Mafra, Lisboa, 2012, 99.

[4] M. Melo, V. Otero, T. Vitorino, R. Araújo, V.S.F. Muralha, A. Lemos and M. Picollo, Appl. Spectrosc., **68(4) (**2014) 434.
[5] M.J. Melo, A. Lemos, A.R. Araújo and V.S.F. Muralha, *O que nos dizem os materiais da cor sobre os livros de horas do Palácio Nacional de Mafra?*, in *Catálogo dos Livros de Horas do Palácio Nacional de Mafra*, Mafra: Instituto de Estudos Medievais da FCSH- UNL/Palácio Nacional de Mafra, Lisboa, 2012, 103.
[6] D. Cardon, *Natural Dyes - Sources, Tradition, Technology and Science*, Archetype Publications, London, 2007, 176.
[7] P.J.M. Marks, *The British Library Guide to Bookbinding: History and Techniques*, The British Library, London, 1998, 11.
[8] P. Anderson, The Book and Paper Annual, **18 (**1999), online at http://cool.conservation-us.org/coolaic/sg/bpg/annual/v18/bp18-01.html
[9] B. Gilbert, S. Denoel, G. Weber and D. Allart, Analyst, **128(10)** (2003) 1213.
[10] K. Marion and R. Thomson, *Conservation of Leather and Related Material*, Elsevier, Amsterdam, 2006, 127.
[11] J. A. Szirmai, *The Archaeology of Medieval Bookbinding*, Ashgate, Aldershot, 1999, 173.
[12] I. Villela-Petit, *Palettes comparées: Quelques réflexions sur les pigments employés par les enlumineurs parisiens au début du XVe siécle*, in *Quand la peinture était dans les livres, Mélanges en l'honneur de François Avril*, vol. 15, Brepols, Belgium, 2007, 382.
[13] I. Villela-Petit and B. Guineau, Le Maitre de Boucicaut - Art de l'enlumineure, **6** (2003) 3.
[14] M. Clarke, *'Mediaeval Painters' Materials and Techniques, The Montpellier Liber diversarum arcium*, Archetype Publications, London, 2011.
[15] K.P. Whitley, *The Gilded Page: The History and Technique of Manuscript Gilding*, Oak Knoll Press & The British Library, New Castle, 2000.
[16] M.P. Merrifield, *Medieval and Renaissance Treatises on the Arts of Painting: Original Texts with English Translations*, Dover Publications, Nova Iorque, 1999.