

HIGHLIGHTING MANUSCRIPTS' THIRD DIMENSION

ACCESS, DOCUMENTATION AND DISPLAY OF MICROMETRIC DETAILS

INÊS CORREIA

DGARQ – National Archives of Torre do Tombo
and IEM, Faculdade de Ciências Sociais e Humanas – UNL, 1069-061 Lisboa (Portugal)
ines.ineia@gmail.com

Introduction

Medieval scribes complained of the difficulty and physical effort of the long and hard labour of illuminating or copying manuscripts with the dim light coming through the windows of the monasteries¹. We can make some interesting reflections on the characteristics of that light. It would reach the working table at an extreme angle², similar to a raking light, modelled by the orientation of the room and time of day. The position of the scribe and the angle of incidence of the light source are not clearly attested by written sources, but may be found in iconography³. It is not rare to find the scribe or copyist monk depicted as seated in profile at their working table, sometimes framed by the arches of the cloister⁴. When illuminated in the same way, with light from the side as it would have been in a *Scriptorium*, i.e. more parallel to the parchment ('grazing' or 'raking' light), a manuscript can expose an extraordinary dimension – texture. If this seems redundant, imagine the difficulty in following lines ruled with a *punctorium* (blind ruling) without such raking light (Figure 1). Such light could also help when painting, where overlapping strokes can be better controlled because of similar lighting. In modern reading rooms the lighting is generally more diffuse and homogeneous, and in consequence the surface texture of a manuscript is not perceived in the same way. Therefore there is increasingly a danger that the evidence of the manufacturing processes and later uses of a medieval manuscript that are detectable within its third dimension (subtle surface deformations, subtle surface textures, such as blind ruling, stylus markings, pricking) will be lost (at worst) or not appreciated (at best). Conservation treatments can remove or reduce this evidence through flattening. Furthermore, increasing reliance on digitised im-

1. Glenisson, J. (dir.). 1988. *Le Livre au Moyen Âge*. Paris: CNRS, 40-41.

2. We are not considering the cases in which the light enters through the roof.

3. Metzger, B. 1968. When did scribes begin to use writing desks? *in* Historical and literary studies, Pagan, Jewish and Christian (New Testament Tools and Studies, 8). 2. éd. Leyde: BNF, 123-132; III-XIX.

4. Azevedo Santos, M.J. 2001. As condições técnicas e materiais da cópia de manuscritos na Idade Média *in* Catálogo da Exposição Santa Cruz de Coimbra: A cultura portuguesa aberta à Europa na Idade Média. Porto: BPMP.

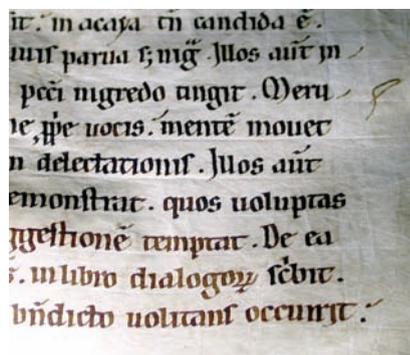


FIG.1 ILLUMINATING THE FOLIO WITH COLD LIGHT AT A SHARP ANGLE, HIGHLIGHTS THE RULING MARKS OF A BLIND TOOL, LORVÃO 5, F. 12

ages of manuscripts by scholars means that these clues can be overlooked (because these features are rarely visible under the types of illumination used for photography and scanning).

Within this framework, we propose the revaluation of digital objects created from the transfer programs of medieval manuscripts, in which the gradual increase in resolution does not compensate, yet, for the bi-dimensional perception of the folio. We propose to improve the *access-preservation* of these manuscripts based on a recovering of optical effects by variable and raking-light as a result of manipulating the orientation and intensity of a proper light source, during direct physical access.

We propose the use of raking-light, not as an optional or secondary procedure, but as an essential and routine measure, which simultaneously improve our perception of important details in the manuscript. The illumination of objects from a light source at an oblique angle or almost parallel to the surface reveals significant information on the codex production, and can thus help improve the understanding of the relations between monastic institutions, theological and doctrinal influences, author's receptivity, migration of models or illuminators and several other contextual matters. Some of these relations are revealed *in, on or beyond* the surviving material of a unique cultural heritage.

From a 'low tech' method to 'high tech' possibility



FIGS.2 CROW IN F. 33, LEFT, AND, RIGHT, DETAIL CAPTURED WITH RAKING-LIGHT (OPTIC FIBRE). THE EFFECT OF A DELIBERATE MUTILATION IS RECOGNIZED IN THE MARKS LEFT BY A TOOL TIP

5. Sequence of images obtained with a different type, intensity and orientation of light in order to obtain specific information.

6. Clark, W. 1992. *The Medieval Book of Birds. Hugh of Fouilloys Aviary*. Bringhamtom: Medieval & Renaissance texts & studies. p 41; Clark, W. 1982. *The Illustrated Medieval Aviary and the Lay-Brotherhood*. *Gesta*. 21(1): 63-74.

In this context, we deal with a so-called 'low tech' method based on a specific lighting plan, (LP)⁵ applied to particular manuscripts. Direct access to the manuscript itself would be justified to assess three-dimensional surface details that are not recorded on digital format. The method proved to be useful for the study of an important medieval manuscript, *De Avibus* from Lorvão Monastery (*Lorvão 5*), both in terms of assessing its conservation status, and helping the interpretation of marks left by copy processes, habits from handling or owner censorship (Figure 3b). Dated, by colophon to 1184, it is known (Clark, 1992) as the earliest surviving dated copy of Hugh of Fouilloys text⁶. In this fully illustrated manuscript the depiction of the twenty-two

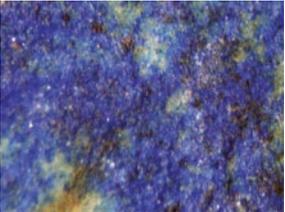
birds is very natural; the illuminator combines in his drawings the classical tradition of the representation as nature and as allegorical symbol⁷, (Table 1). Its importance in medieval art justifies its presence in numerous thematic exhibitions⁸.

Five years have elapsed since a conservation treatment, which was carried out because of the risk of structural collapse. Intervention included disassembly of the structure, stabilization and restoration of parchment support and binding. Interdisciplinary projects had been developed since then, revealing much about this Portuguese manuscript's production⁹ and suggesting that there is more to be revealed. Simultaneously, the dismantling of the codex, freeing the folios of the structure, has also facilitated the scanning of high resolution (300dpi), which is currently available on-line¹⁰ (Figure 6).

We will focus on lighting of type B, which is, as mentioned before, a 'low tech' easy to manipulate source of light. At very sharp angles to the surface of the manuscript, details such as surface defects or distortions can be easily revealed, mapping not only physical changes but also dimensional phenomena like retracting, curling or slight undulations, Table 1-B. At a closer look, we can observe depth of thick paint layers, tool incisions and even subtle scribal corrections¹¹.

Table 1

Manuscript *Lorvão 5*, observed through the microscope with optic fibre lighting, raking-light and a standard homogeneous source

A – Stereoscopic Light	B – Raking Light	C – Standard Light
		
<p>Macro for lapis lazuli, f. 16, Hawk.</p>	<p>Parchment distortion produced by over tension of sewing, f. 58v-46.</p>	<p>General view, displaying text, data on colour, opacity and gloss, f. 54.</p>
<p>This blue pigment area will be characterized at the molecular level by microRaman and micro FTIR.</p>	<p>System of optic fibre with rheostat, which reveals information about macroscopic texture and planar distortion¹.</p>	<p>Standard lighting from scanning technology, optical recording is converted into digital image with variable resolution.</p>

7. Miranda, M.A., Lemos A., Claro A., Miguel C. and Melo M.J. 2010. On Wings of Blue: The history, materials and techniques of the Book of Birds in Portuguese scriptoria. in Afonso, L.U. (ed.) *The Materials of the Image. As Matérias da Imagem*, Lisboa: Campo da Comunicação.

8. Clark, W., *Ib idem*, p.40. For further information about Portuguese «Book of Birds», see Rebelo Gonçalves, M.I. 1999. *Livro das aves / Hugo de Folieto*. 1st edition. Lisboa: Edições Colibri.

9. Projects: 1) «An interdisciplinary approach to the study of color in Portuguese manuscript illuminations», POCTI/EAT/33782/2000; 2) «The identity of Portuguese medieval manuscript illumination in the European context», PTDC/EAT/65445/2006; 3) «Colour in medieval illuminated manuscripts: between beauty and meaning», PTDC/EAT-EAT/104930/2008.

10. <http://digitarq.dgarq.gov.pt>, Reference code: PT/TT/MSML/B/5.

11. Michael Douma, «Visible & Beyond», from <http://www.webexhibits.org/pigments/>, public service of the Institute for Dynamic Educational Advancement (IDEA).

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12. Inês Correia, «What Image physical disturbance can tell?» (*in progress*).

13. Articulated optic fibre was used with rheostat supply.

14. Michael Arnott and Ian Bevan, «Pouncing». The Aberdeen Bestiary. <http://www.abdn.ac.uk/bestiary/codicology.hti#pounce>. 12/04/2003.

15. IDAP, «Improved Damage Assessment of Parchment». Assessment, data collection and sharing of knowledge 2007, European Commission, Directorate-General for Research. Final report, 2008.

Figures 3 and 4, show three examples of *LP* application to *Lorvão 5*, which became the basis of a current research in image damage and its relation with transmission and censorship¹². Images indicated 'A' were digitized using standard lighting from analogue capture, which was not enough to reveal micrometric details of texture. It also shows some interference coming from verso side writing, which is increased by the high intensity of the lighting. On the other hand, when the manuscript was observed under filtered natural light (35 lx), eyes easily adapted to this low levels of light intensity and, at the same time, more was revealed on the texture surface with an additional raking light source¹³. The first example, Figure 3b and Figure 4b, shows the possibility of surface assessment by reducing the translucent character of parchment, revealing even subtle creases. If light direction is changed during examination we can understand the causes of mechanical damage such as shrinkage or local distortion. This example is also significant because it enabled detection of the fine holes along the bird contour, just as in the Aberdeen Bestiary, where such holes can be found on several of the images, and which have been largely studied as *pouncing*, one of most popular copying techniques.¹⁴ To better document the impact of the pricking tool, the verso side was documented (Figure 3b) as well as the next folio, f.62, where no holes were found. During the last conservation treatment (2005), while backlighting was used to help parchment infill, all the images with this kind of contour prick were documented on the conservation report, but it was never contextualised as an artistic or historic issue. The studies on this manuscript did not

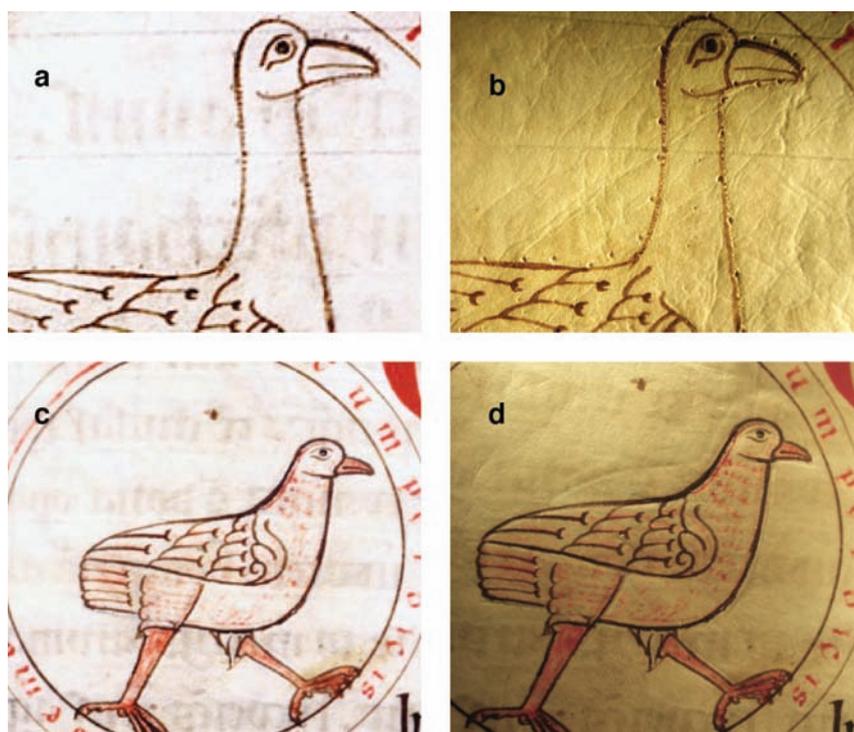


FIG.3: **A), C)** DETAILS ACQUIRED WITH A STANDARD HOMOGENEOUS LIGHT SOURCE (>800 LX) FOR THE PHOENIX AND THE PARTRIDGE, RESPECTIVELY; **B), D)** TEXTURE REVEALED BY RAKING-LIGHT AT 300 (50 LX)



FIG.4: **A)** DETAIL ACQUIRED WITH A STANDARD HOMOGENEOUS LIGHT SOURCE (>800 LX) FOR THE OSTRICH (F. 40); **C), D)** TEXTURE REVEALED BY RAKING-LIGHT AT 300, WITH 35 AND 50 LX, RESPECTIVELY; **B)** STYLUS INCISIONS, IN F. 61V, REVEALED BY RAKING-LIGHT AT 150, 50 LX

proceed to a systematic texture examination. Looking at the next examples it is easy to agree on the importance of the details unveiled. The Ostrich (Figure 4) seen under raking light at 200 reveals two distinct, previously unnoticed, types of physical damage: a deep incision along the contour made with some sharp tool, which is clearly seen under 50 lux and a deliberate scratching on the image. A blind trace, not so abrasive, is documented for the Partridge, *f.62v*, but this time, out of bird contour, suggesting two different drawing options.

The indications detected on the surface of *Lorvão 5* thus can increase our knowledge on its reception and transmission. Medieval manuscripts are full of significant texture – maybe due to the light angle, with which they were written and illuminated. Raking lighting is shown to be a shortcut to bring this past to light.

Conclusion - Texture conservation and display

Parchment is particularly sensitive to relative humidity and temperature changes. Even a small variation induces changes in its dimensions such as curling and waving. Conservation procedures, such as cleaning, even with a small amount of moisture, may increase the stiffness, accelerate chemical reactions and produce irreversible shrinkage, even at room temperature. Also, flattening and pressure with heavy load on moist parchment may cause considerable change of colour and transparency.¹⁵ These treatments have a direct impact on appearance: decreasing surface texture they may decrease or remove the evidence related to the manufacturing processes and

later uses of the codex. Reducing the level of information should always be avoided, but the risk is higher if information at the micro level is not even acknowledged. This evidence may be disclosed with raking-light, applied with a low light intensity to avoid photodegradation. We propose that this lighting may bring us closer to what might have been the medieval conditions of its manufacture and use. It is concluded that, for an accurate recording of medieval manuscripts, namely to assess the conservation status, raking-light examination is an indispensable tool.

As far as we know, digital scanning is not carried out systematically under raking light; this could be easily achieved, in order to preserve and highlight manuscripts' third dimension. Selected manuscripts, with relevant micrometric details noticed by conservators or researchers, should be also digitized with raking light. One of those manuscripts should be, undoubtedly, *The Book of Birds* from Lorrão. ●

Acknowledgements

The National Science Foundation, FCT-MCTES, is gratefully acknowledged for the PhD grant SFRH/BD/44192/2008 and for funding the project PTDC/EAT-EAT/104930/2008. The author would like to thank the Director of Torre do Tombo, Silvestre Lacerda, and to Mark Clarke, Maria João Melo and Adelaide Miranda for helpful suggestions; the author is also grateful to Mark Clarke for his generous assistance in the text editing.

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