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Colour in the Seventeenth-Century Miniatures of Spanish Choir Books

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INTRODUCTION

"The study of illuminated manuscripts down the centuries is intimately linked to the general evolution of the major arts so that a complete study of their development might be a more or less straightforward initiation into the history of art"[1].

Even if, because of their structure, the collective term "book" is used for choir books, in contrast to written and pictorial publications of plural character, each choir book is a uniquely bound work.

The great importance of these documents lies in their being a direct testimony of our past. This aspect is what makes their conservation essential and which opens the door to new discoveries based on the technical and material analysis of the object on hand. With research processes such as the one carried out in this report, the materials and techniques employed in their elaboration are being discovered. They are sometimes different from the materials and techniques included in some recipe books with Europe-wide relevance mentioned below. It can also be argued that this research will guarantee these objects' survival physically and as cultural assets, as transmitters of information, and as a way of recovering the history and identity of peoples via knowledge of the different cultural elements which they used.

CHOIR BOOKS

Characteristics

In general, the inclusion of choir books in catholic ceremonies began around the 4th century in Spain, making their appearance when Mass became a structured ceremony and with the establishment of specific times of day the call to prayer

was held at institutions dedicated to the Divine Office (monasteries, abbeys, convents, etc.). They have musical texts which are sung at different times during the Mass: between readings, religious offerings, or during the communion; or at certain times of the daily life of these catholic communities, at the so-called canonical hours: matins, none, vespers, etc. Their character, the purpose for which they were designed, and their location at the centre of the choir, so that they could be seen by a group of people, were the reasons for their large format: more than 50 cm wide and up to almost one metre tall. Being made of parchment, wood and metal reinforcements, they can weigh up to 40 kg[2].

The size of these books is the major cause of their deterioration, a process which increases once they have been forgotten. Because we usually find them stored in basements or attics, in general they have fallen into a pitiable state of conservation (cf. Fig. 1).

Depending on the artistic value of their miniatures or ornaments, they have become museum pieces. In Spain there are some good examples of choir books in museums such as the one in the Monastery of Guadalupe[3] (in Cáceres, southern Spain: Extremadura; cf. Fig. 2) or the one in El Escorial Monastery. But they are very few in comparison to the patrimony that remains.

Illuminations

The start of the different musical elements contained in these choir books are indicated by means of beautiful illuminations. They are the so-called miniatures or initials, which, accompanied by interesting elaborate decorative motifs, meticulously portray scenes from the Old or New Testaments, episodes from the lives of the Saints, or a wide variety of geometrical or vegetal motifs (Fig. 3).

In Western Europe it was the medieval artists, who, influenced by the canons laid down by the Catholic Church, ensured that both the books and their illuminations conformed to a particular artistic typology. Their characteristics, artistic techniques and the personality of each artist or regional school evolved in accordance with the tastes and preferences of the different artistic styles. The importance of these books was such that they occupied a greater part of the time in the daily life of the monks and nuns in the monasteries and convents. Later it gave rise to a flourishing industry of binder-scribes who created these books outside the religious institutions. They were also used for the catholic education of those who, unable to understand the texts, could identify the images of the life of Christ, the Virgin, or the Saints.

They were also instruments in the transmission of graphic models which inspired sculptures, paintings or stained glass windows. At the same time they

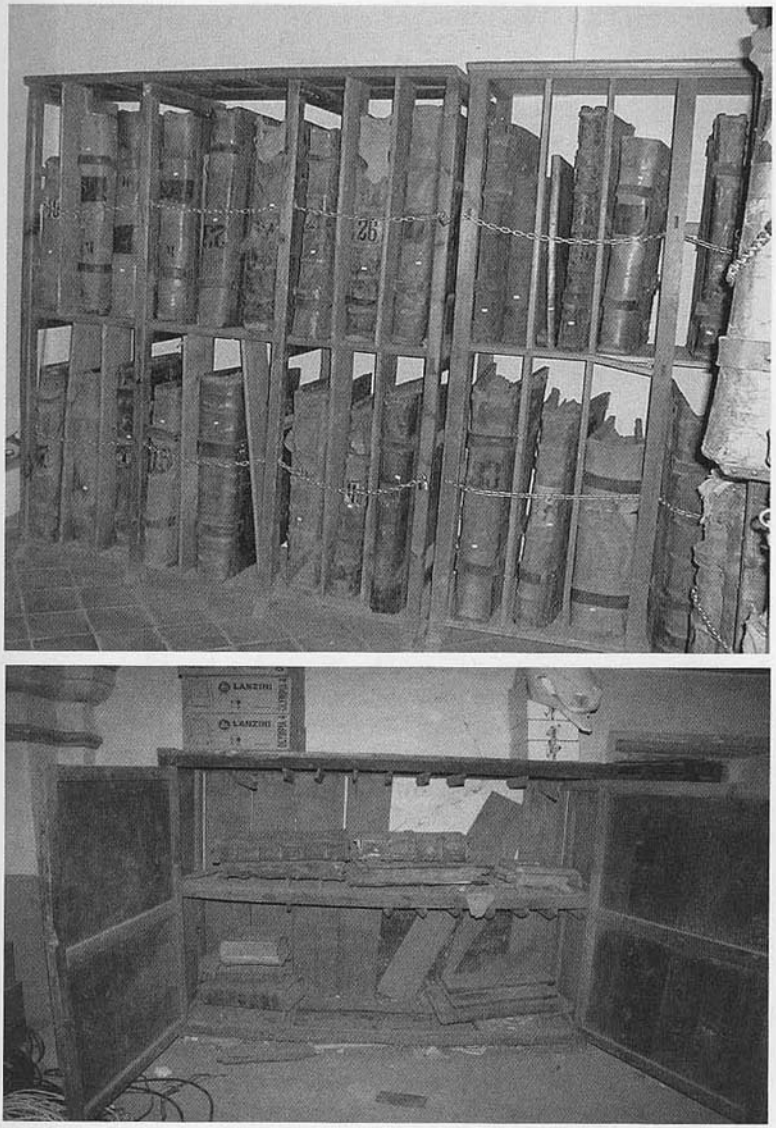

Fig. 1: Shelves of the choir books collection in Sacromonte Abbey and bookcase in a very poor condition in a Spanish Catholics Church (Granada, Spain, 2005).

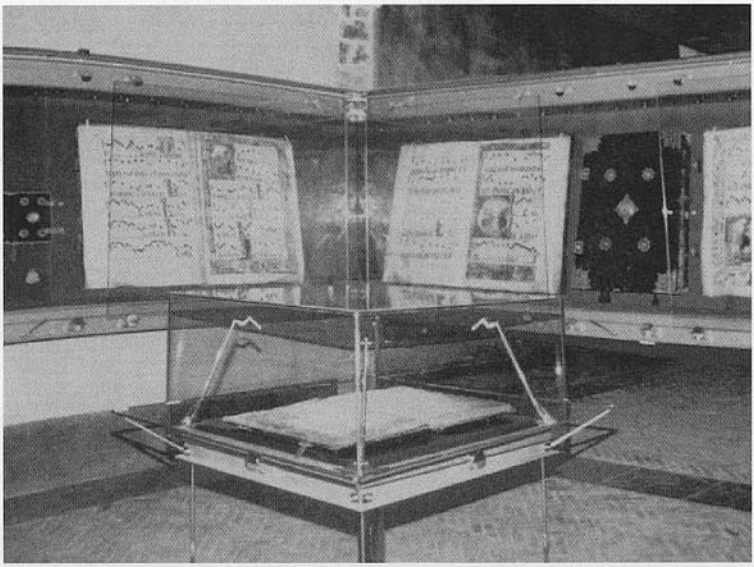

Fig. 2.: Monastery of Guadalupe Choir Books Museum (after the conditioning).

played a determining role not only establishing the bases of different artistic movements but also in the evolution of the arts in general.

The state of conservation of the illustrated manuscripts

In Spain the choir books corresponding to the period that extends from the sixteenth to the nineteenth centuries fell into neglect since the moment they stopped being used habitually in the Spanish catholic rites and institutions. There are some individual studies on their music or text, but no generalised up-to-date studies exist. This is particularly true for studies of the techniques or materials of choir books, the characteristics of which have, in general, been forgotten. The lack of interest which they foster may furthermore be motivated by the sustained thesis of artistic and stylistic decadence which supposedly occurred in the elaboration of illuminated manuscript works in Spain, especially after the invention of the printing press.

Thus, we find comments such as this by Guichot y Sierra: *"The first third of the seventeenth century sees the continuation of the flourishing of the miniature (...). But this century, with its grand masters, was the high-point of classical Painting and saw the beginnings of decadence in the illumination of parchments, and the number of miniaturists in Seville, as in the rest of Spain, started to decline"*[4]. This is a point of view with which we cannot agree, even if it is supported by writers such as José Gestoso, Passavant or Claudio Boutelou in the few studies of choir books undertaken at the end of the nineteenth century.

THE CHOIR BOOKS STUDIED

The seventeenth to nineteenth-collection of choir books in Sacromonte Abbey in Granada, Spain, is a good example of what we have just mentioned. Stored in an archive, remaining unused since the middle of the last century, they are, fortunately, at present in good environmental storage conditions. Nonetheless they show great material deterioration from centuries of use and adverse conditions or situations including vandalism, exposure to damp or inappropriate temperatures, centuries of dirt and attack by micro-organisms, insects and rodents. Nothing was known about them, neither their contents, nor their authors, nor their condition, nor even how many of them existed.

Nevertheless, they have some special characteristics. There are in total 91 books; some are complete, others have suffered losses. Altogether more than a thousand sheets of parchment remain. The complete books weigh between 15 and 40 kg; the sheets measure around 600 x 800 mm. The sheets of the older books and those of the best artistic quality are made of parchment, some from the twentieth century are made of paper. Some of the books contain illuminations, of the highest artistic quality. The covers are made of 2 cm thick wood, assembled and bound in leather with metallic decorated clasps and with straps to hold them shut.

The oldest, originating from the beginning of the seventeenth century, are those which have the best execution and are of the highest artistic quality. We have studied 45 to date, up to the nineteenth century: those which are made of parchment pages and are illuminated in colour. The study has been complicated by the lack of conclusive historical data in the archives. The fact is that they have been vandalised, repaired with material from other books or re-bound. Some were brought to Sacromonte Abbey from other places: convents and monasteries which where closed or which donated or sold their choir books. As choir books are generally not signed, the iconographic-stylistic study of the miniatures and texts and the scientific analysis of their materials is the only way of characterising, authenticating and attributing them to certain authors.

Fig. 3.: Miniature of the choir book N 379.

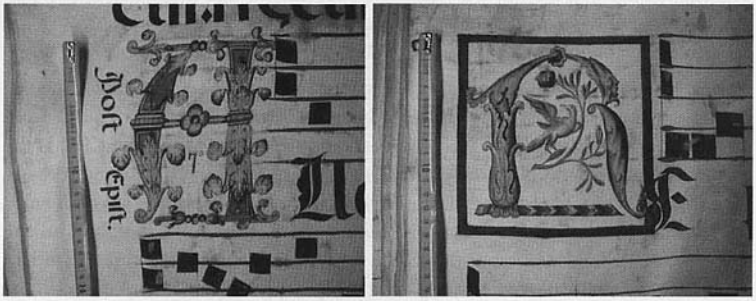

Fig. 4.: Miniatures of the choir books N 305 (Julianus Ferrer, 1663) & 317 (anonymous, seventeenth century

Fig. 5: Deteriorated choir books, N 305, 329 & 370.

Table 1: Colours mentioned by Francisco Pacheco.

Colours mentioned by Francisco Pacheco	English equivalent
albayalde de Venecia	white lead from Venice
bermellón famoso	famous vermilion
genulí (oropimente) alegre	fair ??? (orpiment)
azarcón (minio) en grano	red lead (minium) in grains
azules de cenizas finas y delgadas	blues from fine and thin ashes
fina encorca	fine ???
verdes montaña y terra sutiles	subtle mountain and earth greens
buenos ocres	good ochres
sombra de Italia	shade of Italy
negro carbón	black coal
almagra de Levante	red ochre from Levante
lindo granillo (una leguminosa) para ayudar a los verdes	"lindo granillo" (a leguminous plant) to help the greens
añil	indigo
orchilla (líquenes marinos con los que se prepara el tornasol para oscurecer los azules)	purple (marine lichen used for preparing litmus to make the blues darker)
carmín de Florencia	carmine Florence
la mescla de la goma con (carmín de Florencia) será flaca y en el azul algo más fuerte	mixing gum with (the carmine) will make it thinner and the blues a little bit stronger

THE COLOURS OF THE ILLUMINATIONS

Through bibliographic compilation and the study of ancient recipe books, we already know the colours that were used in the elaboration of miniatures in Spain. Thus, documents worth consulting, because they antedate the processes used, are for example: the Leiden and the Stockholm papyrus (third century), the Lucca manuscript: *Compositiones ad tingenda musiva* (probably eighth century), *De coloribus et artibus Romanorum* by Heraclius (tenth century and compiled in the fifteenth century), the oldest original manuscript which has been preserved in relation to these themes: *Mappae clavicula* (copied in the tenth/eleventh century from older manuscripts), the *Schedula diversarum artium* by the monk Theophilus (eleventh century), the work probably written by a Napolitan miniaturist monk: *De arte illuminandi* (fourteenth/fifteenth century), the well-known *Book of art* by Cennino Cennini (end of thefourteenth century), the anonymous Bolognese manuscript *Secreti per colori*, (fifteenth century), the *Liber de coloribus illuminatorum siue pictorum* (1400) or those listed by D'Ancona and Schlimann[5], Laurie[6], Philips[7], or Clarke[8].

The best quality works of the Sacromonte Abbey choir books were executed during the period when Francisco Pacheco (1564–1644) produced his outstanding

work: *El arte de la pintura*, which lists the colours that were used in illuminations in Spain between the end of the sixteenth and the middle of the seventeenth centuries[9] (cf. Table 1). Also worthy of study is the *Reglamento de la escribanía y pergaminería del obrador del Monasterio de Guadalupe* of 1499[10].

ANALYTICAL TECHNIQUES APPLIED TO THE STUDY OF PIGMENMTS

Sampling: The study was carried out on 218 samples corresponding to different colours of the illuminated manuscripts and red and black inks; the most interesting are those from the seventeenth century. All the samples came from very small detached fragments of the books, because sampling of the books themselves was not authorised. The samples were taken from the edges of pages or from lacunas, from folds in the parchment and from secondary decorative elements (loose leaves or off-set colour particles), but never from important areas such as those depicting human flesh or those crucial to the pictorial design.

From each miniature selected, between three and nine samples of the most representative colours were obtained: red, vermilion, light and dark blue, ochre, green, yellow and brown and sometimes from the metals (gold and silver) and the inks (black and red).

For the colour analyses the samples obtained from the illuminations, decorations and texts were categorised into eight groups according to their colour[11]: reds, vermilions, whites, blues, greens, blacks, yellows and ochres. Until now neither the yellow nor the ochres have been studied, as their use is rare and must be considered as being unrepresentative.

The following techniques were applied: organoleptic analysis (visual-tactile), photography, macro-photography carried out by means of simple methods (traditional and digital cameras). The results obtained by means of ultraviolet light, infrared and X-ray photography are not included in this document.

X-ray analysis: Conventional powder diffractometers present problems in studying extremely low quantities of a powdered sample spread on a substrate, as frequently happens when studying samples coming from works of art. This is a similar situation to studying thin films in materials science, because the penetration of X-rays into the sample generally exceeds the thickness of the film, and as the layer thickness is significantly less than the X-ray penetration depth (which is related to the absorption of the sample and the incidence angle), an unfavourable signal to backpowdered ratio is obtained.

Grazing incidence X-ray Diffraction is a very powerful tool in the phase identification of thin polycrystalline films. We think that this kind of attachment could be used in the study of minute quantities of sample. A powder diffractometer can

be converted to a grazing incidence angle diffractometer by mounting long Soller slits with their plates perpendicular to the diffractometer plane and a LiF 100 monochromator to improve the signal to backpowdered ratio and the sharpness of the peaks. The measurements are carried out scanning the detector while the X-ray beam strikes the sample at a small ($\theta<5^{\circ}$) fixed glancing angle. In our case, we deposited the samples with a pipette on a glass slide, after grinding them in a small agate mortar and pestle with a few drops of ethanol. X-ray diffractometry was carried out using a Siemens D5000 X-ray diffractometer equipped with a thin film attachment, operated at 40Kv and 36mA. The radiation used was CuKα. After the diffractometric study, the samples were used for the infrared study.

Infrared ray analysis methodology: Fourier transform infrared spectroscopy (FTIR) was carried out in a Nicolet (Nic-Plan) FT-IR microscope. A few micrograms of sample were deposited on glass slides and measured in reflection mode. After the measurements, the samples were prepared in KBr pellets and measured in transmission mode.

Scanning Electron Microscopy (SEM) methodology: a Jeol JSM 5490 scanning electron microscope was used, equipped with a Link-ISIS Si/Li detector Energy Dispersive X-ray analyzer (EDX). The samples were prepared using a thin conducting film of gold. When the presence of gold was investigated, the samples were prepared using carbon as a conducting element. The samples were photographed and studied by optic microscopy (Nikon Type 115).

RESULTS AND DISCUSSION

It was found that the palette was usually made up of a rather narrow and standardised number of colours. The mixture of colours is unusual.

Red colours

Table 2, and Figs 6, 7 and 8 as examples for the radio-chemical analysis diagrams, show the chemical composition of the red colour samples.

- Chemical analysis by Energy Dispersive X-ray analysis (EDX) showed the presence of sulphur and mercury. By means of an X-ray Diffraction analysis carried out with the grazing technique, it was confirmed that we are dealing with cinnabar.
- The red samples from the illuminations were different from the colour used in the inks because basic lead carbonate was not detected in the latter. Chemi-

Table 2: Analysis of the red colours.

Main elements	Book number					
	303	312	313	316	321	324
Al			x		x	
C	x		x	x	x	x
Ca	x		x		x	x
Cu					x	
Hg	x	x	x	x	x	x
Pb	x			x	x	
S	x	x	x	x	x	x
Si			x		x	
Other components	1, 3	3	1, 2		1, 2	
Pigment			...4 ...			

1 white lead: hydrocerussite $Pb_3(CO_3)_2(OH)_2$

2 gypsum: calcium sulphate dihydrate ($CaSO_4.2H_2O$)

3 calcite: calcium carbonate ($Ca\ CO_3$)

4 cinnabar: mercury sulfide (HgS)

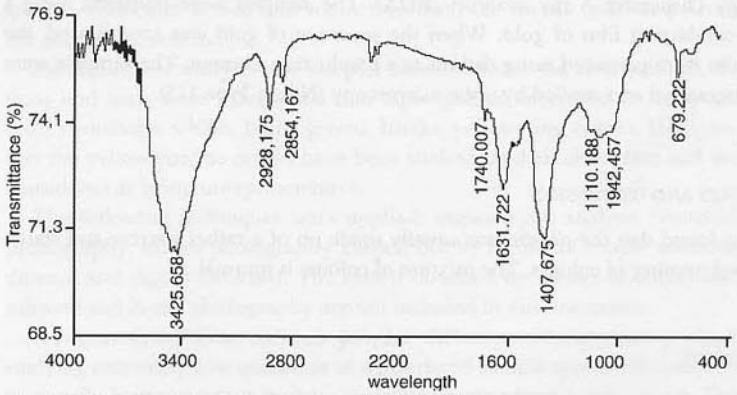

Fig. 6: Infrared spectrum graphic example (book 303).

cal analysis by EDX showed the presence of lead. Infrared spectra showed the presence of carbonates. Grazing Angle X-ray Diffraction confirm that the carbonate was white lead.

- In some samples very minute quantities of sulphates and silicates were detected.

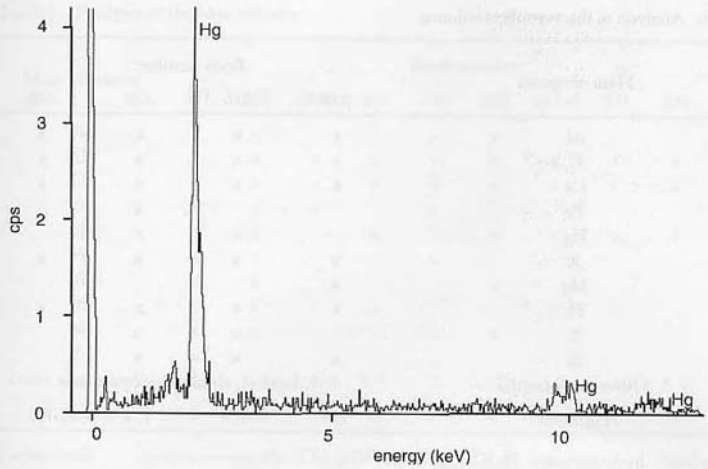

Fig. 7: Energy dispersive X-ray spectrum example (book 303).

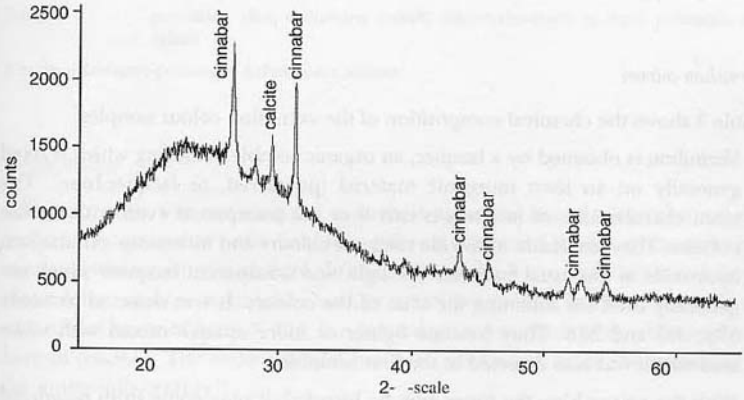

Fig. 8: Grazing angle X-ray diffraction spectrum examples (books 312).

- In all the samples, a great quantity of organic components appeared; originating from the adhesive used and from the products absorbed from the support during the application.

Table 3: Analysis of the vermilion colours.

Main elements	Book number			
	303	316	326	328
Al	x	x	x	x
C	x	x	x	x
Ca	x	x	x	x
Fe			x	
Hg		x	x	
K	x	x	x	x
Mg	x			
Pb	x	x	x	x
S		x	x	
Si	x	x	x	
Other components	1; lacquer, aluminium hydroxide			
Pigments	1, 5	1, 4	1, 4	1, 5

1 white lead: hydrocerussite $Pb_3(CO_3)_2(OH)_2$

4 cinnabar: mercury sulphide (HgS)

5 red vegetal pigment

Vermilion colours

Table 3 shows the chemical composition of the vermilion colour samples.

- Vermilion is obtained by a lacquer, an organic soluble colouring which is fixed generally on an inert inorganic material (powdered, or lacquer-base). The main characteristic of lacquers is that they are transparent even with intense colours. They are made in a wide range of colours and intensities. Aluminium hydroxide is the usual basis for the light and transparent lacquers which are generally used for softening the tone of the colours. It was detected in books 303, 316 and 328. They become lighter or more opaque mixed with white lead which was also detected in the four samples.
- With the colour blue the tones may be blended; it may come from powdered smalt, as silicon and potassium appear, but cobalt was not detected.
- In the case of the colour in books 316 and 326, the pigment used was cinnabar.
- The red pigment in the other cases may be of organic origin and so undetectable by the applied analyses.
- As we have noted, one of the characteristics of lacquers is their shorter lifespan and their tendency to discolour when exposed to inorganic pigments.

Table 4: Analysis of the blue colours.

Main elements	Book number									
	301	305	309	312	315	322	323.al	335	336	369
Al		x			x	x				
C	x	x	x	x	x	x	x	x	x	x
Ca	x	x	x	x	x	x	x	x	x	x
Co	x	x	x		x					
Cu		x		x		x	x	x	x	x
Fe	x	x			x					
K	x	x				x				
Pb	x	x	x	x			x	x		x
Si	x	x			x	x				
Zn	x									
Other components	3	1, 3	1, 3, 6	3, 6	3	3, 6, 8	3, 6	1, 3, 6	3, 6	1, 3, 6
Pigments	7	6, 7	6	6	7	6	6	6	6	6

1 white lead: hydrocerussite $Pb_3(CO_3)_2(OH)_2$

3 calcite: calcium carbonate ($CaCO_3$)

6 azurite: basic copper carbonate ($Cu_3(CO_3)_2(OH)_2$)

7 smalt: potassium glass containing cobalt; silicon-aluminate of iron, potassium and cobalt

8 mica or feldspar: potassium Aaluminium silicate

White colours

Although white was not analysed as such, it appeared mixed with other colours (reds, blues, greens) in order to obtain different tones and shades, it was therefore analysed when part of a mixture. In the cases where it was detected it was found that calcium carbonate, or white lead, or a mixture of both had been used. In the case of the cover of book N 321, the painted pink was made with white lead and barium ($BaSO_4$). The latter pigment has been used since about the beginning of the nineteenth century[12]

Blue colours

Table 4 shows the chemical composition of the blue colour samples.

- The pigments used were: powdered smalt (potassium glass containing cobalt) in book 301, and/or copper in the form of azurite, basic copper carbonate ($Cu_3(CO_3)_2(OH)_2$) in the others. Sometimes the two substances appeared sepa-

rately and sometimes mixed (books 305 and 312). The use of smalt might have produced some variations in colour. Matteini[13] mentions that the colour can be affect by the organic adhesives turning to a dark brown colour.

- In the case of the sky blue colour in the sample of book N 336, calcium carbonate was used as a white pigment, a whitener to which basic lead carbonate was also added in the case of the sample from book N 335. In the rest of the samples, the calcium carbonate definitely came from that used in the manufacture of the parchment and absorbed by the layer of colour during the drying process.
- Mica (potassium aluminium silicate) presence, deduced by X-ray Diffraction, was usually used to obtain metallic or shiny effects. It was only detected in the sample from book N 322.
- The presence of basic lead carbonate, or white lead ($Pb_3(CO_3)_2(OH)_2$), might be due to the preparation of the parchment.
- In all the samples a great number of organic components appeared (deduced by infrared spectra) which came from the adhesive used.

Green colours

Table 5 shows the chemical composition of the green colour samples.

- Two different pigments were used: both forms of basic copper carbonate: azurite and malachite and silicon aluminate of iron, magnesium and potassium (green earth in book N 308). Basic copper chloride or atacamite presence, because of its instability, is due a chemical alteration.
- The blue tone of the azurite implies the use of yellow to obtain the green tone. In the case of the choir book 312, orpiment was added.
- Green earth was usually used in Renaissance painting to give the first tones to the depiction of human flesh and to give them a more natural colouring[14].
- The presence of Cu^{2+}, (when using copper components for green as well as blue), facilitate the reaction of the polysaccharides and monosaccharides that exist in vegetal resins, which on occasions are used as adhesives (like plum, cherry, or apricot gum), or in honey (which is added as a plasticizer to gum Arabic or egg). The reaction causes the decomposition of the sugars into simple organic acids (oxalic, acetic, lactic or formic, among others) which leads to the destruction of the parchment; a sufficient quantity is necessary as well as a high relative humidity (close to 100%) and high temperatures (over 40°C), conditions which could at times have occurred with our books[15].

Table 5: Analysis of the green colours.

Main elements	Book number			
	308	312	316	335
Al	x			x
As		x		
C	x	x	x	x
Ca	x	x	x	x
Cl	x			
Cu	x	x	x	x
Fe	x		x	
Hg	x			
K	x		x	x?
Mg	x			
S	x	x	x	x
Sn	x			
Si	x			
Other components	3, 10; nodules containing aluminium-magnesium-silicon, potassium and ferric components	2, 3, 6, 11	3, 9; white lead, small nodules containing Fe, K and S	6
Pigments	10	6	8	6

1 white lead ($Pb_3(CO_3)_2(OH)_2$)
2 gypsum: dehydrated calcium sulphate ($CaSO_4.2H_2O$)
3 calcium carbonate ($CaCO_3$)
6 azurite: basic copper carbonate ($Cu_3(CO_3)_2(OH)_2$)
8 mica or feldspar: potassium aluminium silicate
9 malachite: basic copper carbonate ($Cu_3(CO_3)_2(OH)_2$)
10 atacamite: basic copper chloride
11 orpiment: arsenic sulphide

FINAL CONCLUSIONS

About the preparation of the support, we have been able to establish that:

- The presence of calcium carbonate or of lead carbonate in numerous samples was due to their being used in the manufacture of the parchment, absorbed during the drying of the colour, or scraped off during the sampling.
- The aluminium and the potassium detected might come from alum (potassium aluminium sulphate, $K_8SO_4.Al(SO_4)_3 \cdot 24H_2O$), a material employed in the preparation of the parchment. Another possible origin of the potassium could

be the pumice stone used in some cases to smooth and polish the surface of the parchment during its manufacture or prior to it being used.

With reference to the colours, they were obtained from the following components:

- Reds were obtained from cinnabar, mercuric sulphide.
- Although in the elaboration of illuminations and miniatures, lacquers are not usually used because of their greater transparency and instability (they fade easily), in our samples we detected that the colour vermilion was in fact obtained with a lacquer. Aluminium hydroxide, the usual base for light lacquers was used. It is colourless and was detected in books N 303, 316 and 328. It becomes lighter or more opaque mixed with white lead, which was also detected. The reddish tone was obtained with organic materials which we have not been able to identify and the bluish tone may come from smalt; though cobalt was not detected.
- For whites, calcium carbonate as well as white lead, or a mixture of both, were used.
- For blues the pigment used was smalt or copper in the form of azurite (basic copper carbonate). At times, each of the two substances appeared separately and at others the two were mixed (books 305 y 312). Potassium aluminium silicate, which could be used to obtain metallic or shiny effects, was detected in the sample from book 322.
- Greens were obtained from two different pigments: both forms of basic copper carbonate: azurite and malachite, and silicon aluminate of iron magnesium and potassium (green earth in book N 308). Basic copper chloride or atacamite presence, because of its instability, was due a chemical alteration. The blue tone of the azurite implied the use of yellow to obtain the green tone; in the case of the choir book 312 orpiment was added. The difference between azurite and malachite depended on the quantity of admixed water. The presence of ions of Cu^{2+}, when copper components were used in both greens and blues, facilitated the reaction of the poly- and monosaccharides in vegetal resins, which on occasions were used as adhesives (like plum, cherry, or apricot gum), or in honey, which was added as a plasticizer to gum Arabic or to egg. The reaction caused the decomposition of the sugars into simple organic acids (oxalic, acetic, lactic or formic among others) which led to the destruction of the parchment. For this to happen, there must be a sufficient quantity of the product, a high relative humidity (close to 100%), and high temperatures (more than 40°C), conditions which may at times have occurred in the case of our books.

- Because of the great quantity of carbon that was detected, black must have been obtained from coal dust, soot, lampblack, or "smokeblack": the black from a flame. The phosphorus detected in the sample from book N 303 tells us that we are dealing with black obtained from the burning of bones. One of the most important characteristics of these pigments is their great stability in the face of acids and bases, which do not fade from the effect of light and other whitening agents and are resistant to biological attack.
- Finally, in all the samples a great quantity of organic components were detected. These may have derived from the adhesive used and from the products absorbed from the support during the application of the ink and its drying method, or it might have been added inadvertently during the sampling.

SUMMARIES

Colour in the Seventeenth-Century Miniatures of Spanish Choir Books

Choir books, which have been essential instruments for the Catholic festive mass up to the nineteenth century, are highly endangered by loss and damage, because of their large size and also because they are – wrongly – often estimated as being of low artistic value. There are two places where they are collected and preserved, i.e. the choir book museum in Cáceres (Southern Spain) and in the Escorial.

The aim of the study presented was to analyse the colours used for making choir books. Pigments to be expected were compiled from medieval recipes, and then those colours that could be separated from fragments and off-set from choir books of the seventeenth were submitted to several radio-chemical analyses. The results are presented in secveral groups: red, vermilion, white, blue, green and black, and their chemical composition is discussed.

Les couleurs dans les bréviaires espagnols du 17 siècle

Les bréviaires enrichis de miniatures ont été en usage jusqu'à la fin du 19e siècle pour la célébration liturgique de l'église catholique, ils sont menacés de détérioration à cause de leur taille et aussi à cause de leur valeur artistique à tort souvent sous-estimée. Il existe deux musées où ces bréviaires sont rasssemblées et préservés, il s'agit du Musée du Bréviaire de Cáceres (dans le Sud de l'Espagne) et de celui de l'Estorial.

L'objectif de l'étude présenté ici consistait à analyser les couleurs utilisées dans la fabrication de bréviaires. On a rassemblé des données extraites d'un ouvrage datant du Moyen-Âge afin de répertorier les substances utilisées, ensuite on a effectué des prélèvements de fragments de bréviaires du 17e siècles, ces fragments ont été obtenus notamment par une technique de frottage et ont été soumis à divers examens radiologiques. Les résultats sont présentés en six groupes : le Rouge, le Vermillon, le Blanc, le Bleu, le Vert et le Noir dont les composant chimiques font l'objet de discussions.

Farben in spanischen Chorbüchern des 17. Jahrhunderts

Chorbücher, bis ins 19. Jh. hinein ein wesentliches Instrument des katholischen Festgottesdienstes, sind wegen ihrer Größe und auch wegen ihres vielfach zu Unrecht als gering eingeschätzten künstlerischen Wertes weithin von Verfall bedroht. Sammel- und Pflegestätten sind die Chorbuchmuseen in Cáceres (Südspanien) und im Escorial.

Ziel der hier vorgelegten Untersuchung war die Analyse der zu ihrer Herstellung verwendeten Farben. Aus mittelalterlichen und frühneuzeitlichen Rezeptbüchern wurde zunächst zusammengestellt, welche einschlägigen Substanzen zu erwarten sind, und dann wurden diejenigen, die sich aus Abreibungen und Fragmenten von Chorbüchern aus dem 17. Jh. gewinnen ließen, verschiedenen strahlungschemischen Analysen unterworfen. Sie werden in der Gruppierung nach Rot, Zinnober, Weiß, Blau, Grün und Schwarz vorgestellt und in ihrer chemischen Zusammensetzung diskutiert.

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