

Supplementary S1. Painting Technique

This supplementary presents the details of the painting technique through photos obtained with a Leica microscope. The conservation condition of the colors is also discussed.

Please note that the manuscripts LA152 and LA193 have a modern numerical pagination, while LA216 and LA253 have a modern numerical foliation. Therefore, the macro images in this description are referenced to pagination numbers for LA152 and LA193 and to foliation numbers for LA216 and LA253, abbreviated as p./pp. (page/s) and f./ff. (folio/s), respectively.

Supplementary S1.1. Bible LA 152

Constantinople/1623/Scribe: Hakob/Artist: Hakob (?)/Commissioner: Xoġa Nazar/224 x 165 mm/606 folios/Script: *bolorgir*/Parchment/Inks, pigments, and gold/Leather binding

Supplementary S1.1.1. Painting Technique

The illuminations in this manuscript are uniform and seem to be the work of a single artist. The drawing lines and brushstrokes are smooth. The paint colors are brilliant and mostly well-preserved. The technique of applying the paint colors is reminiscent of the Byzantine examples, painted in opaque tones by creating layers, black contours, and white shades. Images have volumetry. Even the most minute details are perfectly accomplished.

Gold and saturated blues have uniform and thick appearances (pp. 13–14). Gold is applied to backgrounds, ornaments, and text. The ground preparation for the gold has a reddish hue (pp. 509, 784, 797, 799, 804, 1139). The ornamental illuminations (pp. 296, 1002) and majuscule letters in gold (pp. 407, 408, 950) were probably first drawn with red, and then painted.



p.8



p.8



p.13



p.13



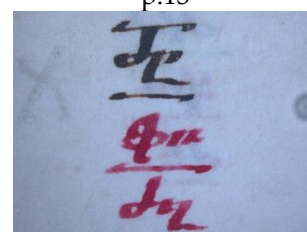
p.13



p.13



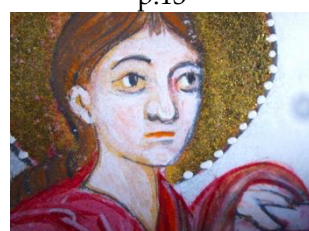
p.14



p.24



p.799



p.799



p.799



p.799

The writing ink is black; in some places, it tends to brown (pp. 2, 550, 750, 1139, 1210). Red, blue, and gold were also used for the majuscule letters. Orange-red and purplish-red are used as inks (p. 478).

Mountains and architecture have rigid lines, clear colors, and shades manipulated with white (pp. 137, 167, 241, 477, 487). Vestments are rendered with perfect folds and highlights (pp. 736, 819, 981).

White highlights and shades the ornaments, vestments, and architectural details. Supplementary S1.1.2. Degradation Issues

This manuscript is in a good preservation state. However, degradation issues can be seen in some instances. Some of the colors used on the ornamental elements and the halos of figures on the margins of the folios are corroding the substrate, revealing the corrosion on the recto side. There is a loss of adhesion of the white lead paints and of the green colors from the support.

The detached pigments and gold can be seen on pp. 8, 13, 14, 76, 296, 487, 623, 627, 652, 685, 778, 795, 796, 877, 946, 982, 996, 1002, 1036, 1057, 1060, 1065, 1095, 1099, 1111, 1113, 1140; the blurred paint surface can be seen on pp. 352, 662, 992. Some detached pigments are transferred onto the facing folio visible on pp. 7, 464, 499, 661, 820, 898, 954, 960. There is a cut of the upper outer corner on p. 800.

On the leather binding, there are three punctures of missing pins on the outer face of each board, and remnants of three leather fastenings on the inner face of the right board. The sewing of the lower part of the first gathering is weakened and slightly loose from the spine.



p.8



p.8



p.14



p.168

Supplementary S1.2. Gospel LA 216

New Julfa (Isfahan)/1686/Scribe: Gaspar/Artist: Hayrapet/Commissioner: Eḡsaberṭ'/108 x 079 mm/266 folios/Script: *bolorgir*/Parchment/Inks, pigments, and gold/Leather binding with silver cover

Supplementary S1.2.1. Painting Technique

This artist's style is quite unique, probably due to their effort to render perfect images in a manuscript of such tiny dimensions. Here, the drawing lines and brushstrokes are thick and voluminous. The paint colors are bright and warm-toned, with abundant orange and yellow. Marginal flowers and ornated letters are probably drawn with light red and black (ff. 20r, 25v, 82r), and then painted. An organic-based carmine is extensively present in many details—for ground preparation, highlighting, shading, and mixing or layering with other colors to render different hues.

Gold is present on most miniature backgrounds, some ornaments, and text, seemingly with a reddish ground preparation (ff. 14v, 15v, 80r, 237v).

The writing ink is black; in some folios, it tends to be brown (f. 58r). Red, blue, and gold are also used for the letters.

There are a few mountains in this manuscript (ff. 21r, 114v). The architecture is represented in tiny forms, mainly highlighted with bright pink (ff. 28v, 33r, 97v, 104v). Vestments are bright-colored, with folds marked in white, red, or orange (ff. 17r, 31r, 44v).

White highlights the flowers, vestments, and architectural details (ff. 88r, 91v, 141v). The green and orange are highlighted with yellow (ff. 97r, 189v).



f.11v



f.12r



f.143v



f.143v



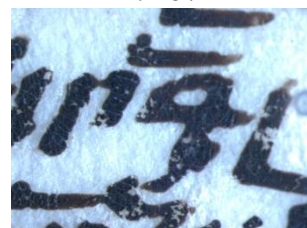
f.12r



f.12r



f.12r



f.2r



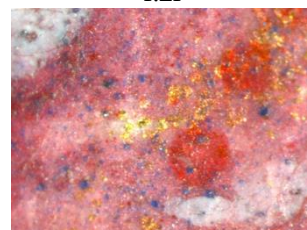
f.12r



f.12r



f.22r



f.22v



f.12r



f.12r



f.12r



f.153r



f.153r



f.153r



f.213v



f.213v



f.143v



f.143



f.143v



f.150r



f.75v



f.153r



f.213v



f.213v



f.141v



f.141v



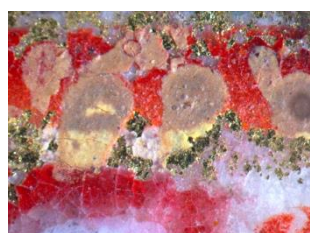
f.141v

Supplementary S1.2.2. Degradation Issues

The manuscript is in a good preservation state; however, the parchment is discolored in some areas. There are several colors with detachment or with extensive micro-cracking. While white and orange colors do not show degradation, the yellow of orpiment is pale and sometimes appears dark. This phenomenon does not affect all the orpiment-based yellows analyzed. On some folios, the gold leaf shows an extensive loss. Among the greens, some present a grainy texture, which could be due to the degradation of the yellow. However, further investigation should be carried out to confirm this hypothesis. The brown applied in the faces and hands displays a heterogeneous surface (as observed in the degradation of the minium in the *Lorvão Beatus* [39]), and in the figure portrayed in f. 193r, the edges of the white lead have darkened, which is an obvious sign of the degradation of this pigment. In addition, some of the pictorial layers are detaching from the support.

The detached pigments and gold can be seen in ff. 1v-8r, 12v-16v, 19r, 22v, 33r, 48r, 55v-56r, 75v, 122r, 142r, 153r, 154v, 155r, 193r, 213v, 218r, 256r; the faded ink in ff. 23r, 56r. Some loose pigments are transferred onto the facing folio visible in ff. 2r, 7v, 15v, 16r, 47v, 50r, 52r, 55v, 56r, 71v, 97r, 149r, 217v.

The sewing of the last gathering is weakened and slightly loose from the spine. The manuscript presents a silver treasure binding attached to the leather boards by metallic pins. The elaborate binding has an articulated metal spine and two clasps attached to the left board. The pins on the inner faces of the boards are corroded and transfer the greenish corrosion product to the parchment. The leather of the fore-edge flap is abraded.



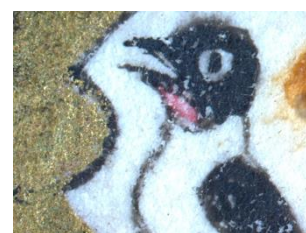
f.2r



f.2r



f.12r



f.2r



f.193r



f.193r



f.193r



f.143v

Supplementary S1.3. Gospel LA 253

Constantinople (probably)/17th century/Scribe: unknown/Artist: unknown/Commissioner: unknown/154 x 114 mm/280 folios/Script: *bolorgir*/Parchment/Inks, pigments, and gold/Leather binding

Supplementary S1.3.1. Painting Technique

The illuminations in this manuscript render a delicate artistic hand. The shades, highlights, and drawing lines in figures and ornaments are smooth and perfectly finished. The paint colors are warm-toned and mostly well-preserved. The rich palette, whether pure colors or mixtures, can be found throughout the manuscript.

Gold is used on the backgrounds of the miniatures, on some details, and text, possibly laid on red-toned ground preparation (ff. 25v, 38v).

The writing ink is black and mostly homogenous. Orange and purplish reds, blue, and gold were also used for the letters (ff. 30v–32v, 93r). The Canon Tables and some unfinished figures at the end are drawn with purplish ink (ff. 19v, 21v).

The mountains have white backgrounds and shades, modeled with pale blue and grey (ff. 6r, 8r, 10v). The architectural details are highlighted and sometimes painted with white (ff. 7v, 9r, 10v). A striking variety of colors are used in the vestments (ff. 9r, 15v, 16r).

White is broadly applied for highlighting and shading. Dark green foliage is highlighted with lines and dots in yellow (ff. 19v, 102r, 220r).



f.25v



f.25v



f.25v



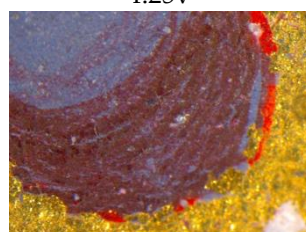
f.25v



f.25v



f.25v



f.25v



f.25v



f.25v



f.19v



f.234v



f.38v



f.234v



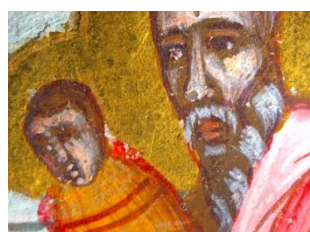
f.234v



f.234v



f.234v



f.7v



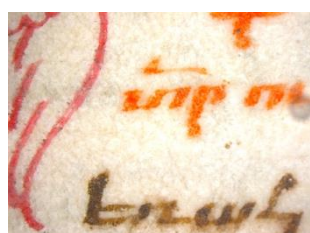
f.7v



f.7v



f.7v



f.277v



f.277v



f.277v



f.277v



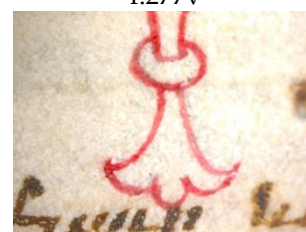
f.277v



f.277v



f.277v



f.277v

Supplementary S1.3.2. Degradation Issues

In general, the manuscript is in a good preservation state, with some minor degradation issues. In some illuminations, there is possibly degradation of the orpiment and white lead. In marginalia areas, there are stains on the reverse side of the parchment. In the first folios and the final ones, the pictorial layer is detaching from the support. In the past decades, tissue papers were placed within the manuscript in an attempt to preserve the illumination; however, as they seem to cause the degradation and detachment of some paints, their removal should be considered in the near future.

Detached pigments and gold can be seen in ff. 5v, 7v, 9r, 11r, 12v, 14v, 15v, 28v–29r, 52v, 91v, 143v, 277r. Some detached pigments are transferred onto the facing folio visible in ff. 15r, 38v, 46v, 53r, 215r, 274v, 276v, and onto the paper endleaves probably placed posteriorly in-between the folios that can be seen within the ff. 11r, 12v, 16r, 23v, 26r, 28v, 29r, 220r, 220v.

The leather of the binding is abraded; the fore-edge flap is embrittled and folded inwards. The lining applied on the inside of the boards is fading. The tail-endband presents the broken core. The sewing of the first and last gatherings is weakened and slightly loose from the spine. Some parchment folios are stained. The lower outer corner of f. 1r and the upper outer corner of f. 280r are torn. The manuscript probably had silver plates in the past, nailed to the boards, because there are several punctures on the outer faces of both boards and a metallic remnant preserved on the outer tail-edge of the right board.



f.234v



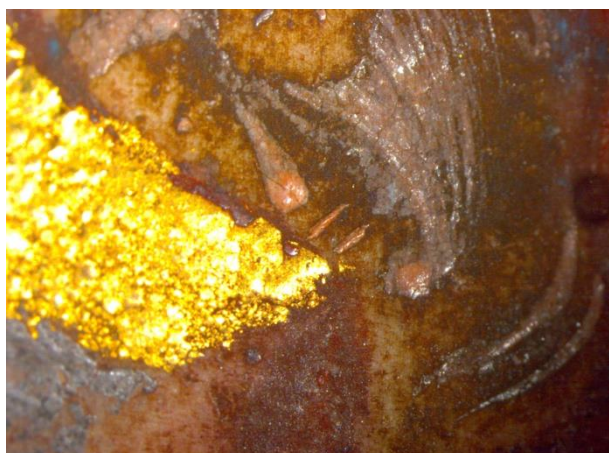
f.234v



f.234v



f.234v



f.5v



f.7v

Supplementary S1.4. Gospel LA 193

Crimea/17th century/Scribe: Nikoľayos/Artist: Nikoľayos/Commissioner: unknown/176 x 133 mm/277 folios/Script: *bolorgir*/Parchment/Inks, pigments, and gold/Leather binding with silver plates

Supplementary S1.4.1. Painting Technique

The illuminations are perfectly accomplished by the artist of this manuscript. Both figures and ornaments are executed with very fine textures and lines. The different tonalities of blue and organic reds are dominant.

Gold is used on the backgrounds, ornamental details, and text, likely applied on red-toned ground preparation.

The writing ink is black and mostly well-preserved. Gold, orange, and red are also used in the text.

The mountains are clearly outlined and layered in different colors (pp. 37, 40, 73). The architecture is highlighted and shaded with white. Vestments are mostly painted blue and purple.

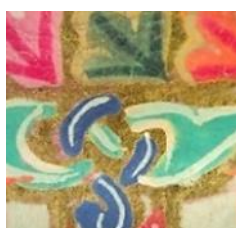
Shades and highlights in figures, vestments, mountains, and architectural details are manipulated mostly with white.



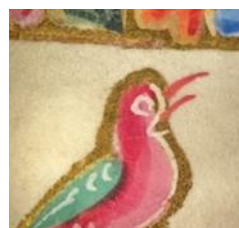
p.12



p.12



p.12



p.12



p.161



p.160



p.161



p.40



p.179



p.160

Supplementary S1.4.2. Degradation Issues

The manuscript is in sound condition. The colors are mostly well-preserved. Unlike the pictorial layers, parchment folios are discolored almost in the entire manuscript, with handling grime most often seen on the outer corners of the leaves resulting from the use of the Gospel in the past. The gatherings are tight within the binding. The leather used to cover the binding is abraded, especially on the spine. The metallic pins used to fix the silver plates on the outer face of the boards are corroded.

Supplementary S1.5. Examples of the Application of Organic-Based Reds (Ranging from Pink to Carmine and Purple) As Outlines, Ground Layers, and Colors

LA 152, Bible, 1623, Constantinople



p.14



p.242



p.296



p.1189

LA 193, Gospel, 17th century, Crimea



p.244



p.132



p.150



p.326

LA 216, Gospel, 1686, Isfahan/New Julfa



f.20r



f.53r



f.105r



f.82r

LA 253, Gospel, 17th century, Constantinople



f.52v



f.277v



f.277v



f.138v



f.199r

Supplementary S1.6. Book of Hours, an Example of Application of Color in very Small Figures

Manuscript 23 is a book of hours from the Boufflers family. The original text block of this manuscript dates from 1410 to 1430, and the folios that were added later were from the 17th century. At present, this manuscript measures 200x 150 x 40 mm, and it is composed of 129 folios with 16 lines of text, written in Latin and French. For more information consult [52]. It is in the collection of Mafra National Palace | Palácio Nacional de Mafra (PNM).

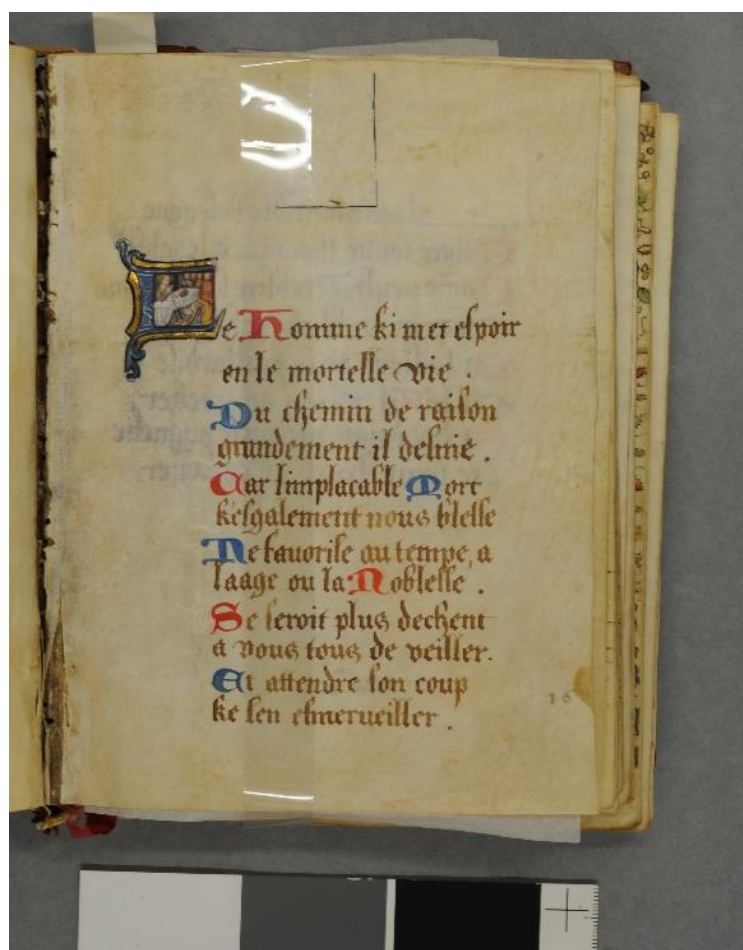


Figure S1. Manuscript 23 (1410-1430), f. 16 (before intervention). Mafra National Palace collection.



Figure S2. *Manuscript 23* (1410-1430), *f.* 16. PNM collection. Details obtained with Leica microscope.