POLYCHROME SCULPTURE:

TOOL MARKS, CONSTRUCTION TECHNIQUES, DECORATIVE PRACTICE AND ARTISTIC TRADITION

Edited by Kate Seymour

ICOM
INTERNATIONAL COUNCIL OF MUSEUMS
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ICOM-CC

POLYCHROME SCULPTURE: TOOL MARKS, CONSTRUCTION TECHNIQUES, DECORATIVE PRACTICE AND ARTISTIC TRADITION

Papers and Posters

Proceedings of three Interim Meetings of ICOM-CC Working Group Sculpture, Polychromy, and Architectural Decoration

Maastricht, October 2010 ~ Hosted by SRAL, Maastricht
Glasgow, April 2012 ~ Hosted by Glasgow Life, Glasgow
Tomar, May 2013 ~ Hosted by Instituto Politécnico de Tomar, Tomar

Kate Seymour
(Editor)

Front Cover Photograph: Niklaus Weckmann, workshop (active in Ulm) St. George ca. 1510, limewood (tilia sp.), Suermondt-Ludwig-Museum, Aachen

Proceedings of three Interim Meetings of ICOM-CC Working Group Sculpture, Polychromy, and Architectural Decoration

Polychrome Sculpture: Tool Marks and Construction Techniques (Maastricht, 2010)

Polychrome Sculpture: Artistic Tradition and Construction Techniques (Glasgow, 2012)

Polychrome Sculpture: Decorative Practice and Artistic Tradition (Tomar, 2013)

Selection of papers:

Kate Seymour: Coordinator ICOM-CC Working Group Sculpture, Polychromy, and Architectural Decoration (Maastricht, October 2010; Glasgow, April 2012; Tomar, May 2013)

Arnold Truyen: Assistant Coordinator ICOM-CC Working Group Sculpture, Polychromy, and Architectural Decoration (Maastricht, October 2010; Glasgow, April 2012)

Stephanie de Roermer: GlasgowLife, Burrell Collection, Glasgow, UK (Glasgow, 2012)

Ana Bidarra: Assistant Coordinator ICOM-CC Working Group Sculpture, Polychromy, and Architectural Decoration (Tomar, May 2013)

Conference Organisation:

Maastricht 2010:
Kate Seymour & Arnold Truyen
Assisted by: Siska Losse and Andrea Retrae

Glasgow 2012:
Kate Seymour & Stephanie de Roermer
Assisted by: Muriel King and Angel Puck

Tomar 2013:
Kate Seymour & Ana Bidarra
Assisted by: Merel Lantman, Claudia Falcao, João Coroado, Agnès Le Gac, Ricardo Triães, and Antonio Joao Cruz.

Conference Hosts:

Maastricht 2010:
Stichting Restauratie Atelier Limburg, Maastricht, The Netherlands

Glasgow 2012:
Burrell Collection, Glasgow Museums / Glasgow Life, Glasgow, UK

Tomar 2013:
Instituto Politécnico de Tomar, Tomar, Portugal

Editor of the Proceedings:

Kate Seymour: Coordinator ICOM-CC Working Group Sculpture, Polychromy, and Architectural Decoration
With the help of Assistant Coordinators Clare Heard and Ana Bidarra

Preface

'Polychrome Sculpture: Tool Marks and Construction Techniques' was the first of three Interim Meetings organised by the ICOM-CC Working Group Sculpture, Polychromy, and Architectural Decoration during the period 2010-2013 which focused on construction processes and decorative practice for polychrome sculptures. Papers given at the 2010 meeting covered the study of tool marks found on sculptures that relate to the construction process, whether these be related to the tools used to carve or mould the support or the periphery aids used by artisan carvers in their working practice, such as work benches or clamps. Registering, documenting and investigating the evidence of the working process can give insight into studio practice and if a large enough body of evidence is collected, may even provide tentative attribution to a specific studio or workshop. The meeting was hosted by the Stichting Restauratie Atelier Limburg (SRAL), in Maastricht and was attended by around 60 international specialists in the field of polychrome sculpture. Volume I of this compendium includes six of the nine papers and four of the five posters presented at the meeting.

The second meeting 'Polychrome Sculpture: Artistic Tradition and Construction Techniques' followed on in the theme outlined in 2010. This meeting was hosted at the Burrell Collection by Glasgow Life Museums, in Glasgow, UK in 2012. The two day symposium focused on artistic traditions within the field of polychrome sculpture. Papers were selected to follow on from themes touched upon in the preceding meeting in Maastricht, focusing on how artistic traditions influenced construction processes. Artistic practice from the Netherlands to Portugal, from the medieval to more modern times was outlined and links between different countries were emphasised. Seventeen papers and seven posters were presented during the meeting, of which twelve papers and six are published in Volume II of this compendium.

The third interim meeting Polychrome Sculpture: Decorative Practice and Artistic Tradition reviewed how decorative practice was linked to artistic tradition. Here seventeen papers and seventeen posters were presented, the majority of which are published in Volume III of this compendium. These focused on the surface effects created by artisans working on polychrome sculpture. Several decorative techniques have been addressed: painting techniques from different regions and epochs, gilding, estofado, use of incised and punched patterns, varnishes, lacquers, applications, and conservation methodology used to deal with challenging problems. Presentations showed that local practitioners are influenced by international taste and developments. The meeting was hosted and jointly organised by the Instituto Politecnico de Tomar (IPT) in Tomar Portugal.

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Papers

Conservation study of materials and construction techniques of Medieval and Renaissance sculpture as a strategy for the Burrell sculpture collection re-display.

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Abstract

The re-display of the Burrell collection to be completed in 2019 provides an opportunity for conservation investigation and research into materials and construction techniques to inform interpretation of the Medieval and Renaissance sculpture collection which to date is largely unknown. Conservation investigation into materials and construction techniques of sculpture practices in the 13th to 16th century will aid art historical research towards identification of the origins of individual sculptures and inform recommendations and required resources for conservation treatments and the future care of the collection. Highlighting the diverse materials and technical aspects of the practice of sculpture of past times - the renewed display aims to offer a different approach and learning experience in contrast to the existing presentation of the Medieval and Renaissance sculpture on primarily aesthetic values. Informing the viewer about traditional working practices and providing an insight into artistic traditions from the past will also enable comparison with sculpture practices in a contemporary context.

Keywords: Interpretation; conservation; investigation; materials; construction techniques; aesthetic entity; historic document.

The Burrell sculpture collection

The Medieval and Renaissance European sculpture collection, around 400 pieces, forms part of the Burrell collection, gifted to the City of Glasgow by Sir William Burrell in 1944. The majority of this collection dates from the 12th century to the 16th century, and includes pieces fabricated from various media - predominantly stone and wood for larger scale items, ivory and enamelled bronze for those of smaller scale. The origin of individual works ranges from Scandinavia to the Mediterranean, with the majority attributed to France, Germany and England. [Collins, 2007] More specifically the sculpture collection comprises of 36 examples of polychrome stone, 115 polychrome wooden sculptures and 50 polychrome alabasters associated with a 15th century workshop in Nottingham, made for export to the Continent. Within this comprehensive group of sculptures originating from one workshop, there are significant individual pieces, such as examples of the *Head of St John the Baptist*, which have remained in their original polychrome wooden case (Figure 1).

Current display of sculpture in the Burrell collection

About two thirds of the polychrome wooden sculpture and less than half of the polychrome stone sculpture collection are currently on display (Figure 2). Display presentation ranges from individual sculptures inside display cases, at height in architectural settings, and as part of the three re-created so called Hutton rooms (Figures 2 and 3). The display settings for many sculptures, particularly the examples mounted at height and in the Hutton rooms do not allow for close investigation which on the other hand assures their secure display and protection from physical damage through touch and photo-chemical ageing of the polychrome surface decorations through light exposure. The criteria for selection of displayed sculpture appear to have been determined primarily on their aesthetic qualities and value as a Fine art object. All

sculptures, apart from a few exceptions, on display have been rated an 'A' category by external art experts and art dealers in the past. There is not much documentation available relating to conservation investigation into their authenticity or quality in regards to working skills, materials or relevance of iconography and subject matter (Figures 2, 7 and 8). Of the alabaster collection only one third is on display. An exhibition of these works as a collection in its own right has always been intended but the required research and conservation involvement were not available.

Access to the on-site stores is restricted to curatorial, conservation and technical staff, which denies access and awareness of the collection to a wider audience (Figures 4 and 5). Overall the sculpture collection is largely unknown, either nationally and internationally, as a comprehensive collection of Medieval and Renaissance art, and in regards to more detailed information relating to material based groups; such as wood, stone and alabaster three dimensional supports.

Figure 1. Head of St. John, the Baptist (1.33), alabaster and polychrome wooden case. ©GlasgowLife.

Conservation background

For examples on display, basic conservation investigation into surface decoration of polychrome wood sculpture has been carried out through microscopic analysis of cross sections, which informed conservation treatment for display purposes. Additionally for most sculptures x-radiography and photography were obtained for assessment of construction and hard copy images and slides are available for study in the relevant object files.

The stone sculpture and architectural component collectionolum received focused conservation attention in the late 1980's under the care of the then stone conservator and relating object files contain a wealth of information from scientific investigation, recorded observations of condition, treatment proposals and practices which was also informed by important ethical issues relating to appropriate display and installation processes.

Today, the overall collection of Glasgow Museums contains over one million objects, broadly divided into collections of paintings, archaeology, ethnography, works on paper, textiles, stained glass, social history, furniture, natural history, transport and technology, modern and contemporary art and sculpture, displayed and stored over seven museums and galleries and two storage facilities across the city of Glasgow.

With approximately 1500 examples comprising the overall collection of sculpture alone, the Medieval and Renaissance sculpture of the Burrell collection is a relatively small part alongside collections of sculpture from past and contemporary world cultures, 19th and 20th century Europe, including public and architectural sculpture, and Modern and Contemporary Art. Within this context the desirable resources to meet the conservation demand for the Burrell sculpture collection were not a priority over the last 25 years and then prepared summaries of treatment requirements and priorities were not possible to follow up and have become somewhat out of date and context.

There is no doubt that the Medieval and Renaissance polychrome sculpture collection deserves the much needed attention not only to secure its safe keeping and preservation but also to make it accessible for study as a significant reference collection for external conservators, restorers and art historians alike (Figures 1, 2, 4, 5, 7 and 8).

Figure 2. Display presentation of sculpture in the Burrell collection. ©GlasgowLife.

Figure 3. Hutton hall. ©GlasgowLife.

Sculpture: a definition

A conservation condition survey of the overall sculpture collection of Glasgow Museums, carried out in 2007-2008 also highlighted the need for a definition of sculpture as opposed to three-dimensional decorative elements.

Within the museum database all three-dimensional elements either carved from wood and stone are documented under the category 'sculpture'. On closer inspection for the condition survey it became clear that a substantial amount of wood and stone carvings may be more appropriately described as separated components of external and internal architectural decorations and furnishings rather than sculpture (Figure 5). These elements include corbels, reliefs, and shields from ceilings, panelling and furniture. Many of these are fine examples of craftsmanship and imaginative expression in stone or wood in their own right (Figure 6).

In some respect a carved decorative component integral to architecture or furniture has a primarily structural function. Its aesthetic is of somewhat secondary nature and becomes more meaningful when observed as a detail in the context of its setting in architectural or furnishing structures. The decorative component's aesthetic value is altered and somewhat diminished outside its original structural context. A sculpture on the other hand, is an aesthetic entity in its

own right, and despite being created with a specific architectural environment in mind it can be transferred without compromising its aesthetic value (Figures 7 and 8).

The different definitions for sculpture and decorative carved components become further emphasised in regards to investigation and interpretation of their construction techniques. While figurative or ornamental carvings may have been mainly executed by the stone mason or furniture maker as part of the process in working individual building blocks or preparing individual parts prior to assembling a piece of furniture they may be investigated within the practice of stone masonry, carvers or furniture makers (Figure 5). A sculpture is the product of multiple creative stages, selecting materials and required working skills for structure, shape and form, depth and texture and surface finish to communicate an aesthetic or artistic concept (Figures 7 and 8).

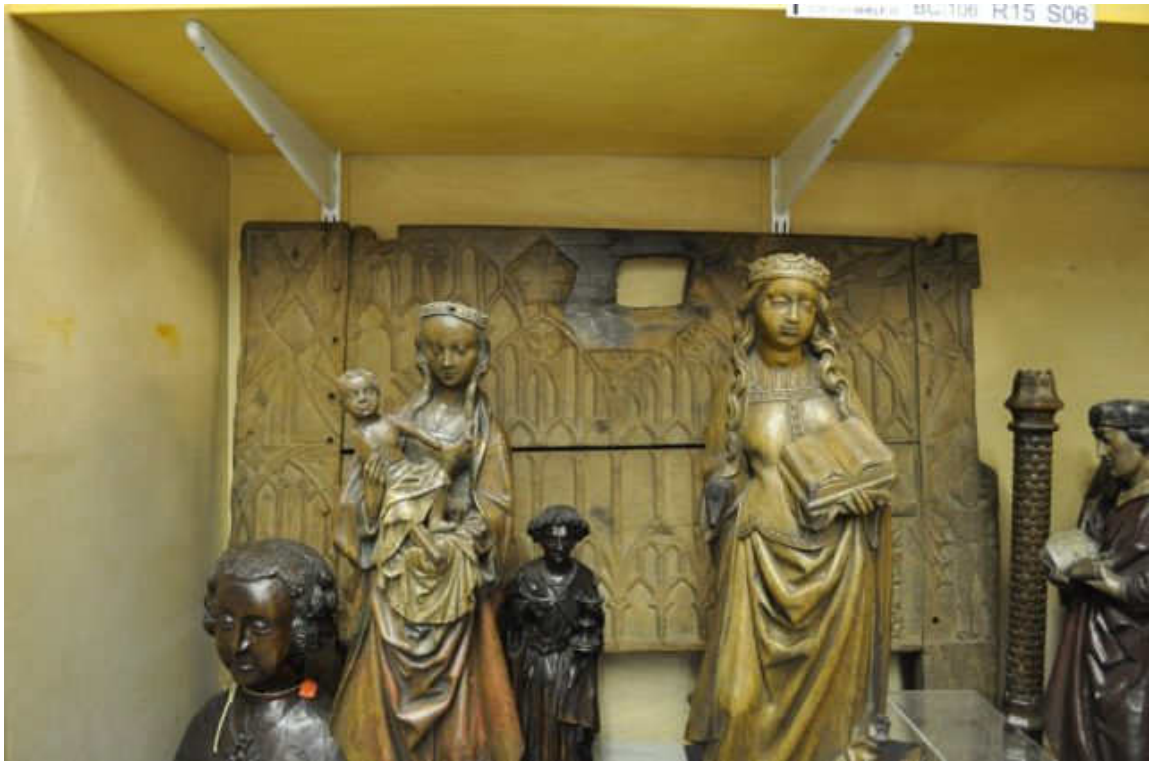

Figure 4. Storage of polychrome wooden sculpture in the on site store (Furniture store). ©GlasgowLife.

'Aesthetic entity' and 'historic document'

The theory of the object as 'aesthetic entity' and 'historic document' discussed in the publication 'Conservation skills, Judgement, Method and Decision Making' is a useful concept to the practicing conservator when faced with complex decision making processes regarding extent and approach of interventive conservation treatments and restoration. [Caple 2000] It provides an ethical framework that aids identification of often complex aesthetic and historic values contained in a single object to prevent the conservator from irreversibly removing evidence of one aspect in favour for the other.

Every object which is consciously made or selected by a human being contains shape, colour and texture which that individual has created or chosen from a range of possibilities. Objects of the past are preserved because of the information they contain and for what they represent. This can be translated into regarding objects as historical documents and aesthetic entities. [Caple 2000, 29] Every object is in part an aesthetic entity, an entity (a physical reality) which provides an

aesthetic experience for everyone who senses (sees, feels, touches, smells or hears) it. The aesthetic entity is that aspect of the object deliberately created by the artist or manufacturer in order to communicate with the user or viewer and as such can be considered the physical manifestation of the 'artist intent'. [Caple 2000, 29] Every object is in part a historic document. It contains information about the materials from which it was made the way in which it was assembled, and every incident which occurred in its life. As all objects contain aspects which are definable as being 'documents of the past' and aspects which are 'aesthetic' no object is totally devoid of either aspect and thus all objects lie between the two extremes. [Caple 2000, 29]

Figure 5. Stone capital with figurative carving. ©GlasgowLife.

Figure 6. Painted roundel in carved ivy-leaf frame with symbol of St John, England, 15th century. ©GlasgowLife.

As a historic document the conservator would seek to determine the materials of which the object is composed, the decay processes at work, the form and original nature of the object, its function, who had owned and used the object and what had happened to it through its life. The nature of the aesthetic entity will also need to be fully appreciated by the conservator so that the 'true nature' of the object can be seen and understood. It may be necessary to clean the object in order to reveal the aesthetic entity, which can then be experienced by present day and future viewers. In reality those objects with high levels of aesthetic entity such as works of art on canvas and paper, are often restored and used. Those objects with high value as historic documents such as historic monuments, to some extent social history and archaeological objects are preserved in their ruined or decayed state. [Caple 2000, 30]

Early collecting focused primarily on objects such as classical statues, which were sought for their aesthetic values. The financial value of objects continues to be primarily influenced by their aesthetic entity and how present day society values that aesthetic. Such financial value and appreciation of the aesthetic gives impetus to the process of conservation. Increase in financial value can also be related to the history of an object, which invariable has to do with its uniqueness, rather than the information it contains as a historical document. [Caple 2000, 30]

Sculpture as aesthetic entity and historic document

Applying these definitions to the conservation strategy for the Medieval and Renaissance sculpture collection, investigation into materials and construction techniques are vital tools to identify and characterise observed evidence for aspects as historic documents and aesthetic entities. This will inform interpretation of the sculpture's history and initial artistic intent (Figure 1).

Investigating medieval sculpture on these two aspects allows interpretation of the relationship between availability, value, knowledge and utilisation of materials to their associated cultural, socio-economic and political environment and how this determines the physical expression of the maker's intent. This approach focuses on the challenges dictated by circumstance and environment and the motivations and decision making processes of the maker for a specific work and allows for a basic understanding of a work from the past by the present day viewer. Additional insights into changing cultural, political and socio-economic values of a society can be explained on investigation of identified alterations, previous restoration and damage as part of the sculptures physical history. Their documentation and interpretation may reveal narratives of an important event or emphasize a specific aspect, which can make a sculpture of lesser aesthetic qualities invaluable as a historic document.

It is often these associated stories that trigger emotional responses in addition to aesthetic appreciation and valuation and allow the viewer to connect on a much deeper level with what the object represents. A display of the sculpture collection communicating conservation investigation into sculptures as aesthetic entities and historic documents is hoped to encourage the viewer to engage with the object beyond or without a required knowledge of art history and fine art.

Conservation program

The presentations of conservation investigation into tool marks and construction techniques at the ICOM-CC working group for Sculpture, Polychrome and Architectural Decorations, symposium held in the Bonnefanten Museum in Maastricht, The Netherlands in 2010, highlighted the diversity of construction methods and material working techniques of polychrome wood sculpture in regards to workshops, regions, periods and even individuals.

In each presented case study conservation investigation and documentation of tool marks and construction techniques brought to light a wealth of information that can be obtained without the reliance on analytical equipment and other resources often not available to the conservator. Furthermore these methods of investigation provide the mechanism to identify and characterise evidence for aspects of sculpture as aesthetic entity and historic document and will be applied to a detailed survey of conservation assessments.

Figure 7. Wood carving of the Madonna and child (50.5), Mechelen, 15th century. ©GlasgowLife.

Figure 8. Wooden carving of seated Madonna and Child (50.9), possibly made in Spain, 14th century. ©GlasgowLife

Conservation survey

The aim of an in depth conservation survey into materials, technical aspects and condition of sculptures is to obtain data for each sculpture, identifying and filling the gaps to allow for a comparative study and analysis on the same parameters for the collection as a whole. For each sculpture a description and condition assessment will be carried out including general description of sculpture in regards to the image, style and composition such as single, group, portrait. Recorded stylistic observations will be compared with known and identified examples from published literature, through communication with curators, art historians and collaboration with external conservators/restorers.

Materials

Investigation into materials and their use to identify characteristics for substrates and their structural assemblage such as type of fixings (nails: modern-old), bolts, screws, dowels will be obtained by macroscopic and microscopic investigation in addition to x-radiography. Information obtained will not only inform further methods of investigation and research into material specific aspects but also provide a first estimate for required conservation resources.

During this part of the investigation examination of observed tool marks will be recorded through drawing, and photography prior to their analysis and interpretation in context of material working properties through consultation of relevant literature and communication with historians and conservators.

Assessment of decorative surfaces

Investigation into surface decoration to identify individual materials employed will be carried out through taking cross sections and their observation under the microscope. Surface layer build up will be recorded and methods such as staining of the cross section sample and observation under ultraviolet (UV) light carried out to obtain information of the nature of ground layer and paint media.

Fourier Transform Infrared Spectroscopy (FTIR) will be applied to investigate paint media and varnish layers in addition to pigment analysis for identification of specific pigments present in the sample. This investigation provides information to polychromy and subsequent identification of iconography and indications to alterations such as over painting, removal of polychromy, or re-varnishing in addition to valuable information for authentication and dating of individual examples.

Obtained data will be summarised for sculptures in a conservation condition document which allows for direct comparisons across and within three main categories of sculpture:

- Polychrome wood (Figures 7 and 8)
- Polychrome stone (Figure 2)
- Polychrome Alabaster (Figure 1)

Within each of these groups examples will be compared and further subdivided into categories displaying similarities in their material culture, structural assemblage, tool marks and working techniques as a first indicator for possible origins from periods, regions, and workshops. Additionally information relating to the style and presentation of the image from initial conservation description will be compared for artistic and stylistic similarities. Previously recorded condition assessments at this stage inform conservation recommendations and planning of resources for potential in depth research and conservation treatments specific to materials and the required practical skills.

For the polychrome alabaster collection conservation investigation will also focus on analytical and technical data to confirm identification of individual pieces to one workshop. Comparison of detailed characteristics in the execution of carving and polychromy of positively identified examples for the Nottingham workshop will be further investigate for potential evidence of individual 'signatures' within one workshop.

Conclusion

Data obtained from the above outlined conservation study of observation and investigation will provide a wealth of information for analysis with the aid of published conservation and art historical literature and is hoped to be made available to a wider audience of conservators and art historians for possible collaboration and identified research projects. Availability of external involvement and contribution in addition to internal expertise will determine the extent and depth of interpretation of individual sculptures and the collection as a whole.

Independent to this, technical and material information obtained, will improve awareness, access and condition of the collection and provides an in depth conservation condition survey to facilitate planning and resourcing for conservation treatments towards display and storage preparation of sculpture.

Analysis and interpretation of recorded and documented conservation investigation aiding identification and characterisation of sculptures origins in regards to periods, regions, workshops and schools alongside photographic documentation may be utilised towards a sculpture catalogue. Not only increasing awareness of the sculpture collection but to also serve as reference literature for conservators and art historians involved in the care and interpretation of Medieval and Renaissance polychrome sculpture.

Conservation/restoration treatments will be guided by the aim to present sculpture equally as aesthetic entities and historic documents. Display information also relating to the various materials employed at the time and their associated working properties, industries and required skills in the practice of sculpture will encourage the viewer to make comparisons to contemporary material culture, their availability, values and effect on present day manufacturing and artistic processes.

The display offers the conservators experience as an applicable guide to observing, investigating and understanding sculpture as aesthetic entities and historic documents, providing the visitor with a mechanism of learning and discovery in addition to appreciation of sculptures aesthetics.

References

Caple, C. 2000. *Conservation Skills, Judgement, Methods and Decision Making.* 1st ed. London: Routledge.

Collins, P. 2007. *Survey of Significance.* Curatorial summary of Burrell sculpture collection for Collections Navigator. Glasgow Museums

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Donatello, Brunelleschi and the others. Construction techniques in early Renaissance wooden sculptures.

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Abstract

This paper discusses techniques used in the early Renaissance period by artists such as Donatello and his circle to construct life-size figures from single solid tree trunks. These life-size figures are not hollowed-out and differ from later construction technology. Evidence presented in the sculptures themselves shows that these artists were not trained in woodworking and thus were not bound to the customs and traditions of the trade. It is clear that they understood the problems in working with wood by the ingenious manner in which the position of the figure in the trunk avoided as much as possible the pith thus reducing cracking to a minimum. This technological phenomenon resulted in an iconographical evolution as artistic experimentation eliminated a carved loincloth replacing this with one modelled in linen covered in gesso. This paper gives examples showing the genesis of this evolutionary development.

Keywords: Crucifix, wood, construction, Florence, Renaissance, single-trunk, pith, oakum, modelling

Introduction: Wooden sculptures in early Renaissance Florence

Polychrome wooden sculpture of early Renaissance Florence is generally not well known, yet the most important sculptors of that period such as Donatello, Filippo Brunelleschi, Michelozzo and Desiderio da Settignano, were commissioned to carve statues in wood. The *Crucifix* in the Franciscan basilica Santa Croce, a masterpiece on the threshold between late Gothic and Renaissance art, is almost universally accepted as Donatello's first independent sculpture (Figure 1). [Cavazzini 2008] It is frequently mentioned alongside Filippo Brunelleschi's *Crucifix* in Santa Maria Novella, which, as legend has it, was carved in reaction to Donatello's masterpiece as part of a contest between the two artists (Figure 2). [Bellosi 2008] Giorgio Vasari tells the episode vividly in his book *The Lives of the Most Excellent Painters, Sculptors and Architects* with the intention of highlighting the superiority of Brunelleschi's *Crucifix*. This represented for Vasari the noble Renaissance ideal of the human image. [Vasari 1878-85] Since then, Filippo Brunelleschi's *Crucifix* has been generally considered to be the first Renaissance crucifix and is believed to be the only wooden statue by Brunelleschi that has survived. However, Vasari also mentions a *Saint Mary Magdalene* in the Florentine church of Santo Spirito, which must have been carved by the sculptor and architect before 1421. A fire destroyed this sculpture in 1471. [Caglioti 2008a] There are no doubts about the creator of the *Mary Magdalene* from the Florentine Baptistery, now in the Cathedral's Museum: its extreme realism can be attributed only to Donatello. [Strom 1980; Rosenauer 1986; Mosco 1986] The *Saint John the Baptist* in Santa Maria de' Frari in Venice is comparable in style. This sculpture is signed and dated on the pedestal by Donatello in 1438. [Valcanover 1979] Recently, a *Crucifix* in Santa Maria dei Servi in Padova has been convincingly attributed to Donatello, but layers of overpaint applied during later treatments have altered this image. [Caglioti 2008b] This crucifix is currently [2014] in treatment in the laboratory of the Soprintendenza ai Beni Artistici e Storici in Udine. The attribution of the *Saint Jerome* in the Faenza City Museum, on the other hand, is rather controversial and recent studies tend to attribute it to Bertoldo, Donatello's well known assistant, rather than to the master himself. [Draper 1992; Caglioti 2008a] One more *Crucifix*, in the small monastery of Bosco ai Frati in the North of Florence had been credited to Donatello but this attribution was widely questioned, even though this sculpture clearly shows features that witness a close relationship with

Donatello's late creations. Alternative attributions were made to Desiderio da Settignano or to another sculptor who was strongly influenced by the late Donatello, such as Bertoldo. [Caglioti 2008; Natali 1986] An amazingly beautiful *Bust of a Woman*, representing Saint Constance and nicknamed "*La belle Florentine*", found in the Louvre, is also attributed to Desiderio or his ambit. [Bormand 2007; Cascio and Levy 2007] According to Vasari, the *Mary Magdalene* in the church of Santa Trìnita had been credited to Desiderio da Settignano who based his work on Donatello's version of the penitent saint. Desiderio died in 1464 and, as recently discovered, the sculpture was finished by Giovanni d'Andrea di Domenico during the 1470s or 1480s, not by Benedetto da Maiano as Vasari had written in his biography of Desiderio. [Waldman 2000] One more *Crucifix* should be mentioned here, which clearly postdates Brunelleschi's *Christ* in Santa Maria Novella: this *Crucifix* is that in the church of San Niccolò. This is attributed to Michelozzo, a sculptor and architect who for a few years shared a workshop with Donatello and who was a prominent actor of the early Renaissance. [Lisner 1970; Natali 1986]

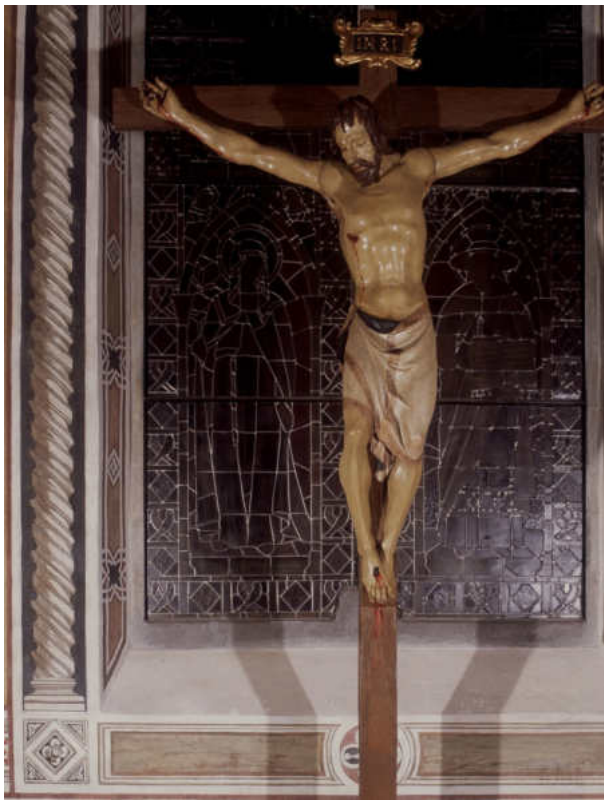

Figure 1. Donatello, *Crucifix*, Santa Croce, Florence. ©OPD

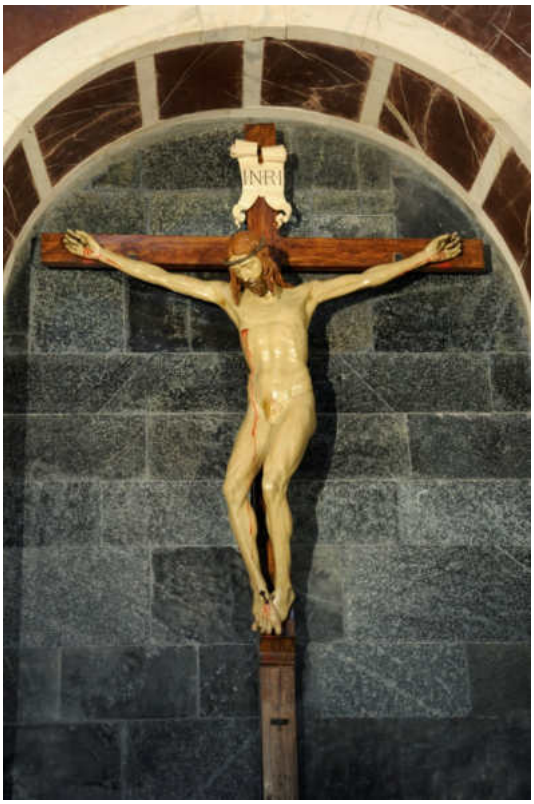

Figure 2. Filippo Brunelleschi, *Crucifix*, Santa Maria Novella, Florence. ©OPD

Now, what all these sculptures, have in common, is that they are basically carved from a single tree trunk, and more specifically, that the figure of Christ is not hollowed-out. Technologically this is a difficult approach for life-size figures in particular, since it can easily lead to cracking. The presence of the central pith in a wooden structure such as a life-size sculpture has always been considered a major source of radial cracks. The most common technique used since the Middle Ages to prevent cracking was to hollow-out the figure after initial shaping. This technique involves the removal of most of the central portion of the trunk, making it possible to use fresh or part-aged wood with little or no risk - a great advantage since it was rare to find a well-aged trunk. Like elsewhere, this hollowing-out technique was used successfully in Florence until 1400 and even during the later 15th century. However from 1480 onwards, workshops making life-

sized sculptures started to use another very efficient construction technique that involved creating an assembled block from several pieces of wood. [Stiberc 1989; Stiberc 2005; Stiberc 2014]

Technological Constructions: Figures from a solid trunk

The sculptures of the early 15th century will now be discussed further, in particular the early *Crucifixes* by Donatello and Brunelleschi. This debate will try to understand what they did to prevent cracking in sculptures that were carved from a solid trunk and not hollowed-out. Subsequently, this paper will illustrate what the preserved sculptures, dating from the early decades of the 1400s, not only by Donatello, but also by artists that were in different ways in contact with him, have in common. These all demonstrate very particular techniques used to construct the final form.

Early Renaissance: the Crucifixes *of Donatello and of Filippo Brunelleschi, carved in solid wood*

During the first decade of the 15th century Donatello created a *Crucifix* for the Franciscan basilica of Santa Croce (Figure 1). [Lalli et al 2006; Stiberc 2007] [1] It is thought to be his first masterpiece as an independent artist. The 173 cm long figure is carved from pear wood and the original polychromy is preserved. It is constructed as a deposition crucifix with movable arms and is not hollowed-out, with the exception of a small hollow in the chest that provides enough room for the armpit component when the arms are positioned vertically downwards. Relatively thin radial cracks are visible at top of the figure's head, on the chest, in the buttock area of the loincloth and on the soles of the feet (Figure 3). The direction line of the pith, either inside - or outside, the volume of the sculpture can be identified with the help of these cracks, since it is along this central axis where these cracks converge. Consequently, the position in which the figure was carved in relation to the tree trunk can be determined (Figure 4).

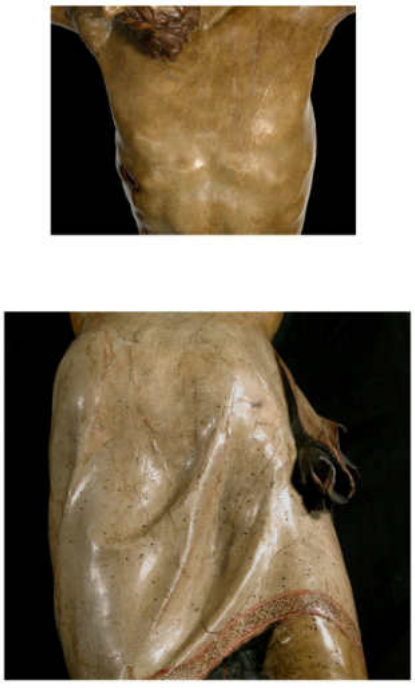

Figure 3. Donatello, *Crucifix*, Santa Croce, Florence. Thin radial cracks on chest and loincloth. ©OPD

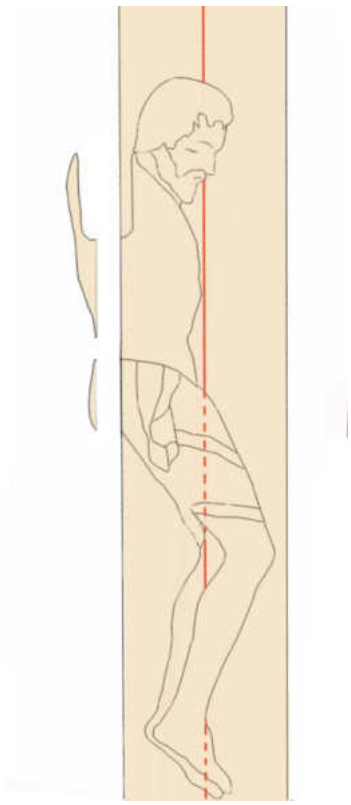

Figure 4. Donatello, *Crucifix*, Santa Croce, Florence. Position "in the trunk". (©OPD)

Looking at the figure in profile, the pith line goes past the head which is bent to the right, skims the chest and the belly, and passes across the spread of the loincloth and then between the legs, passing once again through a part of the figure at the feet. It should be assumed that the sculptor did not hollow-out the figure, as he was convinced that the trunk was sufficiently dry. However, it is clear that he showed a remarkable sense of economy in how he chose to position the figure within the trunk, as he tried to use as much as possible of the trunk that did not contain the pith. To do so, he attached two additional pieces of wood at the back and one on one side of the buttock area where the figure protrudes slightly outside the trunk. However, there is no way to avoid the presence of the pith entirely in the loincloth section of the sculpture. Indeed, here a big crack has opened right in the middle of the loincloth, continuing along its whole length. The position of the figure in relation to the trunk therefore depended on technical necessities and physical features, as its final position on the cross could not be taken into consideration. It is known that medieval sculptors were used to working on figures in leaning or horizontal poses, as can be seen in many contemporary representations. With regard to the position of the figure in relation to the trunk, it can be deduced that the usable part of the tree must have had a diameter of at least 50 cm, given the distance of 25 cm from the pith to the outermost part of the sculpture. It must have been extremely difficult to obtain a fully-dried trunk of these dimensions with good carving properties.

Figure 5. Filippo Brunelleschi, *Crucifix*, Santa Maria Novella, Florence. During treatment, radial cracks highlighted by fillings. ©OPD

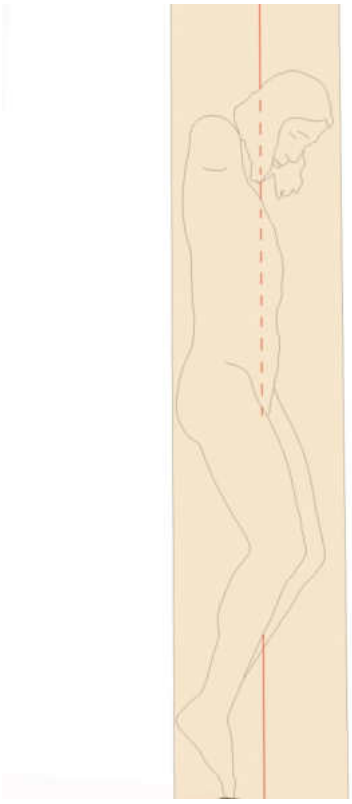

Figure 6. Filippo Brunelleschi, *Crucifix*, Santa Maria Novella, Florence. Position "in the trunk". (©OPD)

Filippo Brunelleschi's *Crucifix* in the Dominican basilica of Santa Maria Novella is generally thought to have been carved between 1410 and 1415 (Figure 2) [2]. Whether the legend of an actual contest between Filippo and Donatello is true or not, Brunelleschi's *Crucifix* must be later than Donatello's. It can be considered a truly innovative depiction of the theme of the crucified Christ, based on anatomical observation. Examining Brunelleschi's approach to the construction, it becomes clear that his answer to Donatello's crucifix cannot be considered only from an

aesthetic point of view. The figure of Christ is 172 cm long and 170 cm wide. Curiously, like Donatello's crucifix, it is carved in pear wood, a fairly uncommon species among Tuscan wooden sculptures, and it is also solid and not hollowed-out. Its original polychromy is relatively well preserved and when the crucifix is studied today, what immediately strikes is its nakedness. Originally, of course, it had a loincloth, probably made of glue-starched linen and draped across the body, and most likely covered with gesso and then painted. Starting with Brunelleschi's crucifix, this became the conventional technique for making loincloths for crucifixes in Florence. Similar types of loincloths had been used in Tuscany during the 14th century, mainly on small procession crucifixes. [Lisner 1972] With the *Crucifix* of Santa Maria Novella, Filippo creates an anatomically-based life-size human body and the sculptural process seems to follow exactly that intention, since at first the entire naked body was carved and afterwards the loincloth was applied, inverting the traditional sculptural process. This life-size figure is constructed from a single tree trunk. In a photograph of the sculpture taken during restoration, the radial cracks on the bust are quite evident (Figure 5). Their orientation indicates the presence of the pith inside the wood just under the front surface. The pith line can be pinpointed on the front of the neck and also faintly on a corresponding spot in the hair on the back of the head. The track of the pith leads down from the groin area, passing between the legs and is not contained in the wood of the sculpture, notably in the section that crosses the loincloth, which in Donatello's crucifix is solid wood (Figure 6).

Brunelleschi's sculpture was carved from the trunk using a similar approach to Donatello's crucifix, trying basically to obtain the bust from one half of the trunk. For each of the figures, half of the trunk must have been just a little too small to contain the whole bust. But instead of attaching several pieces of wood on the back for the parts that protruded to the rear, as Donatello had done, Brunelleschi accepted – or ended up – carving the bust of the figure from one half of the trunk that included the pith. Evidently something did not work out well here. But using a loincloth made of fabric, which was applied after carving, he brilliantly avoided the presence of the pith in that part of the sculpture where it had caused serious damage in Donatello's crucifix and which, according to the legend, he wanted to outdo. But even if there were cracks in that part of the sculpture, they would have been hidden by the applied loincloth. Therefore the linen loincloth can be considered a technical innovation which enabled whole nudes to be carved with an anatomically-oriented working procedure, and at the same time made it possible to dramatically reduce the risk of cracking. It was used from that moment onwards in all Florentine crucifixes and statues of Saint Sebastian. Considering the less durable technique, it is not surprising that many of the original loincloths have been lost, like the one of Brunelleschi's *Crucifix*.

Towards the middle of the 15th century: more crucifixes in solid wood.

The *Crucifix* in the Florentine church of San Niccolò may have been carved around 1440. It is attributed to Michelozzo, a sculptor who is documented as the author of works in marble and in silver who was a passing associate of Donatello. The original loincloth of this crucifix, presumably made of linen treated with glue and gesso, is lost. Thus, the extent of decoration to this area can be seen. Both the carving and the painting were completely finished, notwithstanding that the crucifix was not meant to be seen in the church as a fully nude figure. In an area on the back, where the colour and gesso layer are missing, there is a radial crack which already existed when the sculpture was carved. The artist must have had a rare opportunity to use a dry, well-aged trunk and consequently he did not hollow-out the figure. He used a very interesting method to treat the crack. A line much wider than the crack itself was carved with a hollow gouge. This gouge was then filled with oakum that formed a stable cushion for the gesso ground, but allowed the crack to widen or narrow due to variations in humidity reducing the likelihood of further cracks forming. [Giannelli 1989] [3]

Carving and modelling details

Michelozzo's *Crucifix* shows also another technical feature which is quite common among wooden sculptures in Florence towards the middle of the 15th century and which relates to a less structural aspect of the sculptural process: the creation of the final shape. In several areas of this crucifix, where the colour and gesso are lost, the roughly carved wooden surface with evident tool marks can be seen. Moreover, the variations in the thickness of the gesso show that the final form is more modelled than carved. Some details, such as strands of hair and the crown of thorns are entirely shaped out of gesso, so perhaps these should be called "stucco".

A rather impressive example of this technique is the *Crucifix* in San Francesco al Bosco, a small Franciscan monastery outside Florence. This church was patronised by Cosimo the Elder of the Medici family, who had the monastery church rebuilt to a design by Michelozzo. The *Crucifix* is thought to date from between 1450 and 1460. Various art historians attribute it to Donatello, Desiderio da Settignano or an assistant of the late Donatello. [Parronchi 1962; Caglioti 2008c] [4] During the 16th century the sculpture was damaged in an earthquake, and was probably repaired. It underwent conservation treatment after being re-discovered in 1953. This included removing former fillings and repairs from the badly damaged head, where the combination of carving and modelling is quite evident (Figure 7). This was an opportunity to document the construction materials. Details that were detached from the surface, such as some strands of hair, were studied. These were made out of various materials including small sticks and string or wire and oakum (loose fibres obtained from rope).

Figure 7. Sculptor follower of Donatello, *Crucifix*, San Francesco al Bosco (San Piero a Sieve, Florence). Roughly shaped surface in area where the final modelling is lost. ©OPD

Figure 8. Donatello, *Saint Mary Magdalene*, Museo dell'Opera del Duomo, Florence. A detached stucco hair strand is re-adhered during treatment after the flood of 1966. Also visible: losses on chin, lip, front and hair strand that were left unfilled. (©OPD)

Furthermore, Donatello's *Saint John the Baptist* dated 1438 (140 cm long, max. depth 30 cm; single trunk, not hollow) and *Saint Mary Magdalene* (188 cm long, solid single trunk) are very much characterised by this peculiar approach in which the final shape is realised by modelling stucco on top of a roughly carved wooden surface. [Lazzarini 1979][5] This is in marked contrast to his early *Crucifix* and also to Brunelleschi's in Santa Maria Novella that are both fully carved. On the *Magdalene* this can be observed in the spots of damage, which were not filled during the restoration after the Florentine flood of 1966 (Figure 8). Most Strands of hair are entirely or partially modelled. The strands of the women's long hair of the *Magdalene* in the Florentine church of Santa Trìnita, which reach almost to the ground, are mostly nailed onto the core of what can be considered a nude figure. [Ciatti et al 1990][6] This sculpture was begun by Desiderio da Settignano and finished by the unknown Giovanni d'Andrea di Domenico. This is the only sculpture among those that mentioned which is hollowed-out. That the figure is completely enveloped in hair, makes that technically feasible and perhaps also more necessary. Many of these hair strands, in particular on the back of the sculpture, are made of cork, and also wire and oakum are involved along with a modelling layer of stucco to create the final form. Here calcium sulphate hemi-hydrate ($CaSO_4.0.5H_2O$) was used instead of calcium sulphate di-hydrate ($CaSO_4.2H_2O$). This is not an isolated case, there are a few preserved crucifixes whose construction contains a core of cork, and which contain parts with a modelling finish. An example of this is the *Crucifix* attributed to Antonio del Pollaiolo in San Lorenzo, the Florentine family church of the Medici. [Baldini and Schleicher 1982] [7] Artists had always used similar techniques for less durable and ephemeral objects, but here they were applied to wooden sculptures that were meant to last.

Conclusion

An explanation for this technological phenomenon may be that these artists had no specific background in woodworking and were therefore less bound to the customs and traditions of the trade. They approached the construction of life-size crucifixes by using solid trunks, but avoided hollowing them out, trying at the same time to reduce the amount of pith retained in the figure. The same intention may lie behind the idea to use a linen loincloth, instead of carving it from the trunk. It certainly has that effect. Also to shape the final form of their sculptures, the artists around Donatello frequently used means that can be considered unusual and alien to the traditions of woodworking. The early crucifixes of Donatello and Filippo Brunelleschi show that they were certainly capable of creating the complete form of the sculpture by carving. So when carving and modelling were frequently combined during the following decades, it can be explained within the atmosphere of artistic experimentation that reigned in Florence during that period. It is not surprising that unconventional techniques accompany formal experimentation.

Endnotes

1. Donatello's *Crucifix* was treated at the OPD under the direction of Laura Speranza from 2003 to 2005. Results are published in detail [Lalli et al 2006; Stiberc 2007].

2. Brunelleschi's *Crucifix* was treated at the OPD under the direction of Laura Speranza from 2008 to 2009. The results of the treatment are un-published.

3. This crucifix was treated in 1986 by the private conservator Ida Giannelli, which provided an opportunity for the author to to take photographs [Giannelli 1989].

4. The "*Bosco crucifix*" was examined by the author during the preliminary treatment for the exhibition "Mugello Culla del Rinascimento" [Parronchi 1962].

5. Donatello's Magdalene is currently [2014] in treatment at the OPD.

6. The *Mary Magdalene* by Desiderio da Settignano was treated at the OPD under the direction of Marco Ciatti between 1984 and 1990 [Ciatti et al 1990].

7 The *Crucifix* by Antonio del Pollaiolo was treated at the OPD between 1980 and 1982 under the direction of Umberto Baldini by the private conservator Barbara Schleicher [Baldini and Schleicher 1982] and is currently [2014] in treatment at the OPD

Acknowledgements

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References

Baldini, U., and Schleicher, B. 1982. 'Antonio del Pollaiolo. Crocifisso'. *Metodo e Scienza, operatività e ricerca nel restauro*, Florence, p. 50 – 53.

Bellosi, L., 2008. 'Filippo Brunelleschi. Crocifisso'. In: Tosti, B. (ed.), *Mugello culla del rinascimento*, Florence, pp. 170 – 1742.

Bormand, M., 2007. 'Santa Costanza (già detta "La Belle Florentine")'. In: M. Bormond, B. Paolozzi Strozzi, N. Penny (ed.) *Desiderio* da *Settignano. La Scoperta della Grazia nella Scultura del Rinascimento.* Milan, p. 154 – 156.

Caglioti, F., 2008a. 'Il crocifisso del Bosco ai Frati di fronte ai modelli di Donatello e Brunelleschi'. In: Tosti, B. (ed.), *Mugello Culla del Rinascimento*, Florence, p. 140

Caglioti, F., 2008b. 'Il "Crocifisso" ligneo di Donatello per i Servi di Padova'. *Prospettiva*, 130/131, p. 50-106.

Caglioti, F., 2008c. 'Il crocifisso del Bosco ai Frati di fronte ai modelli di Donatello e Brunelleschi'. In: Tosti, B. (ed.) *Mugello Culla del Rinascimento*, Florence, p. 156 -157 & pp. 176-183.

Cascio, A., and Levy., J., 2007. 'Studio tecnico e restauro della Santa Costanza (detta "La Belle Florentine")'. In: Bormond, M., Paolozzi Strozzi, B., Penny, N. (ed.) *Desiderio* da *Settignano. La Scoperta della Grazia nella Scultura del Rinascimento.* Milan, p. 158 – 159.

Cavazzini, L., 2008. 'Donato di Niccolò di Bardi, detto Donatello. Crocifisso'. in: Tosti, B. (ed.), *Mugello culla del rinascimento*, Florence, pp. 164 – 169.

Ciatti, M., Lupi, S., Venturi, M., Vestri S., 1990. 'Maddalena, scheda di restauro'. *OPD Restauro 2*, p. 155-160.

Draper, J., 1992. *Bertoldo di Giovanni sculptor of the Medici household. Critical reappraisal and catalogue raisonné,* Columbia – London.

Giannelli, I., 1989. 'Il restauro del crocifisso ligneo attribuito a Michelozzo di Bartolomeo nella chiesa di San Niccolò Oltrarno'. In: Tampone, G. (ed.), *Legno e Restauro*, Florence, pp. 276 – 278.

Lalli, C., Moioli, P., Rizzi, M., Seccaroni, C., Speranza, L., Stiberc, P., 2006. 'Il Crocifisso di Donatello nella Basilica di Santa Croce a Firenze. Osservazioni dopo il restauro'. *OPD Restauro* 18, pp. 13 – 38.

Lazzarini, L., 1979. 'Il San Giovanni Battista di Donatello ai Frari'. Technical Note. *Quaderni della Soprintendenza ai Beni Artistici e Storici di Venezia,* 8, pp. 31 – 32.

Lisner, M., 1970. *Holzkruzifixe in Florenz und in der Toskana von der Zeit um 1300 bis zum frühen Cinquecento*, Munich, pp. 65-66 & 73 – 74.

Lisner, M., 1972. *Holzkruzifixe in Florenz und in der Toskana*, Munich, p. 56.

Mosco, M. (ed.), 1986. *La Maddalena tra sacro e profano.* Florence.

Natali, A., 1986. 'Michelozzo. Crocifisso'. In: Phipps Darr, A. and Bonsanti, G. (ed.), *Donatello e i suoi. Scultura fiorentina del primo Rinascimento*. Exhibition Catalogue. Milan-Florence. p. 175 & pp. 186 –187.

Parronchi, A., 1962. 'Il Crocifisso del Bosco'. In: *Scritti di storia dell' arte in onore di Mario Salmi,* II, Rome, pp. 233-234.

Rosenauer, A., 1986. In: Phipps Darr, A. and Bonsanti, G. (ed.), *Donatello e i suoi. Scultura fiorentina del primo Rinascimento*. Exhibition Catalogue. Milan-Florence, p. 54.

Stiberc, P., 1989. 'Polychrome Holzskulpturen der Florentiner Renaissance. Beobachtungen zur bildhauerischen Technik'. *Mitteilungen des Kunsthistorischen Institutes in Florenz.* XXXIII, 2/3, pp. 205 – 228.

Stiberc, P., 2005. 'La Scultura lignea policroma del Rinascimento fiorentino. Osservazioni sulla tecnica scultorea'. *OPD Restauro* 17, pp. 304 – 316.

Stiberc, P., 2007. 'Donatello's Kruzifix in Santa Croce'. *Restauro* 6, September, pp. 386 – 394.

Stiberc, P., 2014. 'Wood Crucifixes in Late 15th Century Florence – Innovations in Construction Techniques. First Results from a Research in Progress'. In: K. Seymour (ed) *Polychrome Sculpture: Tool Marks and Construction Techniques* ICOM-CC Interim Meeting, Working Group Sculpture, Polychromy, and Architectural Decoration, Maastricht 24-25 October 2010. ICOM-CC

Strom, D., 1980. 'A new Chronology for Donatello's Wooden Sculpture'. *Pantheon.* 38, pp. 239 – 248.

Valcanover, F., 1979. 'Il San Giovanni Battista di Donatello ai Frari'. *Quaderni della Soprintendenza ai Beni Artistici e Storici di Venezia,* 8, pp. 23 – 30.

Vasari, G., 1878-85. *Le vite de' più eccellenti pittori, scultori ed architettori,* ed. a cura di G. Milanesi, vol. 9, Florence, pp. 398 – 399.

Waldman, L. A., 2000. 'The Mary Magdalen in Santa Trinita by Desiderio da Settignano and Giovanni d'Andrea'. *Pantheon 58*, p. 13 – 18.

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Technical analysis of the J. Paul Getty Museum's 18th century Genoese '*Christ Child*': an example of a variation in regional practice.

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Abstract

Christ Child, a polychrome sculpture attributed to an unknown Genoese artist, ca. 1700, entered the collection of the J. Paul Getty Museum (JPGM) in 1997. In order to gain a greater understanding of the original construction and decorative layers, as well as the nature and extent of subsequent reworking campaigns, an extensive technical analysis has been carried out. The technical study included surface examination in visible and ultraviolet illumination, radiocarbon dating, X-radiography of the structure, and X-ray fluorescence (XRF), scanning electron microscopy with energy dispersive spectroscopy (SEM-EDS), Raman and Fourier-Transform infrared (FTIR) analysis of the ground and paint layers. Preliminary results suggest that techniques unexpected for 18th century southern European polychrome sculpture, such as non-calcium based preparatory layers, were employed.

Keywords: clay ground, priming, lead white, microscopy, X-radiography, XRF, Raman, SEM-EDS, FTIR

Introduction

The J. Paul Getty Museum's (JPGM) *Christ Child* (Figure 1) is a polychrome wood sculpture that represents a type of devotional imagery that became increasingly popular in Europe, particularly in Spain, Italy and Germany, during the Renaissance and into the 18th century. The sculpture is carved in the round, indicating that it was intended to be seen from all sides. The inward bend of the right arm suggests a gesture of blessing as he looks down, supporting the theory of its use as a processional figure designed to be seen also from below.

When acquired by the JPGM, the statue was attributed to the Genoese wood sculptor Anton Maria Maragliano (1644-1739) [Camberari 2002], who created many devotional and processional sculptures for confraternities in the Genoa area. Although the JPGM's *Christ Child* shares many similarities with works by Maragliano, the style does not closely resemble the artist's figures of children. Still, the *Christ Child* may have been made in Genoa around 1700 since it shows a close relationship to works by leading Genoese sculptors Pierre Puget (1620-1694) and Filippo Parodi (1630-1702). [Magnani 2001] In addition to Maragliano, these artists and others, such as Girolamo Pittaluga (1691-1743), Pellegro Olivari (active c. 1718) and Pietro Galleano (1687-1761) [Sanguineti 1998a], created complex groups of wooden sculptures for churches using a rich polychromy. Because attribution to a specific artist remains difficult, the *Christ Child* is presented in the galleries as dating from c. 1700, made by an unknown Italian artist, possibly Genoese.

In the study presented here, an extensive technical analysis of the paint layers and underlying wooden support in the *Christ Child* was carried out using a variety of analytical techniques in an effort to understand the original fabrication methods and subsequent restoration history. The resulting information on the materials and techniques adds to the body of knowledge regarding Genoese polychrome sculpture. Of particular interest is the discovery of preparatory layers that do not follow the expectations of the regional practices for this sculpture. As more works are subjected to similar technical studies, such results may lead to a broadening of our understanding of artistic practices.

Figure 1. *Christ Child* (96.SD.18) in (a, left) visible light and (b, right) UV illumination. Figure 1b shows non-fluorescing areas, suggesting areas of recent overpaint. Italian, Genoa, c. 1700, *Christ Child*, polychromed wood with glass eyes, H: 73.7 cm (H: 29 in.) © The J. Paul Getty Museum, Los Angeles

Experimental

The construction of the underlying wooden support was studied using X-radiography. [Philips Industrial MG 452; operated at 50 kV, 10 mA for 45 s] The sculpture's surface was examined under magnification (Leica binocular microscope) and ultraviolet (UV) illumination. The visual examination, x-radiographs, and UV images provided information regarding the construction and condition of the piece, and also guided decisions regarding the locations where analysis of surface layers would be carried out. X-ray fluorescence (XRF) spectroscopy was performed *in situ* using a portable Bruker Tracer III-V XRF spectrometer (Re anode, 40 kV, 1.50 μA, Ti/Al filter, 60 s collection time) in a noncontact configuration. Following the XRF analysis, samples of the paint layers were removed for further study. Losses in the decorative layers allowed for sampling of the flesh (six samples), drapery (four samples), hair (three samples), and rock base (three samples). Samples for cross-sectional analysis were mounted in a polyester resin (Bio-Plastic®) or a light-curing methacrylate resin (Technovit® 2000 LC) and microtomed or polished, respectively. Raman microspectroscopy and scanning electron microscopy with energy dispersive spectroscopy (SEM-EDS) were used to identify the inorganic components of the cross-sections. Raman microspectroscopy was performed using a Renishaw inVia Raman microscope equipped with a Leica DM microscope. All spectra were collected using a long focal length 50x objective (8 mm working distance, N.A. 0.50) and were obtained using a 785 nm diode excitation laser. SEM-EDS was performed using a variable pressure Philips XL30 SEM-FEG with the Oxford INCA EDS system, operated in H_2O mode at 1 Torr and 20 kV. Identification of organic materials was performed using Fourier-Transform infrared (FTIR) microscopy on unmounted samples, which

were flattened with a metal roller on a diamond window. Analysis in transmission mode was carried out with a Bruker Hyperion 3000 FT-IR microscope using a 15x objective and purged with dry air. The identification of the infrared spectra was performed with reference libraries.

Results and Discussion

Construction

The sculpture, which is of solid construction, was carved in the round from *Tilia sp.* (Linden or Lime wood; analysis by Arlen Heginbotham). Although best known for its use in sculptures from southern Germany, lime wood was preferred by Maragliano. [Sanguineti 1998b] The centre of the sculpture is formed from a single log, including much of the base, the legs, torso and head, as well as a substantial portion of the drapery. Smaller sections of wood were glued on, including the arms, large sections of the drapery, and eight small pieces added to the base (Figure 2). Three hand-wrought nails were used in the attachment of the drapery but do not appear elsewhere. Wood and glue samples from the base yielded calibrated radiocarbon age of 1623-1676 (Rafter Radiocarbon Laboratory, New Zealand).

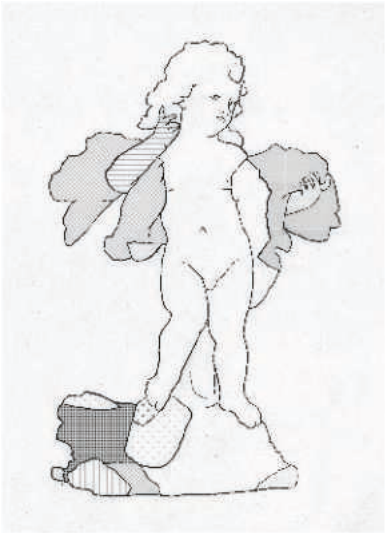

Figure 2. Drawing of *Christ Child* showing added sections of wood. © The J. Paul Getty Museum, Los Angeles.

Figure 3. X-radiography of the head of the *Christ Child*. © The J. Paul Getty Museum, Los Angeles.

The eyes, made of clear glass, have been painted from the inside, a technique typical of 17th and 18th century Genoa. [Sanguineti 1998b] The wood was carved out to make room for the eyes, which were secured to the head with an X-ray opaque putty. Putty has also been used to model the eyelids (Figure 3) and to fill a gap where the separately carved right arm joins the body. The fill in the arm was identified as lead carbonate in oil.

Modifications

All four fingers in the left hand are replacements and a circular fill in the centre of the hand may indicate where an attribute, now missing, was attached. Alterations to the base include the addition of a rock-like form on which the right foot rests. This later addition is joined to the foot with modelled fill material and secured to the base with glue and a modern wire nail (post-1880s). The added wood sits in a large, unpainted recess in the original base. A second, smaller addition was glued to the top of the adjacent high point (Figure 4). These additions suggest that the figure

may have been part of a larger composition that overlapped with the existing base and supported the figure's right leg. This type of multi-figured compositions was typical of 18th century Genoa.

Polychromy

Among the samples taken, the ones from the flesh and drapery will be discussed in detail, as they highlight the major findings of the study.

Flesh Tones: The original paint stratigraphy for the flesh was relatively simple. The ground layer is composed of lead white ($2PbCO_3 \cdot Pb(OH)_2$) bound in oil, approximately 25 μm thick (Layer 1, Figure 5). A size layer is assumed to be present on the wood, but no firm identification has been made. Lead white ground layers have been found on examples, such as four French sculptures in the Metropolitian Museum collection, yet are less common than ground layers containing calcium carbonate or calcium sulphate. [Kargère and Rizzo 2010] Lead white mixed with linseed oil is mentioned as a ground layer for painting on wood in the third book of *De coloribus et artibus romanorum*, believed to have been compiled in France in the 13th century. [Clarke 2001] A thin varnish layer (Layer 2, Figure 5) of ca. 3 μm thick was applied on top of the lead white ground. The flesh-coloured paint layer is composed of vermilion (HgS) in a lead white matrix (Layer 3, Figure 5). A second lead white and vermilion overpaint layer (assumed to date to the 18th or 19th century) was then applied over much of the sculpture.

Figure 4. Later additions in the base outlined in white. Italian, Genoa, c. 1700, *Christ Child* (detail). © The J. Paul Getty Museum, Los Angeles.

Figure 5. Cross-section sample of flesh area that shows no fluorescence under UV illumination and shows two distinct layers of titanium dioxide as anatase (Layer 5) and rutile (Layer 6). © The J. Paul Getty Museum, Los Angeles.

Samples taken from areas that show no fluorescence under UV illumination include additional paint layers containing titanium dioxide (TiO_2; a strong UV absorber) on top of the flesh tones. In one sample (Layers 5 and 6, Figure 5), the two uppermost layers of paint (separated from the flesh layer by a thick varnish layer in Layer 4, Figure 5) were identified by Raman microscopy as containing two forms of titanium dioxide: anatase (Layer 5, Figure 5) and rutile (Layer 6, Figure 5). Titanium dioxide was introduced as a pigment in the early 20th century, with anatase in popular use from the 1910s till the mid-1940s when it was replaced by rutile, which is still widely available. [Laver 1997] The presence of separate titanium dioxide layers, therefore, suggests that at least two 20th century retouching campaigns carried out on the flesh.

Drapery

Originally, the drapery was painted green-blue, with decorative patterns of carefully applied gold leaf (referred to here as the "lower gold"). At a later time, the drapery was entirely overpainted in red and the edge highlighted with gold leaf ("upper gold"). In its current state as seen in Figure 1, much of the red paint and "lower gold" have been stripped off, revealing the original blue-green

paint. A wide border of the red paint has been left along the edges. In isolated areas in the drapery folds, the original decorative pattern of oil gilding can still be seen (Figure 6).

Figure 6. Edge of drapery fold showing remains of the original oil gilding ("lower gold") underneath the added red paint. Italian, Genoa, c. 1700, *Christ Child* (detail). © The J. Paul Getty Museum, Los Angeles

Figure 7 shows the complete paint stratigraphy of the drapery from the ground to the red border; Figure 8 shows the stratigraphy for a sample that contained only the red border with both the lower and upper gold layers. In contrast to the flesh areas, the drapery contains a thick (ca. 80 µm) ground layer consisting of a coarse alumino-potassium-silica clay matrix (Layer 1, Figure 7), over which a layer of finely ground gypsum was applied (Layer 2, Figure 7). This layering of a coarser ground followed by a finer-textured ground is reminiscent of the *gesso grosso-gesso sottile* layering recommended by Cennini. [Cennini ca. 1400] A notable difference is the use of clay in the lowermost layer. Kaolin clay grounds have been observed in Chinese and Japanese polychrome sculpture [Larson 1988; Richter 2004] and was recommended by Pacheco as one type of ground for canvas paintings [Pacheco 1649], but the authors are not aware of its use for sculpture in Western Europe. As seen in Layer 3 (Figure 7), an additional thin preparation layer consisting of lead white in oil, similar to that observed in the flesh areas (Figure 5), was applied as a final priming layer prior to the application of colour.

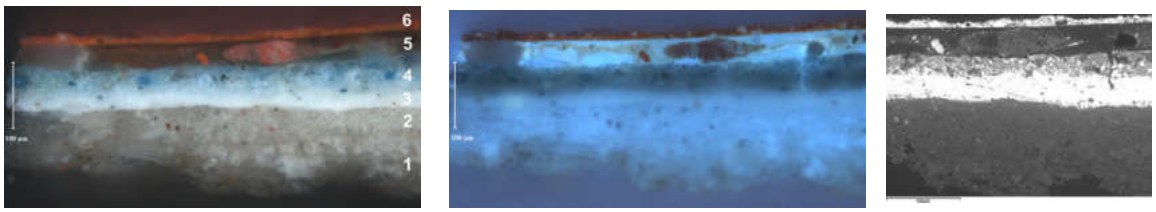

Figure 7: Cross-section of drapery in (a) visible, (b) UV illumination, and (c) SEM backscattered image. In the SEM image, the coarse texture of the clay layer (Layer 1) and the finer texture of the gypsum layer (Layer 2) can be observed. The "lower gold" layer is between Layers 5 and 6, and cannot be observed at this magnification. © The J. Paul Getty Museum, Los Angeles

Raman microscopy identified the pigments in the blue-green layer (Layer 4, Figure 7) as a mixture of azurite ($2CuCO_3 \cdot Cu(OH)_2$) and Prussian blue ($Fe[Fe^{3+}Fe^{2+}(CN)_6]_3$) in a lead white matrix. The identification of azurite and Prussian blue mixed together is notable since Prussian blue was first introduced in the early 18th century [Berrie 1997], and it began to replace azurite [Gettens and Fitzhugh 1993] as a blue pigment in the mid 1700s. The presence of these pigments together

suggests the application of this layer likely occurred during the early to mid 18th century when both were widely available, and presents a strong argument for the blue-green being an original or early paint layer. A thick varnish layer (Layer 5, Figure 7) containing an unidentified organic red pigment is applied over this blue-green paint. The red layer (Layer 6, Figure 7) over this varnish consists of the pigments red lead (Pb_3O_4) and vermilion (HgS); as shown also in Figure 8 and discussed below, the red lead and vermilion are two separate paint layers. A thin layer of the "lower gold" is observed in the SEM image sandwiched in-between this varnish layer (Layer 5, Figure 7) and the later added red paint layer (Layer 6, Figure 7), indicating that the varnish serves as the mordant for the gold leaf. The "upper gold" layer is not observed in this cross-section because it was sampled in a location that did not have the later border gilding.

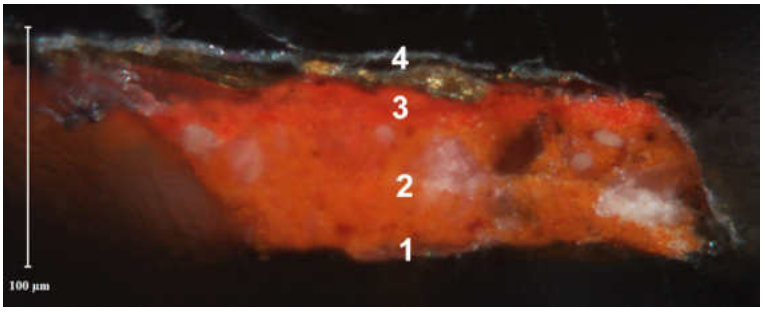

Figure 8. Cross-section of the added red paint from the drapery border. The original "lower gold" layer is Layer 1 and the later "upper gold" is Layer 4. © The J. Paul Getty Museum, Los Angeles

The sample shown in Figure 8, taken from the red border only, contains both the old "lower gold" (Layer 1, Figure 8) and new "upper gold" (Layer 4, Figure 8). The red border is composed of two layers: Layer 2 is red lead in a lead white matrix and Layer 3 is a thin layer of vermilion. The application of the later "upper gold" (Layer 4, Figure 8) seems to be haphazard, in contrast to the original "lower gold" layer (Layer 1, Figure 8). The pigments used to create the red, i.e. red lead and vermilion, have been in use since antiquity, and therefore cannot be used to date the restoration and re-gilding of the sculpture. However, because the red pigments were admixed with lead white, it seems unlikely that this campaign was carried out at the same time as the 20th century campaigns evident in the flesh areas, since one would reasonably expect a similar use of titanium dioxide as a base. More likely, this represents an earlier restoration campaign, either in the 18th or 19th century.

Conclusion

The flesh and drapery components of the sculpture figure appear to have been originally created using different preparation techniques: the flesh areas are built on a ground layer of lead white in linseed oil, whereas the drapery is built upon a clay-based ground with subsequent layers of gypsum and lead white under the pigment layer(s). There are several possible explanations for the observed differences that can be considered: 1) the different techniques were intentionally used in order to obtain different effects, i.e. a smooth, luminous flesh tone contrasting with the opaque tones of the drapery; 2) the figure and drapery elements were created by different artists (or artist's assistants); or 3) subsequent repainting techniques have obscured the original layers of one or more of the different elements.

The use of lead white and vermilion in linseed oil for the flesh tones found in the *Christ Child* is a common paint palette used for polychrome sculpture across broad regions of Europe, having been identified in Spanish [Bassett and Alvarez 2011], German [Pflästerer-Haff 2004], and

French [Kargère and Rizzo 2010] polychromy. Pacheco [Pacheco 1649] has written about the combination of lead white and vermilion in an oil medium to obtain a luminous skin tone.

The identification of Prussian blue and azurite for the green-blue drapery, as discussed above, suggests it was painted no earlier than the early 18th century. Although these pigments were employed widely across Europe, the preparation layers may reflect unusual practices for the region. An unusual finding of the *Christ Child* was the presence of clay as the primary ground layer in the drapery, as this does not fall into any expected European regional practices. The use of the clay layer was most likely to smooth out the rough and uneven wood surface, similar to the role of the coarse gypsum layer in Italian (*gesso grosso*) and Spanish (*yeso grueso*) polychrome sculptures. [Cennini, ca. 1400, Pacheco 1649, Santos Gómez et al. 2008] The upper calcium sulphate layer observed in the *Christ Child* drapery would then serve the same purpose as the fine *gesso sottile* (*yeso mate*), whose role is to provide a finer surface for the application of the subsequent paint layer(s). Assuming that ground preparation layers generally employ locally available materials, one area for further research might be to measure the trace and/or isotopic distribution of elements within the clay layer to identify its geographic source. Future technical studies on more objects would provide a better understanding of whether this clay ground layer was common and may form a basis for more secure attribution.

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Materials

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References

Bassett, J. and Alvarez, M.-T. 2011. 'Process and collaboration in a seventeenth-century polychrome sculpture: Luisa Roldan and Tomas de los Arcos'. *Getty Research Journal* 3 (2011), 15-32.

Berrie, B.H. 1997. 'Prussian blue'. In: Fitzhugh, E.W. (ed.) *Artists' Pigments: A Handbook of Their History and Characteristics (Vol.3)*. Washington D.C., National Gallery of Art, 295-339.

Camberari, M. 2002. '29. Unknown Italian Artist. *Christ Child*'. In: Fogelman P. and Fusco P. with Camberari M., *Italian and Spanish Sculpture: Catalogue of the J. Paul Getty Museum Collection*. Los Angeles: The J. Paul Getty Museum, cat. 29, 232-237.

Cennini, C. ca 1400. *The Craftman's Handbook "Il Libro dell'Arte"*. Thompson, D.V. (translation 1933). New Haven, Connecticut: Yale University Press.

Clarke, M. 2001. *The Art of All Colours: Mediaeval Recipe Books for Painters and Illuminators*. London: Archetype.

Gettens, R.J. and Fitzhugh, E.W. 1993. 'Azurite and blue verditer'. In: Roy, A. (ed.) *Artists' Pigments: A Handbook of Their History and Characteristics (Vol.2)*. Washington D.C., National Gallery of Art, 23-33.

Kargère, L. and Rizzo, A. 2010. 'Twelfth-Century French Polychrome Sculpture in The Metropolitan Museum of Art: Materials and Techniques'. *Metropolitian Museum Studies in Art, Science, and Technology* 1 (2010), 39-72.

Larson, J. 1988. 'The treatment and examination of polychrome Chinese sculpture at the Victoria and Albert Museum'. In: Mills, J. et al. (eds.) *The Conservation of Far Eastern Art: Preprints of the contributions to the Kyoto Congress, 19-23 September 1988*. International Institute for Conservation of Historic and Artistic Works, 120-125.

Laver, M. 1997. 'Titanium dioxide whites'. In: Fitzhugh, E.W. (ed.) *Artists' Pigments: A Handbook of Their History and Characteristics (Vol.3)*. Washington D.C., National Gallery of Art, 295-339.

Magnani, L. 2001. 'La scultura dale forme della tradizione alla liberta dello spazio barocco'. In: *Genova nell'eta barocca* (exhibition catalogue). Bologna: Nuova Alta, 291-302.

Pacheco, F. 1649. 'Arte de la Pintura'. In: Zahira Véliz, (ed. and trans. 1986) *Artists' Techniques in Golden Age Spain: Six Treatises in Translation*. Cambridge: Cambridge University Press, 31–106.

Pflästerer-Haff, C. 2004. 'Ignaz Günther's Guardian Angel in the Civil Hall Church in Munich: Results of the Technical Examination'. In: Kühlenthal, M. and Miura, S. (eds.) *Historical Polychromy: Polychrome Sculpture in Germany and Japan.* Munich: Hirmer Verlag, 80-104.

Richter, M. 2004. 'The Monjû-bosatsu at the Museum of East Asian Art in Cologne'. In: Kühlenthal, M. and Miura, S. (eds.) *Historical Polychromy: Polychrome Sculpture in Germany and Japan.* Munich: Hirmer Verlag, 300-321.

Sanguineti, D. 1998a. 'Scultura ligna Genovese: I fratelli Galleano, Giovanni, Maragliano e gli altri'. In: *Antologia di Belle Arti* (vol. 55-58), Turin: Umberto Allemandi, 52-67.

Sanguineti, D. 1998b. *Anton Maria Maragliano*. Milan: Sagep, 148-152.

Santos Gómez, S., San Andrés Moya, M., and Rodríguez, A. 2008. 'Reconstruction of documented preparation methods of *gesso grosso* and *gesso sottile* in Spanish School panel paintings'. In: Kroustallis, S., Townsend, J.H., Cenalmor Bruquetas, E., Stijnman, A., and San Andres Moya, M. (eds) *Art Technology - Sources and Methods: Proceedings of the second symposium of the Art Technological Source Research study group*. London: Archetype Publications, Ltd., 178-181.

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The crucifix from Kvikne Church: investigation of the construction methods and workshop traditions of a group of Norwegian medieval polychromed sculptures.

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Abstract

The four crucifixes from Kvikne, Horg and Rennebu churches have been classified based on the construction method of the arms, in addition to their style and iconography. Further, the crucifixes have been linked to the same workshop in the medieval city of Trondheim. The objective of the present study was to investigate the foundation for the classification of the crucifixes. The examination and treatment of the crucifix from Kvikne Church at the Norwegian Institute for Cultural Heritage Research (NIKU) instigated further investigation of the crucifixes from Horg and Rennebu churches. The investigations were based on visual examination of the construction method, studies of archival materials and a review of historical source material. The re-examination of the crucifixes revealed inconsistencies in the previous descriptions of the construction methods. In addition, there was no indication that the crucifixes originated from the same workshop in Trondheim.

Keywords: crucifix, medieval polychrome sculpture, construction methods, workshop traditions

Introduction

The four crucifixes from Kvikne, Horg and Rennebu Churches have previously been classified by art historian Martin Blindheim (1916-2009) using similarities in the arm construction method. Based on these technical similarities, in addition to their dating and geographical proximity, the crucifixes were linked to a late 12th century workshop in the city of Trondheim. [Blindheim 1998, 30-31] It became apparent after a technical examination of the crucifix from Kvikne (from now on called Kvikne) (Figure 1) by the authors that their observations of the arm construction were incoherent with what was described by Blindheim. Based on the findings on Kvikne, the three other crucifixes classified by Blindheim as belonging to the same workshop were further investigated. Figures 2 to 4 show the crucifixes from Horg Church (from now on called Horg I and Horg II) and Rennebu Church (from now on called Rennebu) were initiated (Figures 2-4). The results of the technical examination of Kvikne were compared to those from the three other crucifixes. [1] The aim of this paper is to investigate the foundation for the classification of the crucifixes from Kvikne, Horg and Rennebu and the possible connection to a workshop in Trondheim, shedding new light on the existing classification.

Classification and historical sources

There are approximately 100 crucifixes in Norwegian churches and museums dating from 1100-1300. [Frøysaker 1997, 60] (Figure 5) Together with Horg I, Horg II and Rennebu, Kvikne is amongst the oldest preserved Norwegian polychrome wooden crucifixes. Blindheim's catalogue of 62 Norwegian painted wooden sculptures, dating from circa 1100-1250, still remains the most complete survey of these objects. [Blindheim 1998] Blindheim discusses the technical aspects of the objects, in addition to the stylistic and iconographical development of the sculptures. The catalogue entries include technical information such as descriptions of the construction method.

However, Blindheim does not specify when and under which conditions the technical data was collected.

Written historical source material related to Norwegian medieval paintings and polychrome sculpture is scarce. What is known is derived from a handful of sources that are well described elsewhere. [Plahter et al. 2004, Blindheim 1998, Wiik 1995, Plahter 1992] In the context of this research project, the authors are only interested in the sources that can reveal information on the medieval workshops and working methods of the makers of the polychrome sculptures.

Figure 1. The crucifix from Kvikne Church. Photo: Birger Lindstad, 2011. © NIKU.

Figure 2. Horg II from Horg Church. Photo: Per FredriksenThe Museum of Natural History and Archaeology, NTNU.

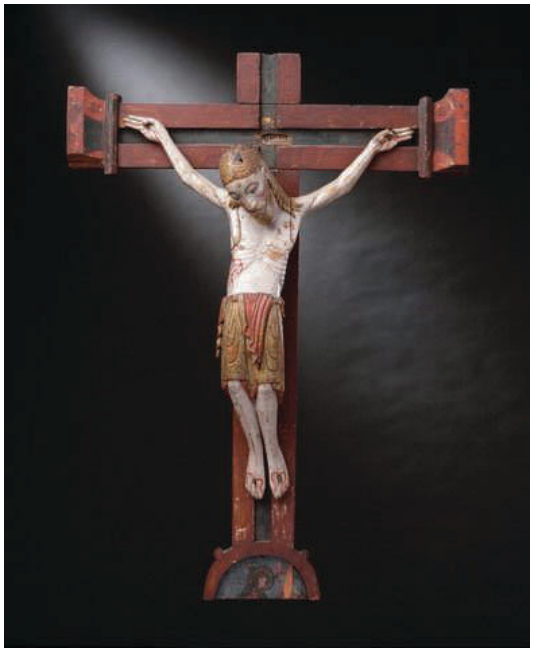


Figure 3. Horg I from Horg Church. Photo: Per Fredriksen, The Museum of Natural History and Archaeology, NTNU.

Figure 4. The crucifix from Rennebu Church during conservation treatment. Photo: Stephan Tsudi Madsen, 1960. ©The Directorate for Cultural Heritage.

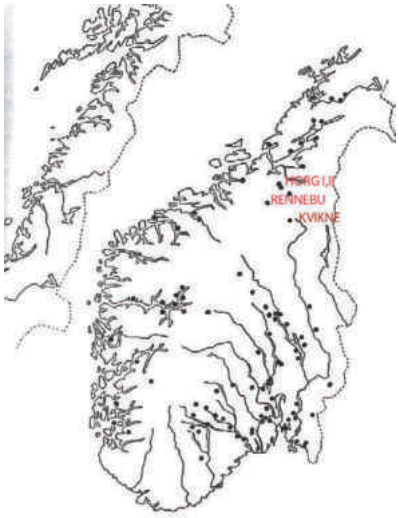


Figure 5. Map of Norway with polychromed wooden crucifixes from 1100-1300 (after Frøysaker 1997, 61).

Figure 6. Map of dioceses in Norway ca. 1100-1300 (after Brendalsmo 2006, 42).

The city law of Bergen from 1296 is the only source where the organisation of painters is mentioned. The law has regulations for different crafts, and where in the city they were allowed to live and sell their goods. [Grieg 1936, 56] This text indicates the start of a guild organisation in Bergen. It is uncertain to which extent this law can be transferred to other cities in Norway, althougth from this text, it can be assumed that there was some sort of organisation of craftsmen working with paintings. It is not known if Bergen, the largest and most important city at the time, was an exception or if the same was true for Trondheim.

The Icelandic encyclopaedia Alfrædi Islenzk dating from the 14th century contains a chapter concerning the making of polychrome sculptures, Likneskjusmið. Information therin has been compared to the technical findings of Norwegian medieval paintings and polychrome sculptures. [Plahter 1992, Wiik 1995] The Icelandic text does not make remarks on the carving of the sculptures, but it does give advice on the seasoning of the wood: how it should be well dried before carving and how to deal with cracks in the wood. [Wiik 1995, 330] These instructions could be interpreted as an indication that the carving and the painting were performed by people working closely together, for instance in a single workshop.

The extensive multidisciplinary effort that resulted in the publication *Painted Altar frontals of Norway from 1250-1350* [Plahter et al. 2004] is an important new source on medieval technique and materials. It contains both technical descriptions [Plahter 2004] and a discussion of the context in which the altar frontals were made. [Hohler 2004] This information is transferrable to the polychrome crucifixes when it comes to painting technique and materials, but not to the construction methods.

An overall methodical technical study of Norwegian painted wooden sculptures has not yet been published. Kaja Kollandsrud has over long period (1990s-2000s) worked on a systematic study of the Norwegian wooden sculptures dating from 1100-1350 at the Museum of Cultural History at the University of Oslo. She has already published parts of her findings. [Kollandsrud 1999, 2002, 2006] This work is an invaluable contribution to the field, especially when it comes to the understanding of the production of these objects.

The archival materials used in this study by the authors are old conservation reports and photographs. Since the written sources on technique and workshop organisation in medieval Norway are scarce, the examinations of the objects become even more important. Kvikne was

examined before and during the conservation treatment. This sculpture was studied using an infra-red (IR) camera and digital X-ray equipment. [Stein 2011] [2] The Horg I, Horg II and Rennebu sculptures were not X-radiographed. The visual examinations of these crucifixes were performed in situ at the Museum of Natural History and Archaeology in Trondheim and on the chancel screen in Rennebu Church, respectively.

Documentation of the construction technique

Tables 1 and 4 show the results of the current examination of these sculptures. [3] The examination of Kvikne revealed that the sculpture is constructed of at least five main elements, possibly seven. The main body is made from one piece and the arms are constructed out of two or three pieces each. The arms are lodged into the shoulders from the side with a mortise and tenon joint; this joint construction includes a large piece of the breast muscle. Each arm is reinforced on the underside with a piece of wood from the elbows to the breast muscle. In addition, a separate piece of wood is inserted underneath the armpit area. Later repairs and overpaint cover the area and make it difficult to say with any certainty whether this is a separate piece or not. The X-radiograph shows the dominance of the opaque, lead based overpaint that only parts of the construction and other elements can be determined. [Stein 2011]

Tables 2 and 3 show the position of the arm joints on all sculptures, and the number of dowels present on Kvikne. Kvikne has eight visible dowels, possibly two more covered by overlaying paint. Only two of the dowels are visible in the X-radiographs. In contrast, Blindheim described the construction of Kvikne as '… made of three pieces of wood, the body and both arms'. [Blindheim 1998, 51] The reinforcement on the underside is mentioned, but not as a separate piece. The inserted piece of wood underneath the armpit area is not mentioned at all, neither are the dowels.

The visual examination of Rennebu showed that the sculpture consists of three main elements: the main body and two separate arms lodged into the shoulders from the side with mortise and tenon construction. Rennebu appears to have no dowels. In contrast, Blindheim described the construction of Rennebu as '… carved from three pieces of wood, the body and both arms. Arms lodged into the shoulders from the side and pegged'. [Blindheim 1998, 51] Here Blindheim mentions the use of pegs, which were not visible when observing the sculpture.

Horg I and Horg II consist of three main elements: the main body and two separate arms lodged into the shoulders from the side with mortise and tenon joint construction, including a large piece of the shoulder and breast muscle. Horg I has one visible dowel, but it is likely that there are at least two, one in each joint, as on Horg II. These observations are consistent with the descriptions made by Blindheim.

To summarise, the authors' examination showed that the following statement from Blindheim is questionable:

'… unlike all other crucifixes in Norway, the arms of these Christ figures are carved together with a large piece of the shoulder and breast muscle of one single piece of wood, thus securing the stability of the arms much better than with the old tenon method. It is most reasonable to assume this technique was practiced in a workshop in late 12th century Trondheim'. [Blindheim 1998, 30]

Table 1. Construction features.

Crucifix	Method	Arm construction	Dowels in arm construction	Number of elements	Measurements
Kvikne Ca. 1200	IR X-radiography Visual Cross-sections	Original arms. Mortice and tenon joints	8 (10) visible dowels	Trunk in one piece. Each arm consists of two (possibly three) pieces.	H: 100 cm W: 85 cm
Horg I Ca.1150 -1200	Visual	Original arms. Mortice and tenon joints	1(2) visible dowels	Trunk in one piece. Two separate arms.	H: 52 cm W: 43 cm
Horg II Ca. 1150-1200	Visual	Original arms. Mortice and tenon joints	2 visible dowels	Trunk in one piece. Two separate arms.	H: 72 cm W: 68 cm
Rennebu Ca. 1180-1200	Visual Earlier conservation report [Damann 1960]	Original arms. Mortice and tenon joints	0 visible dowels	Trunk in one piece. Two separate arms. Crown of thorns (secondary)	H: 58 cm W: 51 cm

Table 2. Arm construction methods

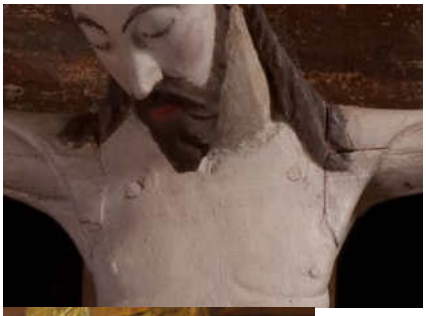
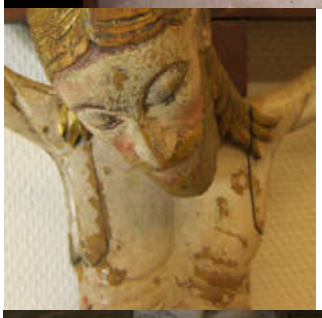
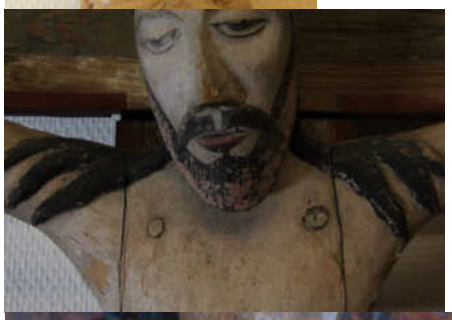
Kvikne		
Horg I		
Horg II		
Rennebu		

Table 3. Schematic drawing of arm construction and dowels for Kvikne.

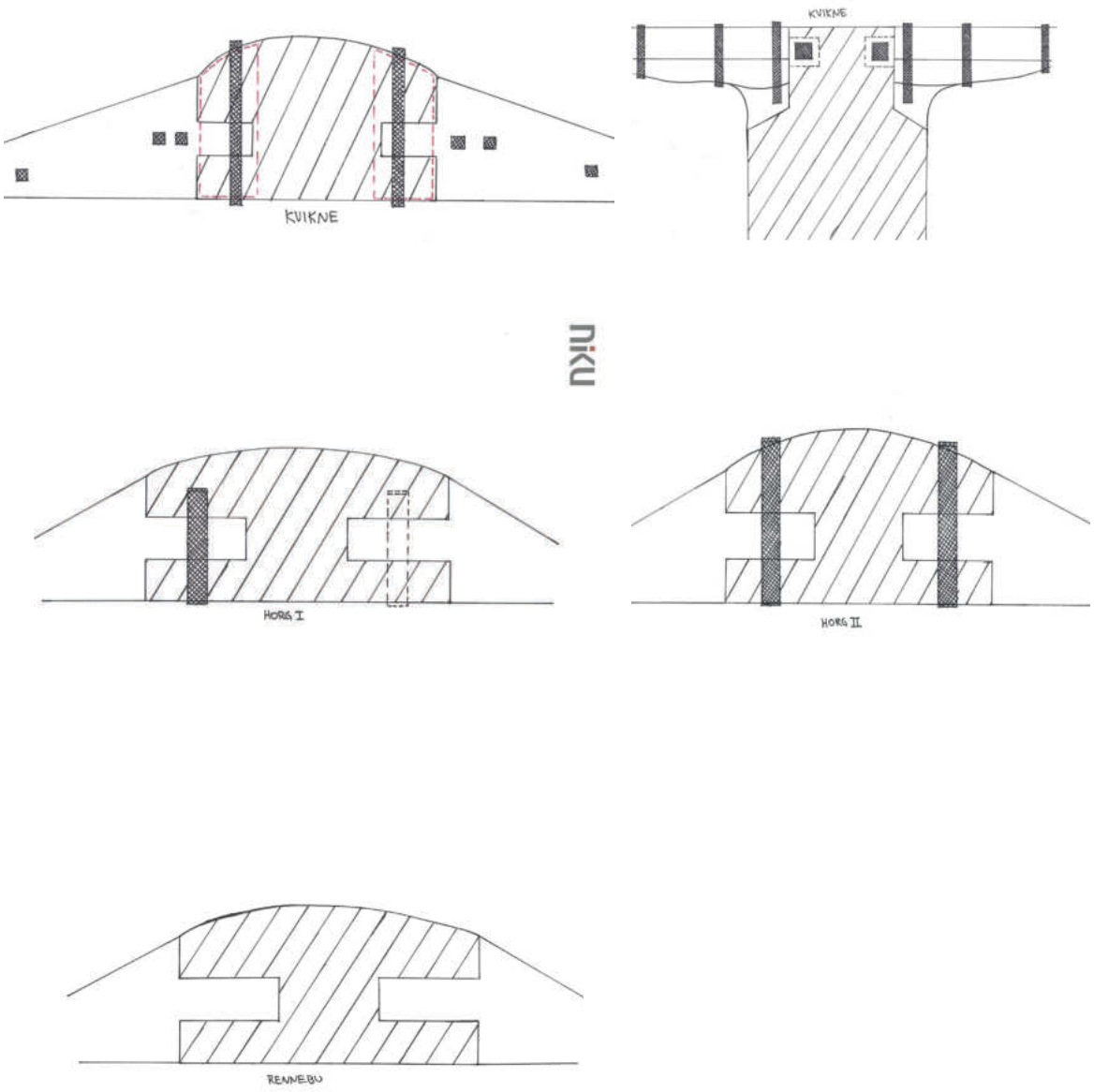


Table 4. Style and iconography.

Crucifix	Hair and beard	Loincloth	Facial features	Head
Kvikne Ca. 1200	Originally brown, shoulder length hair centrally parted with 3 coils over the shoulders.	Originally silver with yellow glaze. Blue overpaint. V-shape in front. Knot on right side.	Eyes are overpainted. Possibly half open or closed eyes originally Fully exposed ears.	Bareheaded
Horg I Ca.1150-1200	Gilded, shoulder length hair centrally parted with 3 coils over the shoulders	Gold. Red lining with black contours. V-shape in front. Knot on right side.	Partially open eyes, painted in brown with blue iris. Fully exposed ears.	Bareheaded
Horg II Ca. 1150-1200	Black, shoulder length centrally parted with 2 coils over the shoulders	Possibly tinfoil with glaze (very degraded). Red lining. V-shape in front. Knot on right side.	Partially open eyes, painted in black with blue iris. Fully exposed ears.	King's crown
Rennebu Ca. 1180-1200	Black, shoulder length hair centrally parted with 3 coils.	Patterned (blue, red, yellow, green and metal foil) with red lining. Original or first layer of overpaint. V-shape in front. Knot on right side.	No remnants of paint on the eyes. Fully exposed ears.	Secondary crown of thorns. Probably king's crown originally

Discussion

The objective of this paper is to investigate foundations for the classification of the crucifixes from Kvikne, Horg and Rennebu and the possible connection to a workshop in Trondheim. The examination of Kvikne, Horg I, Horg II, and Rennebu revealed information regarding the construction technique of Kvikne and Rennebu that questions the classification made by Blindheim. Further, the results were not in support of Blindheim's assumption connecting the crucifixes to the same workshop.

However, it can be argued that variations in construction, style and iconography could be due to a difference in background and training of the craftsmen. On the other hand, similarities between crucifixes may be due to other reasons than a common place of production. Style and iconography can fairly easily be transferred through other channels like model books or through the copying of other works.

According to Blindheim the crucifixes from Kvikne, Horg and Rennebu '… are mainly related through the technique in fastening the arms to the body, and only to a lesser degree by style and iconography'. [Blindheim 1998, 30] However, the recent examinations of the sculptures revealed that the construction techniques of the arms are dissimilar. Horg I, Horg II and Rennebu are similar in the respect that each arm is cut from one piece of wood. The arms on Kvikne, on the other hand, are made from several pieces of wood. On Kvikne, Horg I and Horg II there is no doubt that a large section of the shoulder and breast muscle is carved together with the arms. However, the arms on Rennebu are fixed straight to the main body, not including the shoulder or breast muscle (Table 3). In addition, Rennebu differs because the arms are apparently not secured with dowels. When considering the way the arms are fastened to the main body the data obtained in the current study deviates from the information published by Blindheim.

In addition to constructional features, Blindheim bases the classification on the geographical proximity of the crucifixes. They are all from churches in the same area in mid-Norway, near Trondheim. However, this information alone does not support an attribution to a regional workshop. In the authors' opinion, attributions should be founded on technical investigations paired with classification of stylistic elements and iconography.

There are similarities between the technique used on the medieval painted altar frontals and the painted wooden sculptures. [Plahter 2004, 192] Thus, it is not unlikely that they were made in the same environment. However, the technical and art historical examination of the medieval painted altar frontals executed by Plahter et al. did not reveal information that could be used to attribute any of the objects to a Trondheim workshop. [Hohler 2004, 69]

Paintings conservator Kaja Kollandsrud considers it likely that the Norwegian carvers and painters of wooden sculptures were trained as apprentices in workshops in the same way as in the rest of Europe at the time. [Kollandsrud 2002, 127] The assumption is made based on the examination of the medieval collection at the Museum of Cultural History at the University of Oslo. However, there is currently not sufficient information to make more specific workshop attributions based on the objects themselves.

It has been suggested that the workshops were tied to the dioceses, to the masons and carpenters site-shop by the cathedral. [Frøysaker 2001, 13; Blindheim 1998, 52] The dioceses were the foundation of the growing cities in this period and could provide the economical foundation necessary for organised crafts like painting and woodcarving. Norway had five dioceses, and the cathedral in Trondheim was the archbishop's seat (Figure 6).

A cathedral workshop housed the craftsmen building and maintaining the cathedrals. It is not known whether painters and woodcarvers operated in the cathedral workshop, as the main function was to build and decorate the stone cathedral. If the woodcarvers worked in the

cathedral workshop, one would expect some degree of similarity between the stone sculptures and the wooden sculptures. But, as yet, there has not been made a thorough comparative survey of the contemporary stone and wood sculptures in Trondheim. [Hohler 2004, 69] Until more is known about the connections between the stone sculpture and the wooden polychrome sculpture, or sources come to light, confirming or connecting the woodcarvers and painters of polychrome sculpture to a cathedral workshop is not possible.

Conclusion

In conclusion, the re-examination of the crucifixes Kvikne, Horg I, Horg II and Rennebu has revealed previously undocumented information regarding the construction technique of the arms. The results of the current examination differed from the technical information found in the art historical literature. In addition to contributing to the body of knowledge about these specific sculptures, this illustrates how the conservator can contribute with technical examinations that can shed new light on classifications of medieval polychrome sculptures.

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Endnotes

1. It is not within the scope of this study to compare Kvikne, Horg I, Horg II and Rennebu with sculptures outside the group (Figure 5). Neither is it a goal to make new attributions or alternative classifications. The authors' intent is merely to document the data that can be drawn from the source materials by re-examining the objects.

2. Digital X-ray equipment was provided by Industrial Control Machines 120.

3. A study of the crosses has not been included in this paper due to the scope of the project.

References

Blindheim, M. 1998. *Painted Wooden Sculpture in Norway c.1100-1250*. Oslo: Scandinavian University Press.

Brendalsmo, A. J. 2006. *Kirkebygg og kirkebyggere. Byggherrer i Trøndelag. Ca. 1000 – 1600*. Oslo: Unipub forlag.

Damann B. 1960. *Restoration report*. Oslo: Directorate for Cultural Heritage Archive.

Frøysaker, T. 2001. 'Hvordan middelalderens krusifikser ble laget'. In: Brendalsmo, A. J., Frøysaker, T. and Jensenius J. H (ed.) *Kors og krusifiks. Tre utsnitt av deres historie*. NIKU Publikasjoner 105. Oslo: NIKU, 13-22.

Frøysaker, T. 1997. 'Otterøykrusifikset- kilde til middelalderhistorie'. In: Dybdahl, A. (ed.) *Middelalderforskningens mangfold. Seminarer ved Senter for middelalderstudier*. Trondheim: Tapir, 59-88.

Grieg, S. 1936. *Det norske håndverks historie* (2 volumes), vol. 1. Oslo: Norges håndverkerforbund i kommisjon hos Grøndahl & Søn.

Hohler, E. B., 2004. 'The frontals in their contemporary society'. In: Plahter, U., Hohler, E.B., Morgan, N.J. et al. (ed.) *Painted Altar Frontals of Norway 1250-1350* (3 volumes) vol. I. London: Archetype Publications Ltd., 66-78.

Kollandsrud, K. 2006. 'New light on the Virgin from Veldre, the Virgin from Østsinni and the Crucifix from Tretten'. In: Nadolny, J., Kollandsrud, K., Sauerberg, M.S. et al (ed.) *Medieval painting in northern Europe: Techniques, analysis, art history. Studies in commemoration of the 70th birthday of Unn Plahter*. London: Archetype Publications Ltd., 76-90.

Kollandsrud, K. 2002. 'Technological mapping of Norwegian polychrome wooden sculpture, 1100-1350: a preliminary overview'. In: Hofseth, E. H. (ed.) *UKM - en mangfoldig forskningsinstitusjon*. Oslo: UiO Museum of Cultural History, 125-42.

Kollandsrud, K. 1999. 'Systematic mapping of Norwegian wooden polychrome sculpture, dating from 1100 to 1350'. In: Shieβl, U. (ed.) *Polychrome sculpture in Europa: Technologie, Konservierung Restaurierung.* Dresden: Hochschule für Bildende Künste, 40-46.

Plahter, U., Hohler E. B., Morgan, N. E., et al. 2004. *Painted Altar Frontals of Norway 1250-1350* (3 volumes). London: Archetype Publications Ltd.

Plahter, U. 2004. Volume 2: *Materials and technique.* In Plahter, U., Hohler, E.B., Morgan, N.J. et al. (ed.) *Painted Altar Frontals of Norway 1250-1350* (3 volumes) vol. I. London: Archetype Publications Ltd.

Plahter, U. 1992. 'Líkeskjusmíð: Fourteenth century instructions for painting from Iceland'. Zeitschrift für Kunsttechnologie und Konservierung, 2(1), 167-173.

Stein, M. 2011. 'NIKU Oppdragsrapport 39/2011. Røntgenundersøkelse av middelalderkrusifikset i Kvikne kirke, Tynset kommune'. Unpublished report. Oslo: NIKU.

Wiik, S. A. 1995. 'Líkeskjusmíð. Medieval polychrome technique in Iceland'. Zeitschrift für Kunsttechnologie und Konservierung, 9(2), 327-336.

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Use of sized cloth for the construction of polychrome sculpture in the German speaking area.

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Abstract

Sized cloth was used to complete the figural outline of sculptures or to substitute delicate parts of the carving. In some cases, entire statues could be made from stiffened cloth. The sized fabric was also useful to combine different materials like wood, straw, and wax; helping to create lightweight sculptures in an efficient, time-saving manner. Moreover, the technique served for restoration purposes. The cloth was usually dipped in a water soluble, liquid binder and arranged over an internal armature. After drying the stiffened, and arranged fabric was polychromed. The technique was apparently widely known as it is described by several treaties or by artists themselves. The sculptures that will be discussed in this paper mostly originate from the German speaking area and range from the 14th to 19th centuries with an emphasis on the 18th century, when the technique occurred more often. It was frequently used to help construct life-sized figures for ephemeral installations, processional sculptures, or temporary presentations.

Keywords: sized cloth, stiffened cloth, tela encolada, baroque, processional sculpture, ephemeral sculpture, polychrome sculpture

Introduction

Pieces and strips of canvas have been frequently glued to the surface of wooden sculptures to cover flaws or joints in the carving block. It is less known that the figural outline of sculptures was often completed with a stiffened cloth by sculptors. The material was used to substitute very delicate parts of the carving, or it served to form the entire drapery of a figure whose structure was made from otherwise different materials. Sometimes, artists have even created a complete formal aspects of a polychrome statue out of cloth.

For these purposes, the term 'cloth' refers to a flexible flat material formed by weaving thread or yarn that has been previously produced by spinning raw fibres of wool, flax, hemp, cotton, or other fibres. The term 'sized cloth' in English is derived from the Spanish/Portuguese *tela encolada* or the Italian *tela collata*. German written sources refer to this term as *geleimtes/leimgetränktes (*glued or sized*)* or rather *gesteiftes Gewebe* (stiffened cloth). The term 'sized' should only serve as a synonym for the more precise expression 'stiffened', considering the fact that the textiles can be solidified with a wide range of binding media, for example animal glue, natural gum, wax, starch paste or gesso. Nevertheless, the term 'sized cloth' has become common usage and will also be used in this article.

There are two basic techniques employing sized cloth: moulding and free modelling. To mould the fabric, it is first dipped into a liquid binding medium and then either put into a negative mould or laid around a positive mould or template. More often the binder-saturated cloth is freely modelled, arranged over an internal structure of various materials when wet and held in place with nails, pins or simply cords. Occasionally moulding and modelling are used together. After drying, a preparation layer is applied to the now rigid fabric and the process of polychromy follows, being rather similar to that of wooden sculptures.

Sources

This method has been scarcely reported in the last few decades (late 20th - early 21st century), and only a few authors have paid attention to the phenomenon from an art technological viewpoint. Gilca de Flores Medeiros and Eliane Monte present the results of their research in Brazil on a noteworthy website. [1] Other art technical publications in the Latin American area mention the technique and offer a wide range of object examples. [Ribera and Schenone 1948, Querejazu Leyton 1978, Gori and Barbieri 1993, Terán and Cazzaniga 1993] The main sources for further information on this technique are conservation projects that have been carried out in southern Europe or Latin America. [Lisner 1970, Melzl 1979, Hasbach Lugo and Carmen Garrido 1992, Vuyst and Beltrán 1992, Bianchi et al. 2000, Gambús et al. 2000, Russell 2002, Galassi 2005, Li Vigni Tusa 2007] Many of these remain unpublished, such as Claudia Bodach's interesting study regarding the use of textiles on baroque polychrome sculpture in Spain. [Bodach 2008] This publication will concentrate on lesser-known examples of sized cloth found in northern Europe, in particular the German speaking area, because the technique has been reported more fully in the Ibero-American area.

Early sources that mention the use of a mixture of flour paste and glue to stiffen cloth exist, such as the *Tegernsee Manuskript* printed around 1500. [Berger 1975, 197] Also Renaissance artists like Filarete, da Vinci and Vasari, as well as the Spaniard Pacheco (citing Vasari) mention the technique, specifically relating to work the drapery of artist's models (*bozetti*). The sources also suggest the use of paper or thin leather, instead of cloth, and liquid clay to make the material rigid. [Oettingen 1890, 654, Herzfeld 1909, 253, Maclehouse 1970, 150-1] An Italian sculpture, probably a *bozetto,* constructed using a method matching the instructions outlined by Vasari is described by Zindel. [Zindel 1992, 127]

Figure 1. Detail of a house altar with a lamentation scene, 1510/20, South Tyrol (Museum *Predigerkirche,* Eisenach, Germany) © B. Fuecker.

Examples in German speaking areas

Structure: Modelling

The easiest and most common way to employ this material in sculpture construction was to complement the figural outline, forming especially delicate edges or larger parts of the drapery of a sculpture. A clear example of this is the mantle of the *Miraculous Madonna* of Dimbach, Germany, dated 1398. The sized cloth used to form the reverse, centre and edges of the mantle can be distinguished. [Brückner 1978, 40-1] Another example is the 14th century *Pietá* from the *Dom* in Wetzlar, Germany. In this sculpture, the detached parts of the Madonna's mantle and some of the drapery around her arm are worked with stiffened fabric. [Pracher 2010, 42] Sculptors in the 15th and 16th centuries used the technique to form the loincloth on crucifixes, conforming to the hyper-realistic artistic trends of the time. [2] Examples can be found on the crucifixes of the monastery Rohr in Niederbayern, Germany [3], and the *Stiftskirche* Innsbruck-

Wilten, Austria. [Koller and Höring 2007, 126] Oher instances also exist, such as the small lamentation altarpiece Brixen area, dated around 1510/20. Here, the shroud of Christ lies on was formed by a piece of fairly coarse fabric (Figure1).

In the 18th century sized cloth begins to be used to form the entire drapery of figures. The technique is described in the treaty *Kunst- und Werckschul*, first published in Nuremberg in 1696. [Kunckel von Löwenstern 1705, 542] [4] In this case, the source describes how the initial inner structure was assembled using wooden staves arranged in a life-like posture which were given volume to create a body using padding made from woollen cloth stuffed with leather, tow, wool shavings, or other fillers. The clothing, sewn by a tailor, was cut to order, and soaked in a strong glue before being arranged over the substructure. Once dry, several layers of gesso were applied. Finally the formal aspects of the sculpture would be completed with the addition of head, hands and feet made of plaster or *papier mâché* are attached to complete the work.

Sauter describes thirteen life-sized baroque figures in the church St. Anna in Munich, Germany, with simple inner structures of fir wood sticks padded with straw, similar in technique to that described in the source above. [Sauter 2009, 161-7] Their clothes are entirely made from linen cloth. However, in contrast to the technique described by Kunckel, the clothing was not pre-sewn, but freely draped and fastened with nails to the inner armature. Additionally, the textile was dipped in gesso (instead of size) prior to modelling and the sculptures' extremities were carved from lime wood. Further examples of the technique described in the *Kunst- und Werckschul* can be found in the *Theatinerkirche* in Munich. Here, very similar construction techniques are used to assemble the two prophets. The process follows the source more closely as drapery was first soaked in size and then primed. [Wimmer 2007, 34-7]

The figures in the scene representing *Christ on the Mount of Olives* in Füssen, Germany appears akin in production technique to the figures from Munich (Figure 2). However, in this particular case the blue tunic had been pre-sewn and a fair amount of different fabric scraps seems to have served for padding the substructure.

Figure 2. ***Christ of a mount of olives,*** **Anton Sturm (?), 1720-30, height: 112 cm, church St. Mang, Füssen, Germany © B. Fuecker.**

Figure 3. ***Palmesel*****, Johann Kaspar Eberle, 1738, height: 161 cm, Friedberg bei Augsburg (Museum** ***Georgianum,*** **Munich, Germany) © B. Fuecker.**

The *Palmesel* kept in the *Herzogliche Georgianum* in Munich (Figure 3) differs from the previously mentioned examples. In this sculpture the body of Christ is entirely sculpted from wood, though in a coarse and simple manner, and therefore the pre-sewn gown was applied without any need of cloth padding. The application of the polychromy on the textile and wooden substrates followed after assembling the whole structure.

Several sculptures found as a part of the architectural decoration in the *Alte Kapelle* in Regensburg, Germany have been worked with sized linen cloth. The drapery, previously dipped into size, was draped over an inner structure made from wooden staves and metal wire, leaving the carved wooden head, hands and feet visible. The construction, including the carved areas, was covered in a gypsum preparation layer and polychromed in white. The surface contrast between the carved wooden parts and the matt drapery was achieved by polishing the surface. This technique is called *Polierweißfassung*. [Kühlental 2001, 33] The sculptor Simon Sorg (1719-1792) received payment for four of these sculptures in 1764. [Betz 1980, 79] Sorg might also have been the creator of a *Putto with Timpani* in the church St. Oswald in Regensburg (Figure 4). The figure is placed centrally on the organ case of an instrument which was finished in 1750. The drapery of this putto is entirely made of gilded sized cloth, formed to suggest that he is apparently frozen in an energetic movement.

Figure 4. *Putto with timpani,* around 1750, Organ case, church St. Oswald, Regensburg, Germany © G. Janßen.

Most of the sculptures mentioned so far show a combination of wood and sized cloth, although the material can be draped over structures of wax, clay, plaster, *papier mâché*, cork, amongst others [5]. Thus, the technique was exceptionally useful in combining materials of different nature. However, other materials were used to stiffen the cloth. Ritz mentions several waxen votive figures of the 18th century whose garments were partly made from textile stiffened with wax. [Ritz 1981, 4-5] The *Madonna with child* from Nestelbach bei Graz, Austria, dated to the first half of the 18th century shows a combination of wooden hands and heads cast in wax. The sized textile is arranged in several layers over an inner structure formed by a raw wooden nucleus partly padded with maize husks. The outer surface of the cloth is mostly covered by a layer of paper or *papier mâché* before being painted. The over-modelling of stiffened cloth with *papier mâché* is also described in a manual for making papier mâché sculptures first published in 1814. [6] This text suggested stiffening the cloth with thick flour paste instead of glue. [Auracher von Aurach 1822, 40-1]

Double-layer, water-soluble grounds have been found on a number of sculptures. The identification of the mineral *Steinkreide* (dolomite and calcite) as a component in the ground has been made repeatedly. [BDA 1992-94; Sauter 2009, 170; Wimmer 2007, 37] Polychromy usually remained rather simple, although all kinds of decoration was possible. In Spain, the sculptures were finished with rich gilding and *sgraffito* ornaments. Examples include the works of Francisco Salzillo. Furthermore, in some cases it was not only the drapery that was created with stiffened fabric. In the miraculous image *Wiesheiland*, in the *Wieskirche* in Steingaden, Germany, the torso, legs and arms partly are worked with cloth and padding, though hands and head remain sculpted in wood. (Figure 5) Unusually, an untreated textile loin-cloth is wrapped around the hip of Christ.

Structure: Moulding

If the entire sculpture was formed of rigid cloth, it was likely that a negative mould was used to achieve the form. Large wooden moulds, used to create almost life-sized waxen votive figures, exist. [Pfistermeister 1983, 274]. However, other materials, such as terracotta or metal, could have been used to create forms. Terán and Cazzaniga describe the technique of applying strips of sized cloth around a simple structure (made from wooden sticks and straw), which can be removed after drying, leaving a hollow figure. [Terán and Cazzaniga 1993, 31] Flores Medeiros, however, finds remnants of clay inside 'textile sculptures', proving that positive clay models were used too. [Flores Medeiros 1996, 405-6] Francescutti describes two large 16th century crucifixes made from several layers of fabric stiffened with gesso, which might have been formed in a negative mould in two longitudinal halves sewn together afterwards. She also assumes that the moulds have been cast from a 15th century wooden crucifix. [Francescutti 2006, 207-13]

The entire body of the late-gothic *Crucifix* (h: 136 cm) in the chapel of the *Katholische Akademie Bayern* in Munich has been made from sized fabric, covered with a superficial layer of paper. [Melzl 1979, 87] During a recent endoscopic examination, no inner armature could be detected. Since the body is modelled in a rather primitive manner, it is unlikely that a negative mould was used in this case. The figure is missing a loin-cloth that was most likely made from sized cloth. Another example in which moulds could have been utilised can be found in the Loreto monastery in Prague. Here, a baroque, large-sized *Crucifix* seems to be entirely made from cloth. (Figure 6) The rather undefined forms of the body suggest the use of moulds; the loin-cloth, however, must have been freely modelled.

Figure 5. *Wiesheiland,* after 1730, height: 128 cm, Wieskirche, Steingaden, Germany © B. Fuecker.

Figure 6. *Crucifix*, 18th century, Loreto Monastery, Prague, Czech Republic © B. Fuecker.

Restorations

Stiffened cloth was also used fairly often to refurbish sculptures, either for aesthetic or for reasons of reverence. In order to ensure modesty, naked forms of the Christ Child or *putti* were vested with loin-cloths made from stiffened fabric. (Figure 7)

The group of six sculptures from Bad Wurzach, Germany is striking. These devotional artworks were used in processions on feast days. Two of the lay figures are designed with articulated joints, indicating that these must have been originally dressed with real clothes. The fact that the joints are articulated suggests that the drapery (or clothing) would not have been stiff. The figures were carved with bald-heads, suggesting that 'real' hair would have been imitated with wigs. The existing wigs have been stiffened with glue or paste and are now fixed to the cranium. (Figure 8) The reworking might have been carried out due to church regulations imposed in the late 18th century, when the enlightened Catholics urged the parish to remove all 'obscene' figures from their churches. The Habsburg monarch Joseph II even enacted a ban on all dressed sculptures in 1784. [Kropatschek 1786, 579-80] Substituting the real clothing with sized cloth must have saved the sculptures from destruction and to prolong their use in the festival processions.

Last but not least, in the 19th and 20th centuries mutilated gothic sculptures are known to have been restored with sized cloth, remodelling drapery that had been lost. The 14th century *Madonna* of the parish church Imbach, Austria is one of these known examples. [Zykan 1968, 187]

Figure 7. *Madonna with child, Allgäu,* 1475-1500 (Museum *Georgianum,* Munich, Germany) © B. Fuecker.

Figure 8. *St. Anne with virgin and child (Anna Selbdritt)*, 18th century, height: 133 cm, church St. Verena, Bad Wurzach, Germany © B. Fuecker.

Conclusion

All in all, the use of sized cloth for the construction of polychrome sculpture was neither limited to the Ibero-American or Italian areas, nor was it restricted to a certain time period. The material and technique was useful for many reasons: it allowed the creation of multi-material constructions or the easy formation of delicate parts drapery often difficult to carve. It served in particular to create lightweight sculptures for the use in processions (sculptures from Steingaden, Nestelbach, Bad Wurzach or the *Georgianum* in Munich are all made in this way), in temporary installations (as exemplified by figures from *St. Anna* or the *Theatinerkirche* in Munich or *St. Mang* in Füssen) or for architectural decoration (as seen in *Alte Kapelle* and organ case in Regensburg). The production is rather time-saving which made the technique also useful for the creation of

bozetti, as well as votive or ephemeral sculpture as in baroque *castri dolori* or celebratory decorations. The Bavarian sculptor Andreas Faistenberger even used a similar technique for theatre props at the end of the 17th century. [Löwenfelder 1955, 61-2] Analogies to the manufacture of - especially Italian – nativity scenes are obvious and have been mentioned in the corresponding literature. As described above sized cloth also served for restoration or reworking purposes. Due to the fragile nature of the constructions only few examples of the versatile technique survived to the present day and are now seen as a rare curiosity - which they might not have been after all.

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Endnotes

1. Flores Medeiros, G. and de, Monte, E. '*Obras em tela encolada*': URL http://www.conservacao-restauracao.com.br/tela_encolada.htm (accessed: 2012-05-01).

2. Many crucifixes of the late 15th century in Tuscany also have loincloths made from stiffened fabric. The technique is also very common in Spain with a countless number of examples from the 17th century onwards. One of the most famous of these is the *Cristo de la Misericordia* dated 1695 by José de Mora, chapel *San José,* Granada.

3. The sculpture is currently (2012) being investigated by Anna Rommel at the TU Munich. Rommel correlates the visible loincloth to a later reworking of the sculpture in the 17th century. However, this might be a replacement of an older textile loincloth.

4. This interesting source has been recently digitalised: http://diglib.hab.de/drucke/oc-77-1/start.htm?image=00554 (accessed 2012-03-03).

5. In the Ibero-American area sized cloth is also frequently combined with structures made from *pasta* (malleable paste of different contents), *maguey* (agave stumps), or *caña* (maize stalks).

6. The corresponding part of the manual: 'Sowohl bei den kleinen als auch bei den großen Figuren wird das Kleid, der umgeworfene Mantel oder sonst eine Draperie von Leinwand zugeschnitten, mittelst eines Fadens in die erforderlichen Falten zusammengezogen, die inwendige Seite mit etwas dickem Mehlkleister bestrichen und mit der nassen Seite auf die betreffenden Theile der Figur gelegt.(…) Hohlfalten (…) mit der teigartigen Masse [papier mâché] ausgefüllt und ausgeglichen, und hie und da dadurch Ausgleichungen veranlaßt, die dieses Gewand der Arbeit des Bildhauers näher bringen.'

References

Auracher von Aurach, J. 1822. *Neue Erfindung eine feuchte, teigartige Masse aus geringem Materiale zu verfertigen, die nach vollendeter Austrocknung die Härte des festesten Holzes übersteigt.* 2nd ed. Vienna.

BDA (Bundesdenkmalamt) Vienna 1992-4. *File W 8475*, *Nestelbach bei Graz*, Vienna: Bundesdenkmalamt.

Berger, E. 1975. *Quellen und Technik der Fresko-, Oel- und Tempera-Malerei des Mittelalters*. Walluf bei Wiesbaden: Sändig.

Betz, K. 1980. *Simon Sorg: 1719 - 1792; Hofbildhauer der Fürsten Thurn und Taxis; ein Regensburger Meister des bayerischen Rokoko.* Kallmünz: Lassleben (Thurn und Taxis-Studien 12).

Bianchi, A., Conti, I., Cremonesi, P. et al. 2000. Le sculture e l'impalcata: problemi e metodi di intervento per i manufatti polimaterici. In: Museo del Palazzo Ducale Mantua 2000. *Mira il tuo popolo: statue votive del Santuario di Santa Maria delle Grazie: Exposition of the Museo del Palazzo Ducale Mantua 11 febbraio-2 aprile 2000*.

Bodach, C. 2008. 'Die Verwendung von Textilien bei der Herstellung polychromer barocker Sakralskulptur in Spanien'. Seminararbeit. Hochschule für Bildende Künste Dresden.

Brückner, W. 1978. *Gnadenbild und Legende:Kultwandel in Dimbach.* Würzburg.

Herzfeld, M. (tr.). 1909. da Vinci, L. *Traktat von der Malerei.* Jena: Diederichs.

Flores Medeiros, G. de 1996. 'Our Lady of Delivery: Restoration of a tela encolada Sculpture'. In: *Preprints of the 11th Triennial Meeting of the ICOM Committee for Conservation (Vol.1).* Edinburgh: International Council of Museums, 405–409.

Francescutti, E. 2006: 'Crocifissi "a pesto" nella città di Pordone: anticipazioni di tecnica e restauro'. In: Goi, P. (ed.) *In hoc signo: Il tesoro delle croce; [mostra storico-artistica di oreficerie, sculture, dipinti, miniature, stampe, tessuti e fotografie dall'età paleocristiana al XX secolo fra Livenza e Tagliamento, Pordenone e Portogruaro, 4 aprile - 31 agosto 2006, itinerari a Venezia).* Milano: Skira, 207–223.

Galassi, C. (ed.) 2005: *Sculture "da vestire": Nero Alberti da Sansepolcro e la produzione di manichini lignei in una bottega del Cinquecento.* Exhibition catalogue. Perugia, Mailand: Electa.

Gambus, M., Genestar, C., Paloub, J., et al. 2000. 'Madera, corcho y tela encolada como soportes de la escultura policromada'. In: *XIII Congreso de Conservación y Restauración de Bienes Culturales del ICOM Comite de Espana.* Lleida: ICOM, 475–481.

Gori, I. and Barbieri, S. 1993. 'Técnicas y caracteristicas esteticas, estilisticas e iconográficas de la imaginería de los siglos XVII-XX en el territorio Argentino'. *Zeitschrift für Kunsttechnologie und Konservierung* 7 (1), 1–68.

Hasbach Lugo, B. and del Carmen Garrido, M. 1992. 'Technique and Restoration of three Sculptures by Pedro de Mena'. In: Hodges, H.W.M., Mills, J.S., Smith, P. (Ed.): *Conservation of the Iberian and Latin American Cultural Heritage: Preprints of the Contributions to the Madrid Congress 9-12. September 1992.* London, 68–71.

Koller, M. and Höring, F. 2007. 'Spätgotische Kruzifixe mit echten Haaren in Österreich'. In: IIC Sektion Österreich (ed.): *Gefasste Skulpturen: Mittelalter II.* Klosterneuburg: Verlag Stift Klosterneuburg (Restauratorenblätter, 26), 121–131.

Kropatschek, J. 1786. *Handbuch aller unter der Regierung des Kaisers Joseph des II. für die K.K. Erbländer ergangenen Verordnungen und Gesetze: in einer systematischen Verbindung enthält die Verordnungen und Gesetze vom Jahre 1784.* vol.6. Wien: Moesle.

Kühlenthal, M. 2001. 'Die Raumfassung der Alten Kapelle'. In: *Die Alte Kapelle in Regensburg.* München (Arbeitshefte des Bayerischen Landesamtes für Denkmlapflege), 31–40.

Kunckel von Löwenstern, J. 1705. *Der Curieusen Kunst- und Werck-Schul erster Theil: lehrend allerhand sehr nützliche und bewährte Feuer-Künste (…).* 2nd edn. Nürnberg: Zieger.

Li Vigni Tusa, V. P. 2007. *Il colore ritrovato: Il restauro di quattro gruppi statuari dei Misteri di Trapani.* Palermo.

Lisner, M. 1970. *Holzkruzifixe in Florenz und in der Toskana: Von der Zeit um 1300 bis zum frühen Cinquecento.* München: Bruckmann (Italienische Forschungen Folge 3, 4).

Löwenfelder, G. 1955. 'Die Bühnendekoration am Münchner Hoftheater von den Anfängen der Oper bis zur Gründung des Nationaltheaters 1651-1778: Ein Beitrag zur Münchner Theatergeschichte'. Ph.D. Dissertation. Ludwig Maximilians Universität München.

Melzl, E. 1979. 'Die Untersuchung des Kruzifixes aus der Katholischen Akademie Bayern'. In: *Jahrbuch der Bayerischen Denkmalpflege* 33, 83–88.

Oettingen, W. von (Ed.) 1890. *Antonio Averlino Filaretes Tractat über die Baukunst nebst seinen Büchern von der Zeichenkunst und den Bauten der Medici,* vol. XXIV. Wien.

Pfistermeister, U. 1983. *Wachs (Vol. 2).* Nürnberg: Carl.

Pracher, B. 2010. 'Das Vesperbild aus dem Dom zu Wetzlar'. In: Bergmann, Ulrike (Ed.): Frühe rheinische Vesperbilder und ihr Umkreis. Neue Ergebnisse zur Technologie'. In: Kölner Beiträge zur Restaurierung und Konservierung von Kunst- und Kulturgut (vol. 20), 39-44.

Querejazu Leyton, P. 1978. 'La escultura en maguey, pasta y tela encolada en Bolivia y Peru'. In: ICOM Comite de Espana (Ed.): *II Congreso de Conservación y Restauración de Bienes Culturales.* Teruel.

Ribera, A. L. and Schenone, H. 1948. *El arte de la imaginería en el Río de la Plata.* Buenos Aires.

Ritz, G. M. 1981. *Die lebensgrossen angekleideten Kinder-Wachsvotive in Franken*, (Volksglaube Europas, Bd.3.) Volkach: Hartdruck.

Russell, M. 2002. 'Four Spanish Polychrome Processional Sculptures from the early 18th Century and a Masterpiece in Focus'. In: *The Textile Specialty Group Postprints: Papers delivered at the textile subgroup session, 30th Annual Meeting.* Miami, 119–131.

Sauter, C. 2009. 'Die barocke Abendmahlsgruppe in der Münchner Damenstiftskirche St. Anna- 13 lebensgroße Figuren mit Gewändern aus gesteiftem Gewebe'. In: *Zeitschrift für Kunsttechnologie und Konservierung* 23 (2), 161–176.

Terán, C. M. and Cazzaniga, B. 1993. *Técnicas de la imaginería en el arte hispanoamericano.* Buenos Aires.

Maclehouse, L. (tr). 1970. Vasari, G., *Vasari on technique: Being the introduction to the three arts of design, architecture, sculpture and painting, prefixed to the lives of the most excellent painters, sculptors and architects.* New York: Dover Publications.

Vuyst, P. de and Beltrán, J. 1992. 'The Collection of Polychromed Sculptures of the Museo Fray Pedro Bedón in Quito'. In: Hodges, H.W.M.; Mills, J.S.; Smith, P. (Ed.) 1992: *Conservation of the Iberian and Latin American Cultural Heritage: Preprints of the Contributions to the Madrid Congress 9-12. September 1992.* London, 31–37.

Wimmer, M. 2007. 'Zwei Figuren von Andreas Faistenberger aus der Münchner Theatinerkirche'. Master thesis. Technische Universität München, Lehrstuhl für Restaurierung, Kunsttechnologie und Konservierungswissenschaften.

Zindel, C. 1992. 'Die "Madonna mit dem Pardelfell" von Jacopo Sansovino (1486-1570)'. In: *Zeitschrift für Kunsttechnologie und Konservierung* 6 (1), 95–138.

Zykan, M. 1968. 'Zwei gotische Madonnenstatuen und ihre Restaurierung'. In: *Österreichische Zeitschrift für Kunst und Denkmalpflege* 22, 171–188.

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Preliminary studies and conservation treatment of the polychrome sculpture '*Virgen con Niño*' of the Cathedral of Valencia, Spain.

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Abstract

In this study, the authors present the preliminary results of the investigation and restoration process of the sculpture *"Virgen con Niño"* (Madonna and Child) from the Cathedral of Valencia. The work belongs to the group of sculptures classified as 'ugly Virgins' created in the 15th century. All sculptures in this group have numerous repaintings, interventions and changes made in later centuries. The authors investigated the sculpture as a representative of the group using several techniques to document the artwork, such as X-radiography, infrared reflectography (IRR), ultraviolet fluorescence photography (UV). Additional techniques were used to determine the materials used, such as Scanning Electron Microscopy, coupled with energy dispersive X-ray analysis (SEM/EDX), and gas chromatography - mass spectrometry (GC-MS). Combining results of the analyses contributed to better understanding the original technology and materials used, and the location and identification of damages, deterioration and later interventions. The results of the investigations reveal exceptional craftsmanship, and allow a classification as a special example of International Gothic in Valencia. The preservation and appreciation of this unique sculpture promotes the approach and investigation of this stylistic group, a deepening of material and technical knowledge of their manufacture, as well as serving to enrich the study of the cultural heritage of the region.

Keywords: Restoration, Sculpture, Polychrome, Gothic Valenciano, Techniques and Materials, Conservation, Heritage Documentation.

Introduction

The masonry structure of the Cathedral of Valencia is the result of the juxtaposition of different artistic styles developed over centuries. It was built on the older Visigothic Cathedral that later became a mosque. According to documents, King James I, known as the 'Conqueror', bestowed the name of *"Nostra Dona Santa Maria de Valencia"* to the building, after entering and purifying the newly conquered city of Valencia on Saturday 9 October in 1238. It is a Gothic building planned with three naves, a transept, and a dome with a polygonal apse. The central naves were elongated between 1300 and 1350; later additions included the chapterhouse (1356-1369) and Miguelete Tower (1381-1425). The interior Gothic structure was replaced in the 18th century in a contemporary style, and the building suffered the consequences of the Spanish Civil War in the 20th century. Recently the building has undergone a further intervention – a major restoration of the profuse baroque ornamentation. During this process the spectacular Renaissance paintings of Paolo de San Leocadio, representing angels playing musical instruments, were discovered and

revealed. [Pérez and Abellán 2006] The three entrance doors to the building attest to the changes and evolution of architectural styles: a Romanesque door called "*L'Almoina*" ('alms' in Valencian dialect), situated near the house where relief was given to the needy; the clearly gothic '*Door of the Apostles*', constructed between the 13th and 14th centuries, named for the sculptures of the twelve apostles of Christ placed in the lancet arch; and finally, the baroque *"dels ferros"* door ('from irons'), made at the end of 17th century.

Figure 1. Initial Photography of the sculpture. Superficial dirt and overpaint covering the sculpture surface. Areas of consolidation with animal glue and Japanese paper applied in a previous restoration. © María José Rodríguez.

Figure 2. Line drawing. Location of the different damages on the sculpture prior to conservation. © María José Rodríguez.

In the rich heritage of the Cathedral of Valencia, the sculpture collection has special relevance. It comprises two major groups: sculptures dedicated to the cult of worship, and sculptures reserved for the Cathedral Museum. The "*Museo de Antiguedades"*, created in 1761, and its collection, has undergone various changes since its inception. [Moril 2008] Originally located in the Archbishop's Palace, it was dissolved during the French invasion in 1812, to be reconstituted as "*Museo Arqueológico Diocesano"* in 1922, with funds from the diocese of Valencia and the Cathedral. In the Civil War of 1936 it was again closed, and did not open again until 1954, this time as the Cathedral Museum. The collection of the museum today contains, amongst others, the original Gothic Door of the Apostles, a polychrome wood carving of the *Death of the Virgin* (15th century), a reliquary bust of *St Peter* made in silver, various gothic panel paintings, and as was already mentioned, a very important collection of sculptures.

Description of the Sculpture

The artistic work described in this study belongs to this museum. Neither its date of construction or origin, least its authorship, are known. It belongs to a series of sculptures of Virgins with gilded hair and areas on the figure, which have undergone different interventions during the 17th, 18th and 19th centuries. Today, their common feature is the presence of extensive colour repaints, usually blue and red, which cover the robe and the original polychromy. These sculptures are commonly classified as 'Ugly Virgins'. On arrival in the conservation department, the *Virgen con Niño* was in an advanced state of deterioration, with accumulated surface dirt, and a loss of adherence of paint layers that endangered the preservation of its polychromy. It was decided,

after taking samples, to carry out an initial emergency consolidation and facing with animal glue (Italian *'coletta'*) and Japanese paper. Subsequent consolidation required use of Acril 33 and Japanese paper. This treatment was carried out in 2003.

The *Virgen con Niño* is a free-standing piece that was made from the trunk of a conifer (or possibly a fruit tree). The trunk is roughly hollowed inside with a gouge, as is usual in these sculptures typical of the late 15th century. [Gonzalez 1997] The Virgin, looking down with her head tilted to the left, extends her open right hand, while with the left arm holds the child. She wears a blue robe with brown floral decorations and a light pink dress, which is visible below the scallop of her undershirt. The pointed shape of her right shoe can be seen between the lower folds of her robe. The Christ Child looks forward, with his right arm raised in blessing, and his left extended, with the palm half open, presumably, according to the iconography of these sculptures, holding the ball of the world (Figure 1). The robe of the Virgin is currently painted blue, hiding the original colour. It does not cover completely the back of the sculpture, allowing observation of the applied gold leaf and the white clay bolus used as preparatory layer for the gilding.

Preliminary Studies

To learn more about the work, structure, material and state of conservation, a comprehensive study using various analytical techniques was conducted. The authors investigated the sculpture using several techniques to document the artwork, such as X-radiography, infrared reflectography (IRR), ultraviolet fluorescence photography (UV). Additional techniques were used to determine the materials used, such as Scanning Electron Microscopy, coupled with energy dispersive x-ray analysis (SEM/EDX), and gas chromatography - mass spectrometry (GC-MS). Damages affecting stability were observed across its surface. Furthermore, superficial dirt, delamination between both the paint and the ground layers, as well as to the underlying support, and repaints were found (Figure 2). One of the most significant issues was the delamination of the ground layer to the wooden support, which necessitated the consolidation of practically the whole surface of the sculpture. The worst of the losses, contributing to the fragility of paint layers, were consolidated during an emergency treatment undertaken in 2006. Other areas were treated once the sculpture was moved to the conservation studios of the Institute of Heritage Conservation of the *Universidad Politécnica de Valencia* three years later. Further problems included splitting of the wooden support. A crack runs vertically from the base up to the head on the reverse of the piece. This coincides with the opening to the roughly gouged out interior. This opening would have been made by the artisan or sculptor to access the inside of the piece in order to hollow out the timber (Figure 3).

Documentation

Optical Microscopy

Optical microscopy (OM) was used to study the morphology of the timber. It was not possible to identify the exact species of the wood beyond that it was a softwood of either pine or fruit origin. This close examination of the object also identified canvas consisting of flax textile fibres. The canvas is attached to the wooden support below the ground layers, and comprises the primary structure of the substrate preparation.

Non-Visible Photographic Techniques: X-Radiographic study

An X-radiographic study of the sculpture was used to determine the construction system, and to identify possible damage to the support and decorative layers. A mobile radiology unit TRANPORTIX TX was used. The working parameters were: 74 kV voltage, 20 mA intensity,

240 cm distance between the focus and target. The results obtained after processing the images, testify to the good condition of the wood and to the construction process of the support. The main figure is constructed from a single trunk which has been hollowed-out. The head, hands and arms of the Christ Child were carved as separate additions. The opening on the reverse of the Virgin, made to assist the hollowing out process, has been covered with a separate section (Figure 4). Evidence of local contemporary practice, such as the use of masks applied over the faces and glass spheres used to imitate eyes, was not found.

Non-Visible Photographic Techniques: Ultraviolet (UV) and Infra-red (IR) examination

The sculpture was examined using ultraviolet and infrared radiation (UV and IR). Images were recorded showing the effect of the non-spectral radiation on the artwork. Both methods of analysis helped to deepen the understanding of the construction process, the current conservation status of the sculpture and past interventions carried out. Ultraviolet fluorescence (UVF) photographs allowed accurate confirmation of the positions of the overpaint. Moreover, the differing response of the flesh tones of the Virgin's right hand to UV radiation, combined with the unusual anatomical position of the hand, suggests that this is a later addition. Examination under IR radiation allowed a closer look at the *sgrafitto* designs that adorn the Virgin's robe. These became clearer when observed in this region of the electromagnetic spectrum. The generally bad condition of the polychromy and gilding was clearly visible in the resulting IR images. Large areas of loss could be clearly determined. These are scattered across the entire surface of the sculpture (Figure 5).

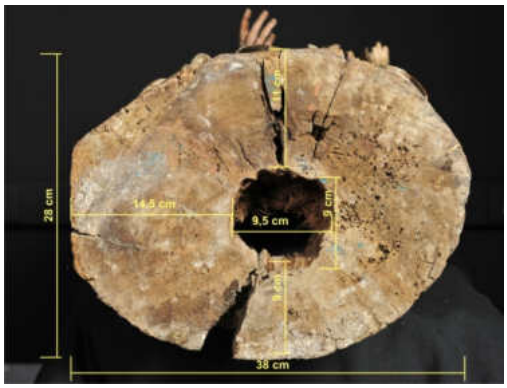

Figure 3. Hollow interior detail and image dimensions. © Juan Valcárcel Andrés.

Figure 4. X-Radiography of the sculpture. Carving technique used and the absence of masks or fasteners. © Enriqueta González Martínez.

Material Analysis

Scanning electron microscopy - energy dispersive x-ray analysis

Scanning electron microscopy, combined with energy dispersive x-ray analysis, (SEM/EDX), was implemented to determine the qualitative material composition and techniques used on the sculpture to execute the robe, flesh tones and hair. Elemental identification was carried out using a scanning electron microscope Jeol JSM 6300, operating with a microanalysis system Link-Oxford-Isis X-ray. Working conditions were 20 kV voltage, 2 × 10-9A amperage and a working distance of 15 mm. Samples to be analysed in the form of transverse cross-sections were coated with carbon graphite. Backscattered electron images and corresponding X-ray spectra were

obtained. This technique was used in combination with optical microscopy and supplemented the stratigraphic study of the sculpture (Figure 6).

The results of the combined techniques confirmed initial observations of the stratigraphy made by the authors, allowing the mineral content and material composition of each layer to be determined. In robe of the Virgin, the most deteriorated area, the stratigraphic sequence of layers was observed as follows, starting from the lowest layer to the surface:

-1. The wooden support;
0. Linen canvas applied over the wooden support;
1. First ground layer consisting of coarse grained calcium sulphate;
2. Second ground layer consisting of finer grained calcium sulphate;
3. Red Armenian bole extracted from natural clays;
4. Thin layer of gold leaf;
5. A thin layer of lead white pigmented paint;
6. A thicker application of lead white pigmented paint, with the addition of an unidentified blue pigment;
7. Surface layer containing calcium phosphate associated with an animal black charcoal and an unidentified lead pigment.

The sample removed from the hair showed also an additional layer containing lead white pigment combined with a sienna earth pigment. The ground layer under the flesh tones was the same material as on the rest of the sculpture. Here the calcium sulphate mineral was coarsely ground. The flesh colours were obtained in two layers, the lower of which consisted of a higher concentration of yellow sienna earth pigment, while the upper paint layer was dominated by lead white pigment. Results are reported in Table 1 (Appendix I).

Figure 5. Later addition detail. Above: a detail of the Virgin's right hand. The difference in the treatment applied to the wood is also visible. Below: in the UV Photography, there is a different response of the original polychrome and later addition. © Juan Valcárcel Andrés.

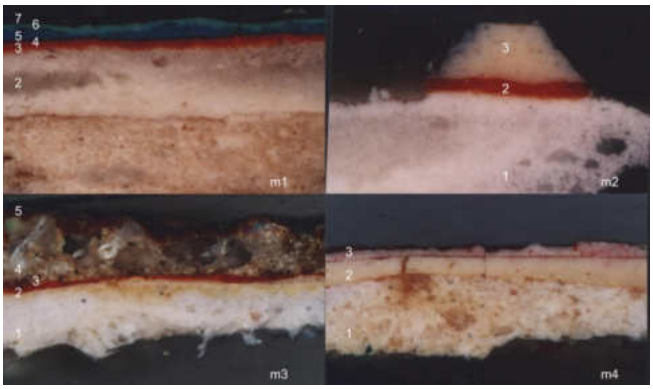

Figure 6. Optical microscopy. Photograph of cross sections of the samples analysed. © Enriqueta González Martínez.

Gas chromatography / mass spectrometry

To complete the investigative study, gas chromatography-mass spectrometry (GC-MS) was carried out at the University Institute of Heritage Restoration in the Polytechnic University of Valencia (UPV) in 2003, it was used to facilitate the identification of organic materials. The

analysis was carried out on a HP-6869N chromatograph gases coupled to a mass selective detector HP-5973 Network (Hewlet Packard, Abondale, PA, USA). The injector temperature was 250ºC. The chromatographic separation was performed on a fused silica capillary column HP-5MS (30 m x 250 mm x 0.25 mm nominal). As ionisation technique was used the electron impact and the working conditions of the mass spectrometer were: temperature and power interface 280 and 150°C respectively, electron energy 70 eV, and scanning speed of the mass spectrometer of 0.5 seconds /scan in the m / z integration range of 20-800. Results indicated that the original organic binder present in the pictorial film is egg tempera. However, drying oils were also identified. The peak area ratio of stearic to palmitic acids indicates the abundant presence of linseed oil (flaxseed) in an upper layer. This is can be explained by the existence of an oil repaint on the surface.

The preliminary studies confirmed observations made regarding the alterations to the original decorative scheme. Thick oil paint overpaint containing lead white and other pigments were identified, for instance sienna was identified as present in the hair. However, not all pigments could be identified. The blue pigment in the Virgin's robe remains without classification. Chlorides were identified on the surface of the sample removed from the robe. In other samples, such as that removed from the Virgin's hair (originally gilded), a microcrystalline calcite layer containing silica was found. The presence of chlorides, silica and calcite can be explained by the dirt layer present over the whole surface of the sculpture.

Figure 7. Cleaning Process. © María José Rodríguez.

Figure 8. Photography after cleaning (visible light). © Juan Valcárcel Andrés.

Applied Treatments

A treatment strategy was determined considering the results obtained from the preliminary studies. The preliminary studies allowed the conservators to clearly establish the condition of the sculpture. The first procedure required the removal of the facings applied while still in the museum to temporarily protect the badly flaking paint. The Japanese paper facings had been adhered with animal glue (Italian '*coletta*'). These were removed mechanically. The thick overpaint applied over the hair, robe and dress of both figures was also removed mechanically. This process recovered the original appearance of the sculpture and allowed the restoration of the gilt *sgraffito* applications to be carried out at a later stage.

Overpaint covering the *sgraffito* areas was removed using a solvent based compress. The solvent component was determined based on a series of solvent tests. The selected solution consisted of a mixture of aromatic hydrocarbons and ketones. The compress was applied for intervals of 5

minutes, which allowed the controlled removal of the repaints without altering the original *sgraffito*. Overpaint applied to the flesh tones was removed using an emulsion consisting of a neutral pH soap in which xylene was dispersed. The surface was neutralised after application with deionised water (Figure 7).

Parallel to cleaning, due to their extreme fragility and sensitivity to contact with moisture, it was necessary to consolidate the preparatory layers and paint of much of the Virgin's mid-lower robe. This was done by injecting Acril 33 in a proportion of 40% with water, after pre-wetting the area with an alcohol-based surfactant to achieve a greater penetration of the consolidant.

Once the cleaning process and consolidation were finished, the lacunae were filled. A new generation product, Stuc-Bol®, created from synthetic and natural compounds, was used for this purpose. [1] This product could be applied as a substitute for the ground (similar to a gesso based stucco), and in effect seals porous surfaces. This product provides in a single action a solution to a number of treatment phases that previously were carried out as individual actions: namely priming and isolating the surface of lacunae found on a work of art. The ability to vary the product colour is also useful, as the base colour can be toned for retouching of the lacunae (Figure 8).

An art historical study and a comparison with other sculptures of constructed using a similar technique and iconographical attributes confirms that the Virgin's right hand is not original. [Mayer 1929, Gómez 1931] This confirmed the observations made when studying the IR images. According to the iconography of the period and compared to other contemporary sculptures, the Virgin would hold a fig or pomegranate (symbol of fertility) in her right hand.

Conclusions

According to the results obtained using the different analytical techniques employed, it is clear that the *Virgen con Niño* is a sculpture carved from softwood, either of pine or fruit origins, and pith is roughly hollowed-out with a gouge. The X-radiographic study has been crucial to understanding the absence of masks or additional elements in the faces, something common to the Valencia region. The right forearm and hand of the Virgin are latter additions. The difference in support and stratigraphic build-up are evident in the X-radiographs and cross-sections. Furthermore, the condition of the polychrome layers in this area differs from the rest of the sculpture. These conclusions are confirmed by UV analysis, noting the different composition of the paint layers by the different spectral responses for the materials.

The original preparation incorporates the application of a sized linen canvas to the wooden support. This is a traditional way of preparing the wood in order to preserve the ground and polychromy from resin efflorescence, to strengthen joints and, of course, provide a better surface finish. The main component of the primer layer is calcium sulphate. The bole, made with natural clays, is applied in a thin layer before the application of gold leaf that covers much of the sculpture, except for hands and faces, which are flesh painted and polished.

The existence of at least two previous interventions can be determined from the analytical investigation: one corresponds to the discovery of repaint made with lead white and an unidentified blue pigments, probably belonging to the 18th century; and another subsequent intervention is associated with the alterations to the facial features of both the Virgin and Child (the eyes, original eyebrows); this latter, due to the oil composition of the paint used, dates to the 19th century. Presumably, also at a similar time the forearm and hand of the Virgin were added.

The *sgraffito* designs that decorate mainly the garments are made with egg tempera on gold leaf. The results from both the research and treatment reveal a sculpture of a fine manufacture that represents an extremely interesting example of what is known as International Valencian Gothic.

Its preservation and valuation will enhance the understanding and appreciation of the collection to which it belongs, and is thus an important exponent of the regional cultural heritage.

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Endnotes

1. Product patented in 2009. Research line of the I+D+I group for Conservation and Restoration of Gold and polychrome, Polytechnic University of Valencia, Spain.

Material List

Coletta (animal skin glue and vinegar)
CTS S.R.L
Via Pave 20/22 (Altavilla Vicentina) Vicenza
Italy
+39 0444 349088
www.ctseurope.com

Acril 33 (Aqueous copolymer dispersion based on acrylic ester)
CTS S.R.L
Via Pave 20/22 (Altavilla Vicentina) Vicenza
Italy
+39 0444 349088
www.ctseurope.com

Stuc-Bol® (Acrylic resins and natural clays)
Universidad Politécnica de Valencia
Camino de Vera S/N
Valencia, España

References

Gómez, M. 1931. *La escultura del Renacimiento en España*. Barcelona. Editorial Guinart.

Mayer, A. 1929. *El arte Gótico en España*. Madrid. Editorial Epasa Calpe.

Moril, R. 2008. *La gestión del patrimonio artístico de la iglesia. Los museos y colecciones museográficas de la diócesis de Valencia.* Valencia. Universitat de Valencia.

Pérez, M, and Abellán, A. 2006. *Los ángeles músicos de la Catedral de Valencia: Estudios previos*. Valencia Edit. Generalitat Valenciana.

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Appendix I

Table 1. SEM/EDX Results:

Sample	Type	Thickness	Layers	Compound Identified
M1	Robe	20 μm	7	Surface deposits which identify calcium phosphate associated with black (bone) charcoal and lead pigment. Chlorine intense signal alteration suggests chlorides in the surface material.
		40-80 μm	6	Layer made of lead white pigment and an unidentified blue pigment.
		60-120 μm	5	Layer made with lead white pigment and blue pigment, unidentified because of its high level of scarcity in the surrounding white lead.
		5-10 μm	4	Gold leaf.
		60-80 μm	3	Layer red bole made with natural red clay.
		428-432 μm	2	Preparatory layer made with fine-grained calcium sulphate. Also strontium sulphate was identified.
		680 μm	1	Preparatory layer made with coarse calcium sulphate particles. Strontium sulphate grains are also identified.
M2	Flesh tones	220-240 μm	3	Lead white pigment layer.
		50- 70 μm	2	Layer made with natural-red clay.
		400-450 μm	1	Preparatory layer made with coarse calcium sulphate particles. Strontium sulphate grains, calcite, natural clays and silica are also identified.
M3	Polychromy	20-40 μm	5	Layer contains lead white pigment and brown clays.
		150-180 μm	4	Layer made with microcrystalline calcite and an abundance of large-size grains of silica and calcite.
		100-250 μm		
		2- 5 μm	3	Gold leaf.
		5-30 μm	2	Yellow bole layer made with lead pigment. Yellow ochre was not identified due to the dominance of the lead pigment in the sample.
		120-200 μm	1	Preparatory layer made with calcium sulphate.
M4	Gilding	36-60 μm	3	Layer made of lead white pigment and unidentified organic red pigment.
		120-200 μm	2	Layer made of lead white pigment.
		350-650 μm	1	Preparatory layer made with calcium sulphate.

Materials and construction techniques used in two wax-cast figurines

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Abstract

The construction techniques of two very similar 18th century figurines (ca. 30 cm high) were investigated in this study. Both figurines belong to the same museum and are produced by casting wax. Prior to the study it was unclear if these were related in more than their depiction of Francis of Assisi. A careful examination of the two objects provided insight in their construction processes and determined that they were likely cast from the same mould, although details differ. Each figurine consists of seventeen parts, most of which consist of solid wax. Smaller sections are cast in a mixture of wax and Venice turpentine. Metal rods are used to connect smaller sections to the main body. Polychromy was also carried out in wax and texture achieved by adding material.

Keywords: moulding, casting, wax, polychrome sculpture, construction techniques, treatises, Rococo style, wax paint

Introduction

Two similar figurines belong to the *Museu Nacional Machado de Castro* collection in Coimbra, Portugal (Inventory numbers E657 and E658). Both artworks represent Francis of Assisi in the round as an emaciated Lesser Brother living in poverty. St. Francis is clad in a rough homespun garment and is depicted barefoot. The Stigmata he received in 1224, two years before his death, are visible. Each figurine stands on a cylindrical imitation marble pedestal framed by Rococo motifs. The artworks measure ca. 30 cm in height. Both are made of coloured wax out of multiple sections. The style, aesthetic and intimate character of the sculptures suggests they belong to the second half of the 18th century (Figure 1). [Pereira 1989, 418]

The initials 'S.C.' found on one figurine's reverse (E657) indicate the provenance of the two statuettes (Figure 2). 'S.C.' corresponds to Santa Clara or more specifically the Monastery of St. Clare situated in Coimbra. Both artworks were accessioned into the collection of the museum in 1915-16 after a decree was passed disbanding all religious orders in Portugal.

Figure 1. Pair of 18th century wax-cast figurines. Dimensions (cm): (a-E657, left) 28.5 x 12.5 x 10 cm; (b-E658, right) 30 x 12 x 11 cm.

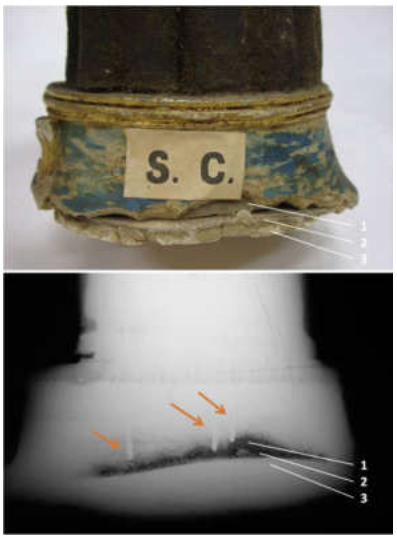

Figure 2. Pedestal E657: (a-above) Detail; (b-below) X-radiograph ©Archives LCR-JF.IMC-IP

Objectives

While very little is known about the context of their production, what makes the connection between these statuettes so exceptional is that they have been cast from the same model. A systematic comparison provided a unique opportunity to verify material and technical aspects inherent in the manufacture of multiples copies by wax casting. The main objectives of this study consist of unveiling the way these wax polychrome figurines were manufactured and to compare the results obtained with art technological sources. The theoretical information available during the Baroque period was compared with these concrete examples.

Methodology

Art technological sources

The production of wax sculptures was not new to the 18th century, but based instead on a long artistic tradition. [Baudry 1978, Bondil 1996, Clérin 2001, Le Gac 2006] In this study, technical literature was consulted to establish the contemporary processes used to cast small and large sculptures. Recipes related with 'modelling wax' were duly noted as these were thought to closely resemble those used for moulding and the lost-wax technique used to create these artworks. [Le Gac 2012] The treatises Cellini wrote between 1565 and 1567 on 'Goldsmithing and Sculpture' continue to be the seminal publications in this field. Among the Portuguese art technological sources accessed, Vasconcellos' treatise [1733] and Machado de Castro's Dictionary [Castro b.1812] were considered the most valuable. As testimonies of Lusitanian practices, they corroborate what was previously referred to by their predecessors.

Examination and analysis

The two statuettes would be quite alike if it were not for certain features that make them easy to distinguish one from another (Table 1). It was helpful to note the slight differences between the two artworks in terms of understanding how these sculptures were manufactured.

A complementary study required the use of *in situ* digital microscopy (Dino-Lite) for high magnification images, *in situ* digital X-radiography for assessing the statuettes internal structure, and *in situ* Energy Dispersive X-ray Fluorescence (EDXRF) technique for their elemental composition. Further analyses by Raman spectroscopy and Gas Chromatography coupled with Mass Spectrometry (GC-MS) were performed on a few samples to identify the colouring substances and the base cast-material [1].

Table 1. The main differences between the two figurines, E657 and E658

	E657	E658
Head a different inclination of the saint's head	Positioned upwards	Positioned downwards
Size a slight variation in size between both artworks, as a consequence of the head orientation	28.5 x 12.5 x 10 cm	30 x 12 x 11 cm
Base the marbling of the base is a different colour	Blue – Prussian blue on white background	Red – vermillion on white background
Robe different surface treatments on the robe rendering a rough cloth	Fibres	No fibres
Damages breaks and losses	Cowl missing Hand missing Girdle missing at reverse	Cowl missing Fingers missing Toes missing

Results and discussion

Moulding techniques

The figurines were cast from an original three-dimensional model. As this has not come to light, its material composition is unknown. Models could have been made in a variety of materials, such as carved wood, plaster, clay, wax or cast metal. It is likely that either a clay or wax prototype would have been used for multiples which show slight changes in form. Protruding forms could be cut from freshly modelled wax or clay figures and these could be cast separately but first adjusting the details. In this way any undercuts could be avoided. By casting separate sections as independent objects different colours could be used according to the element to be reproduced.

Composition

Each sculpture contains seventeen elements. Eleven parts were used to construct the body of St. Francis: the bust, the lower part of the habit, the fall of the cowl, the cowl itself (lost in both artworks), the head, both arms, hands and feet (Figures 3 and 4); three were needed for the pedestal: the cylinder forming the base and the bottom edge made of cardboard and wax (Figure 2); the final three sections correspond to the knotted girdle the friar wears, made of twisted natural fibres imitating a real rope, and both blown glass eyes inserted in the face to give a glassy stare (Francis was almost blind in 1224) (Figure 5).

Figure 3. Frontal view. Left: E657. Right: E658. Slight differences are visible between both figurines.

Figure 4. Reverse view. Left: E657. Right: E658. Different colours of wax are employed.

Casting

Univalve, two-part or multiple-part moulds

It is clear that the form of several sections is repeated between both figurines. This suggests the use of reusable moulds, '*à bon creux*'. These would have been made of plaster or unfired clay. For other sections, such as those with a hidden or flat edge, such as the feet and arms, univalve moulds were used. These moulds produced the desired form at once. Other sections were created using two-part moulds, if not multiple-part moulds. Here the two forms would be fitted together to create the desired shape in the round. It would be easier to avoid undercuts or protrusions using a two-part mould.

The inner face of the moulds would be treated to aid the removal of the form once set. Typically, the porous material would have been dampened to prevent the form from sticking to the mother mould. However some contemporary authors recommend that the mother mould be coated with a vegetable oil as a release agent. [Theophile XIIthC, Vasari 1550, Cellini 1565-1567, Vasconcellos 1733, Castro b.1812]

Hollow or solid cast

The casts were deliberately made either hollow or solid according to their size and location in the artwork. The main axis of the sculpture (body and pedestal) are solid, to confer stability and enable the smaller sections to be joined. The smaller elements were also solid cast to give them more durability. However, the head and neck were hollow cast to provide a mortise and tenon with the bust. The structural and solid elements were not all cast in one go, but in two phases, by pouring wax '*à la volée*' and then wax '*au noyau*'. [Baudry 1978, 109 and 120]

St. Francis' body casting

A mixture of beeswax and Venice turpentine, containing another fatty substance in very low proportion was used. The materials were determined via GC-MS analysis. This kind of mixture is consistent with recipes related to 'modelling wax' found in technical literature. [Le Gac 2006; Le Gac 2012, Table 4, 102-104] It is not possible to distinguish the type of 'turpentine' referred to in the texts. This could be resin distillates, fresh secretion of a coniferous tree or Venice turpentine (*Larix decidua* Mill.). [Le Gac 2009, 527-540]

A two step procedure was followed: 1) the base mixture was poured into the mould and moved around in a whirling motion, until it evenly coated the inner face of the mould, the excess of wax was thrown away. As the wax used for this process would form the outer surface of the object, it was of high quality. The colour was determined by the desired final effect – in this case brown. 2) a second batch of lower quality wax was melted and poured into the remaining cavity to form a dense core. This is likely to be unrefined beeswax of a lower melting point. It was mixed with materials capable of giving the figure the required strength and stability. The X-radiographs show

that the core of the figurine is denser than the outer layer and contains metal filings (Figure 6). The EDXRF analysis corroborates that the core contains lead, copper, zinc and nickel-based materials.

Figure 5. Wax-cast head with inserted blown glass eyes: (a) Detail E657; (b) X-radiograph of corresponding detail.

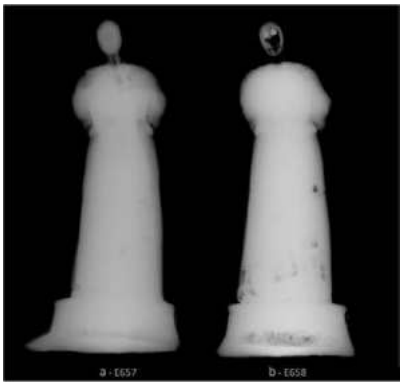

Figure 6. X-radiographs. Left: E657. Right: E658 ©Archives LCR-JF.IMC-IP

Losses in the surface of the robe and cowl reveal the undertone that the desired colour was not achieved in the first phase of production. In figurine E657 this undertone is grey and in E658 it is beige (Figure 4). The hue of the wax used would have been determined by the means at the artist's disposal. The dual tonalities indicate that a finishing layer was applied after casting to create the desired final effect.

Pedestal casting

The pedestal was also manufactured following the procedure already described for the body. A lead white based layer was cast to form the outer layer. The opaque and bright colour of the surface was deliberately white to achieve an appropriate basis for imitating marble (Figures 1 and 2a). The upper half of the cylindrical shell was reinforced by filling up the void with a second batch of molten wax. This material, visible in some losses, is made of a translucent waxy substance of a yellow-greyish colour, similar to that of natural beeswax. Since it contains no pigments, it remains transparent to the X-radiation, but the different densities of the two materials are clear (Figures 2b and 6). The lower half of the pedestal remained hollow (Figure 2a).

Flesh tones

The flesh tones – the face, hands and feet – were likely created by using bleached wax with the additions of white and red colouring materials. Bleached wax has a long history of use, especially in Italy, in particular Venice. [Jaucourt 1752, 472] Vasari mentions its use in his treatise for producing small objects. [Vasari 1550, 125-126] Bleached wax is obtained by melting and pouring beeswax in cold water several times. Cast sheets of the product are left in the sun and exposed to the morning dew. Impurities are eliminated with talc. [Lemery 1675, 884]. In the present cases, Raman and EDXRF analyses proved that the wax was mixed with finely ground vermilion and white lead. The use of a red organic dye is not excluded but needs further research. Here, the very realistic rendering of flesh lies on the fact that bleached wax, slightly coloured, reflects light and is capable of imitating to perfection the translucent aspect of St. Francis' skin (Figure 5a).

Joint techniques

Although multiple-piece moulds were used, the assembly of the different parts was designed to make the joints invisible, strong and durable. The wax itself provides the means to adhere the sections to each other by its own adhesive and melting properties. Most of the wax-cast elements were bound by gently heating the joins and exerting the desired pressure to attach them in the

proper place. The same procedure was adopted to attach the eyelids to the face after having hollowed-out the orbits and inserted the glass eyes into them first.

The hollow-cast head and neck incorporated a mortise and tenon joint. The tenon is likely to have been created using a piece of wood given that it is totally transparent in the X-radiographs. This gave the small sized elements strength and kept the piece in its correct position (Figures 5a and 6).

The figure and pedestal were attached together employing at least three long rods that run through the cores of the figure and the base, holding them firmly and providing stiffness (Figure 6). These rods are likely to consist of iron as a higher intensity of this element was detected with EDXRF in the area where the robe meets the base.

A thick cardboard cut to the exact diameter of the pedestal bottom was used to close the base. To disguise this procedure, the cardboard was coated with wax containing lead white, which has been perfectly welded to the circumference of the base. This single layer, which helped to hold the 'cover' in place, played an aesthetical role just as important as the physical one, fully integrating the bottom of the figurine – so often a part deemed secondary – in the whole design.

Finishing touches

Marble Imitation

In both artworks, the marbling has been perfected by using a colouring substance bound in wax and applied in its liquid state. Oil of turpentine was certainly added to the mixture to increase fluidity and handling, but this has evaporated. Fluid brushstrokes of 'paint' were applied randomly over the white background as can be see when observing the fluorescence induced by UV radiation (Figure 7). Raman spectroscopy identified Prussian blue as the pigment for the blue veining on E657 and vermillion for the red pattern on E658 (Figures 1 and 2). It is likely that the wax used was of the bleached variety as the natural form would produce a greenish hue if mixed with Prussian blue. As the brushstrokes left no visible raised marks, the surface may have been hot-worked in order to blend the applied decorative pattern with the white background.

The pedestals both have a glossy surface. While this could have been achieved as a result of the blending process described above or by polishing by a wet cloth, as describe in the sources [Bondil 1996, 112; Clérin 2001, 68], it is in fact due to the application of a resin-based varnish. The resinous layer now appears slightly yellowish in hue due to its ageing (Figure 1). Under UV radiation it has a greenish fluorescence (Figure 7). The varnish is missing on E658 where a label was previously adhered (Figure 7b).

Matt gilding

The pedestal decoration was completed with powdered gold applied directly to the mouldings while the varnish layer was still tacky. There is no other explanation for the absence of any binder acting as size for the gilded surfaces (Figure 2a).

St. Francis' robe

Beside the finishing touches performed on the pedestals, the final layer to have been applied to the statuettes concerns St. Francis' robe. A brown paint layer containing coarsely ground particles was applied to the overall surface of the garment (Figures 1, 3 and 4). This aimed at giving the homespun garment a homogeneous tone and to hide the different colour between some of the cast parts have (as seen above) (Figure 4). Furthermore, the satin-like appearance that wax gets after casting was modified. The dark brown hue observed on both artworks results from a complex mixture of vermilion, carbon black and raw umber bound together in a resinous medium.

Figure 7. Ultraviolet Flouresecence. Left: E657 frontal view; Centre: E658 frontal view; Right: E658 reverse.

Figure 8. Rough texture imitated (a-E657) with or (b-E658) without natural fibres.

Rough texture – Fibres

By using coarse materials to imitate the coarse woollen stuff of the robe, the artist clearly revealed his intent to produce a strong tactile effect, close to what one would expect of a true homespun garment. However, this effect is achieved slightly differently. On figurine E657, natural fibres were applied on the robe after paint application but before the paint was dry (Figure 8a). No binding medium seems to hold them in place. This procedure proved efficient on the short-term, but as most of the fibres have been rubbed away from the high points, the long term stability of this technique is questionable. The absence of fibres on figurine E658 should not be confused with such decay (Figure 8b). This figurine received no additional fibres at time of creation. The absence of fibres was verified at high magnification and under UV illumination. The natural fibres that can be identified by their green fluorescence on figurine E657 are not present on figurine E658 (Figure 7).

Conclusion

Wax, so often used in the past as transitional material for sculptural purposes, is undoubtedly one of the most suitable materials to retain the precise cast of moulds. The form can be replicated to produce the same model at least twice. The solid-cast forms produced are resistant over time. Thanks to its low melting point and workability, wax assisted all the joint techniques used and no lines are discernable between the sections. Due to its ductility, wax facilitated the insertion of glass eyes into the heads. Slightly pigmented, bleached wax simulated perfectly the diaphanous appearance of skin. Loaded with pigments, wax made available to the 18th century artist a wide range of shades. This included Prussian blue which had been synthesised in 1704. The figurines show a variety of plastic effects through the application of specific decorative techniques. In fact, different textures and contrasts were achieved in the wax medium between the delicate flesh tones, the rough cloth and the polished marble-like pedestal. The technique conforms to the astonishing realism that the Baroque period sought to produce.

Has this overall result been conceived by the same individual, responsible for the wax casting? It is difficult to determine the specific roles of the different actors in question. It cannot be verified with any certainty who performed the colouring tasks, from the wax tint to the final and subtle polychrome appearance: the caster or a painter, or both?

Although this working process may suppose a concrete division of labour, in no way does it detract from the unique characteristics of each of the figurines. While these may be cast from a mould, each product has its own unique appearance. The figurines thus are perfect illustrations of the concept of *polychrome sculpture*. This artistic field combines both three-dimensional (plastic) and

aesthetic (chromatic) aspects. Through this combination a special relationship between mass and surface, through shape and colour, is developed. This concept has been discussed by Paul Philippot in 1970. The conservation of such artworks requires a particular approach as both the material and the technological, as well as the historical and artistic, characteristics of the work need to be fully recognized. The intrinsic and integrated relationship between these concepts is fundamental to their conception and artistic value. It is these values that allow the formal and iconological characteristics of the art work to be fathomed.

Endnotes

1. The detailed results will be published elsewhere.

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References

Baudry, M.-T. 1978. *Sculpture. Méthode et vocabulaire*. Paris: Imprimerie Nationale.

Bondil, N. 1996. *La Sculpture, art du modelage*. Paris: Editions Fleurus Idées.

Castro, J. M. de [b.1812] 1937. *Dicionário de Escultura*. Lisboa: Livraria Coelho.

Cellini, B. [1565-7] 1989. *Tratados de orfebrería y escultura*. Escobar, J.C. (tr.). Madrid: Ediciones Akal.

Clérin, P. 2001. *La Sculpture. Toutes les techniques*. Paris: Dessain-Tolra/VUEF.

Jaucourt, L. 1752. 'Cire blanchie', In *L'Encyclopédie ou Dictionnaire raisonné des Arts et des Sciences*. Paris: Briaçon, vol. 2.

Le Gac, A. 2006. 'A utilização de compostos à base de cera na escultura policromada dos séculos XVII e XVIII, em Portugal'. In *Imagem Brasileira 3*. Belo Horizonte-Minas Gerais: CEIB, 41-68.

Le Gac, A. 2009. 'Le Retable majeur de la Sé Velha de Coimbra et la polychromie dans le diocèse de Coimbra à l'époque baroque'. Ph.D. dissertation. Departamento Conservação e Restauro, Universidade Nova de Lisboa.

Le Gac, A. 2012. 'Raised decorations applied to Baroque polychrome sculpture in Coimbra, Portugal'. In Townsend, J. (ed.), Postprints of the 4th ATSR International Symposium. London: Archetype Publications, 90-111.

Lemery, N. 1675. *Cours de Chymie*. Paris: Jean-Thomas Hérissant.

Pereira, J.F. (Coord.) 1989. *Dicionário da arte barroca em Portugal*. Lisboa: Editorial Presença.

Philippot, P. 1970. 'Problèmes esthétiques et archéologiques de conservation des sculptures polychromes', In *Conservation of Stone and Wooden Objects*. London: IIC, 59-62.

Théophile [XIIe] 1996. *Essai sur divers arts* [*Diversarum Artium Schedula*]. Guichard, J.M. (tr.). Nogent-Le-Roi: Jacques Laget-Editions.

Vasari, G. [1550] 1960. *Vasari on technique*. Maclehose, L. S. (tr.). New-York: [s.n.].

Vasconcellos, I. da P. 1733. *Artefactos Symmetriacos, e Geométricos*. Lisboa Occidental: Officina Joseph-António Sylva.

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Monumental polychrome clay sculptures in blocks.

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Abstract

The monumental polychrome clay sculptures of the Royal Monastery of Saint Mary in Alcobaça were constructed hollow and in horizontal blocks. This technique, common in Portugal in 17th and 18th centuries, facilitated handing, drying and firing production processes. Sculptures were then polychromed in the traditional way; a process that also hid the joints between the blocks. Documents mention that the sculptures from Alcobaça were made by the workshop in the monastery by monks. However, it is likely that there were at least two different workshops, working at same time. In both, the artisans were lay brothers and eventually secular employees. Although both workshops used the same basic construction techniques, the clay sculptures do show some technical differences and it is evident that the sculptors followed quite different anatomic models. Two almost unknown sculptures, now in two museums in Lisbon, were chosen to gain a deeper historical, technical and material understanding of the construction processes and these workshop practices. Preliminary results indicate that both of these sculptures were made by the first workshop.

Keywords: Monastery of Alcobaça, conservation, clay sculptures, clay analysis.

Historical Introduction

In 1153, the first Portuguese king, D. Afonso I (1109-1185), and his wife, Queen Maud of Savoy (1125-1157), donated land in the region of Alcobaça to Saint Bernard of Clairvaux (1090-1153). Over the centuries, the Royal Monastery of Saint Mary in Alcobaça became the most wealthy and powerful monastery of the kingdom. Portugal regained its independence in 1640 after sixty years under Spanish rule, and a peace treaty was signed in 1668. Important works were carried out in the monastery mirroring this nationalistic period. The production of monumental clay sculptures became the main field of artistic expression in the last third of the 17th century and one of the most original and important chapters of the Baroque in Portugal (Figure 1). [Moura 2006] The construction of monumental clay sculptures lasted until the mid-18th century.

With the extinction of the religious orders in Portugal in 1834, the monastery was occupied in the subsequent decades by national and municipal services or abandoned, which caused much damage. The monastery was restored in the first half of the 20th century according to the philosophy of Violet-le-Duc (1814-1879). Almost all the Mannerist and Baroque altarpieces were

dismantled in this restoration campaign in order to return the monastery to its original appearance. Today, many of these sculptures have been lost, destroyed or are de-contextualised. Furthermore, many of these sculptures were restored in their new settings, and thus a correct interpretation of the polychromy is no longer possible. In 1985, the monastery in Alcobaça was classified as UNESCO World Heritage. Some of the sculptures from this monastery are now found in the National Museum of Ancient Art (MNAA) and Carmo Archaeological Museum (MAC), in Lisbon.

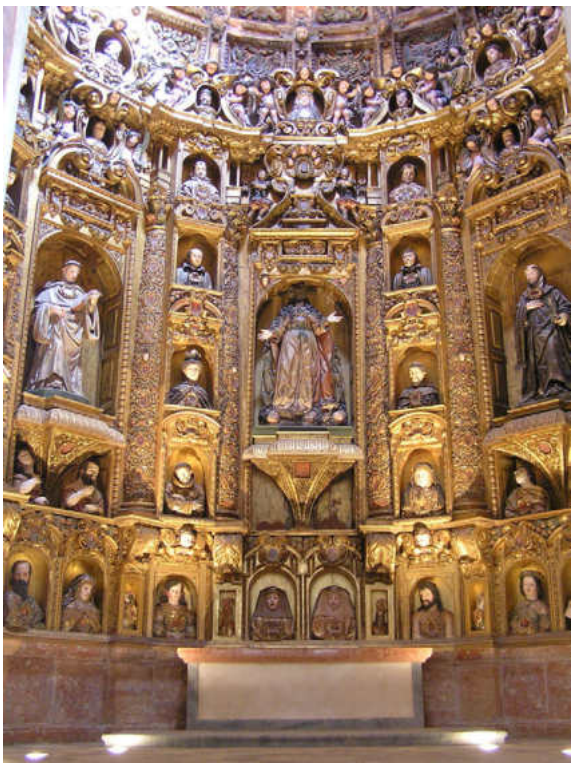

Figure 1. The reliquaries of the sanctuary of the Royal Monastery of Saint Mary in Alcobaça (constructed c. 1670)

Clay sculpture in Portugal

The oldest known clay sculpture in Portugal is the figure of *St. Andrew* in Évora Cathedral, probably dating to the 14th century. Studying artworks of this type and from this period is difficult due to their scarcity. The existence of contemporary sculptures is rare because baked clay is a very fragile material. However, it is probable that the clay sculpture had a constant presence ever since and in the entire Portuguese territory.

Clay was an easily accessible resource that cost little, and its material characteristics allow large monumental sculptures to be created with great plastic complexity. Sculptures could be created with high artistic finish by skilled artists, or to a more crude level by artisans. Clay is a very versatile material which can be formed into sculptures of large or small size, fully round or in relief, as isolated images or as individual parts of a series. It was used for both the interior and exterior decoration of buildings. In almost all cases it was polychromed.

Using clay blocks to construct large monumental sculptures has been known in Portugal since at least 1514. In this year, six polychromed and glazed clay sculptures arrived in Lisbon, delivered to the Convent of Saint Mary in Belém. These sculptures were ordered from the Italian workshops of Andrea della Robia (1435-1525) and the Buglioni family. By the 17th and 18th centuries, this technique was common practice. Centres of production were established, including the Royal Monastery of Saint Mary in Alcobaça. Here some hundreds of monumental polychrome clay sculptures were produced, some measuring up to three metres high. This paper will focus on two

almost unknown sculptures made in this artistic centre: *Saint Mary Magdalene* (MNAA, Inv. Esc. 2506) (Figure 2), and *King Afonso I (?)* (MAC, Inv. Esc. 88) (Figure 3), one made for the Saint Mary Magdalene Convent, and the other probably for the Royal Monastery of Saint Mary, both in Alcobaça. The historical, technical and material aspects of both sculptures will be examined in order to further understand the construction processes and workshop practices. The study aimed to establish whether both sculptures were produced in the same workshop.

Figure 2. Sculpture of the Saint Mary Magdalene of Saint Mary Magdalene Convent in Alcobaça (MNAA, Inv. Esc. 2506). © MNAA

Figure 3. Sculpture of King Afonso I (?) probably of the Royal Monastery of Saint Mary in Alcobaça (MAC, Inv. Esc. 88). © MAC

The workshops in Alcobaça

Sources suggest that all of the monumental polychrome clay sculptures of the Royal Monastery of Saint Mary in Alcobaça were produced by a single workshop composed of monastery monks. [Natividade 1885] However, was observed contradictory evidence while carrying out conservation projects on-site between 2006 and 2009. This project allowed for a new interpretation of the often confusing and contradictory texts. A preliminary research of a number of sculpture sets, still in the monastery in Alcobaça, or deposited at MNAA and MAC, corrected names and dates of some, and allocated others to the sets that were previously unknown. [Remígio 2009a, Remígio 2009b, Remígio 2012] A further study, which included a macroscopic analysis of the anatomic models used to create the sets, allocated the known sculptures to two groups that correspond to two different workshops.

The high finish and mature modelling of the sculptures, coupled with the technical complexity required for production, suggests that experienced craftsmen created them in a large workshop. The skill involved and quality achieved eliminates authorship by an amateur or solitary sculptor – more likely production occurred on a larger scale guided by a master, officers and apprentices. The Alcobaça monastery was a Cistercian order. According to Cistercian statutes, lay brothers and secular employees usually carried out craft skills while the monks devoted themselves to prayer. [Nascimento 1999] However, it is reported in other documents that some sculptures were carried out by Cistercian members from the monastery, probably lay brothers. [Piedade 1728, Santos 1924] Thus, it can be presumed that two workshops existed in the monastery. Sculptures that can be characterised as belonging to these two workshops are found in the region and throughout the country. In fact, documentation exists mentioning commissions for other centres by the Alcobaça sculptors. [Piedade 1728, Santos 1924]

The first workshop (before c.1675)

The first workshop at the Alcobaça monastery probably produced the individual pieces or sets of sculptures described in Table 1. The construction of the monumental clay sculptures followed the techniques outlined in contemporary treaties. [Vasconcellos 1733; Nunes 1982] The large sculptures were produced based on an anatomic model, the features of which are typical of the 17th century but individual to this particular workshop. The model is characterised by a voluminous body, fat arms and hands, a thick neck, an oval and a naturalistic face. The physiognomic features include a high forehead, protruding eyes, with almost closed eyelids and a vacant look, fleshy lips, and a straight nose. The hair is often undulating and male figures have beards. The movement of the figures is often theatrical. [Remígio 2009a] It is the similarities in physical appearance of the figures that allowed the authors to categorise these particular sculptures to this workshop production.

Table 1. The sculptures allocated to the first and second workshops [Remígio 2012]

Commissioning Body	**First Workshop (<1675)**	**Second workshop (>1675)**
Royal Monastery of Saint Mary in Alcobaça	*Our Lady of the Rosary*	the sculptures of the *Mor chapel* (1676-1678)
	the reliquaries of the *Sanctuary* (c. 1670) (Figure 1)	the *Nativity* (c.1684-1690)
	the sculptures of the first phase of the altarpiece of the *Transit of St. Bernard* (c. 1675-1678)	the sculptures of the second phase of the altarpiece of the *Transit of Saint Bernard* (c.1687-1690)
	the sculptures of the first phase of the *Royal Series* (c. 1675-1678)	the sculptures of the altarpiece of *Saint Peter* (though these do not belong to the group there are possible associations)
	King Afonso I (?) (MAC, Inv. Esc. 88) (Figure 3)	
Monastery of Saint Mary in Coz	*Immaculate Conception*	
	Christ *at the* **Column**	
Convent of Saint Mary Magdalene in Alcobaça	*Saint Mary Magdalene* (MNAA, Inv. Esc. 2506) (Figure 2)	
Found in Vestiaria (now Private collection)	*Saint Rose of Lima*	
Sanctuary of Our Lady of Nazareth in Nazaré		the sculptures of the *Holy Family*
Monastery of Saint John in Tarouca	*Saint John the Baptist*	*Our Lady of the Rosary*
		the sculptures of the *Annunciation*
Monastery of Saint Mary in Lorvão	*Head of Saint John the Baptist*	
Convent of Saint Peter of Alcântara in Lisbon	the sculptures of the altarpiece of the *Transit of Saint Francis* (MSR Inv.º SPA 17) (has probably sculptures of both workshops)	the sculptures of the altarpiece of the *Transit of Saint Francis* (MSR Inv.º SPA 17) (has probably sculptures of both workshops)
Now in the Alberto Sampaio Museum, Guimarães		*Saint Cecily reliquary* (?) (MAS Inv. E 60)
Now in the City Museum of Coimbra		*Virgin* (MMCICTM, 43 E)

There are also similarities between the sculptures of this workshop and the sculptures found in the sacristy of the Monastery of St. Martin in Tibães, Braga. Their relationship, direct or indirect, is clear. The sculptures in Tibães were made by the famous Portuguese sculptor Fr. Cipriano da Cruz (c. 1645-1716) between 1682 and 1683. He joined the monastery in Tibães in 1676. He was

thirty-six years of age and was already a reputable sculptor. [Smith 1968] There is little information about his work before 1676, but documents prove that he also had contact with the monastery of Alcobaça in this year. This indicates that his work was known in Alcobaça at that time. [Smith 1968] Coincidentally or not, around this date, the first workshop in Alcobaça stopped producing artworks around this year. Therefore, that hypothesis that Fr. Cipriano da Cruz was a part of this workshop before taking his orders in Tibães is not frivolous. This would suggest that the first workshop in Alcobaça would have been composed of secular artists or lay brothers collaborating with other secular employees. It is highly likely that secular artists performed the majority of artistic works in this period in the monastery. By his age and fame, he couldn't be just an apprentice. [Remígio et al. 2014]

The second workshop (after c.1675)

The production of monumental clay sculptures in Alcobaça reached its peak in the latter third of the 17th century. The scale of production increased dramatically in this period and a second workshop was founded. The motivator behind this large-scale production was General Abbot Fr. Sebastião de Sottomayor (1619-1691). He commissioned more works from the existing (first) workshop in Alcobaça, and contracted more from an additional (second) workshop during his first governance (1675-1678). The known sculptures belonging to this production are listed in Table 1. Again comparing the physical forms of the sculptures closely allowed the authors to categorise them.

The sculptures of this second workshop are considerably more elegant and dynamic than those produced by the first workshop. There is clear evidence of a greater maturity and control of the construction techniques. The model for the angels, for example, is characterised by its effeminate face, expressionless look, abundant hair cut to the shoulders, long neck and thin body. The figure is dressed not in a long robe but in a short tunic, modelled with much fantasy. [Remígio 2009a] This model has been repeatedly copied without any alterations in several altarpieces.

Documents dating to this period are scarce, so it is almost impossible to establish why the second workshop took over production of the altarpiece of Transit of Saint Bernard at Alcobaça. However it is reasonable to assume that the first workshop was no longer active at this stage. The disbandment of this earlier workshop is likely to coincide with the first governance of Sottomayor.

Again there is evidence that the production (or skills) of the second workshop was exported. A document exists suggesting that the altarpiece of the Transit of St. Francis of Assisi (MSR Inv. SPA 17) of the Convent of Saint Peter of Alcântara, in Lisbon, was made by a Cistercian lay brother from the region of Leiria, and then transported to Lisbon. [Piedade 1728] It is probable that this is artisan belonged to the monastery in Alcobaça, situated in the district of Leiria. While this monumental sculpture set has similar features to the first workshop models, the harmony and balance of the composition link it to the second later workshop. It may be that this piece was produced in a transitional phase between the first and second workshops in Alcobaça.

Construction techniques

Both workshops in Alcobaça used the same production techniques but in slightly different ways to construct and decorate the monumental clay sculptures. These differences aided in the allocation of the individual pieces to either the earlier or later workshop (Table 1).

The clay used for the sculptures was probably extracted from the vast territory owned by the monastery. In this region the clay is pure, and is reddish and orange in colour. [Feyo 1945; AA.VV 1974] The Alcobaça clay has very little plasticity due to its mineral content which gives the product a porosity of 33.3% and a water absorption capacity of 18.6%. Its mineralogical

composition is based on mica, quartz, calcite and metahaloisite. [AA.VV 1974] Finding trace elements specific to locations would demonstrate that the clay was extracted from different places. A variety of trace minerals was identified when analysing the ceramic bodies of *King Afonso I* and *Saint Mary Magdalene* (Table 2). However, whilst the mineral content is different, stylistically these both can be classed as first workshop production. The results obtained from the analysis of *King Afonso I* are similar with to previous results found in other sculptures from the first workshop. [AA.VV 1974]

Compositional forms were inspired by prints that circulated throughout Europe either as individual prints or as sets bound in books. The sculptures of the Royal Monastery of Saint Mary of Alcobaça were no exceptions – the forms created can be identified in prints. The print series of Peter Perret (c. 1555-1625) published in 'Elogios dos reis de Portugal (…)' in 1603 by Fr. Bernardo de Brito (1569-1617) inspired the first phase of the Royal Series. [Santos 1979] The source for the Queen Saint Isabel of Portugal (1293-1359) reliquary has also been found. Queen Isabel was one of the founders of the Alcobaça monastery. Her reliquary was inspired by the 1621 engraving by Cornelius Galle, or at least by an ensuing copy. [Remígio 2012]

Realising the design was achieved in a number of steps. First a small model, roughly one hand-span (*palmo*) in height, was constructed which served as a guide for the larger work. [Castro 1937] The actual sculptures were constructed in an additive process from the base upwards. Wooden slats were used to distribute the increasing weight as the height of the sculpture grew. [Castro 1937; AA.VV 1974] The joints between the individual horizontal slabs are visible from the hollow interior of the sculpture. This is especially true for the sculptures of the first workshop in which the slabs are often clumsily joined together. The formal aspects of the sculpture were created by moulding the clay by hand or by carving excess away with a wooden chisel. [Castro 1937, AA.VV 1974] The proportions of the head section would determine the final height of the sculpture. [Vasconcellos 1733] The details were manipulated using smaller wooden chisels and gouges. Wire ended modelling tools were used to remove excess clay and smoothing chisels were used to flatten and mould areas. Wet paintbrushes were used to obtain the finest details. [Vasconcellos 1733]

Table 2. Mineral content of *King Afonso I* and *Saint Mary Magdalene*

Sculpture	Main Components	Trace Minerals Identified
Saint Mary Magdalene (Figure 2) (MNAA, Inv. Esc. 2506)	mica quartz calcite metahaloisite	dolonite nontronite hematite
King Afonso I (Figure 3) (MAC, Inv. Esc. 88)		nontronite muscovite anatase gypsum hematite goethite

Figure 4. A horizontal block of a sculpture showing the interior construction.

Figure 5. The horizontal blocks of clay used to construct the sculpture are visible.

The sculptures were executed hollow, but with a system of clay bars inside them, so as to provide support for the walls (Figure 4). This procedure was also intended to aid the drying and firing processes. [Vasconcellos 1733] Artisans of the first workshop chose to make thick walls with few bars inside, while the second used thinner walls and a more complex bar system. [Remígio 2009a]

Once formed, the sculptures were cut transversely into blocks, called *tacelos*, using a wire cutter (Figure 5). [Castro 1937] This operation was intended to facilitate the transport and also to aid the drying and firing processes as the blocks would be smaller. Also in this procedure the two workshops proceeded differently. While the first workshop cut its sculptures in a few blocks (about six per figure) and in a regular sized section, the second preferred to cut its sculptures in more pieces (about ten) and in irregular blocks, accommodating whenever possible the aesthetic forms. This demonstrates the higher technical level of the second workshop. Smaller figures of roughly one metre tall were treated differently – these were not sectioned at all by the first workshop, but were cut at the waist in the later period.

Clay loses volume as moisture content is driven out during the drying and firing processes. [Batista et al. 2009] A breather hole was cut into the top of the sculptures, usually at the head, to allow for air circulation and to release the steam and gases during firing preventing fractures of the block. Several breathers were opened in hidden areas in the horizontal orientated sculptures – usually one in each block. The blocks were baked in wood burning kilns in several sessions. Each session lasted up to two days. Temperatures needed to reach 450º C in the kiln. [Castro 1937; AA.VV 1974] The inner walls of some sculptures are blackened by the severely hot temperatures (Figure 6). This phenomenon occurs in the sculptures of both workshops, but is more intense in the first, possibly because the sculptures have thicker walls. Often the blocks broke in the firing process or during transportation. Damages were repaired with an adhesive consisting of a resin mixed with a stone powder.

Smaller protruding elements were at times carved in wood. These elements were inserted into predesigned holes (using mortice and tenon joints) and fixed in place with a similar resin/stone adhesive discussed above. Examples of this practice can be found in the figure of the Virgin from the Sanctuary of the Royal Monastery of Saint Mary in Alcobaça where the hands of the figure are made of wood. Also the wings of a angel from the altarpiece of the Transit of Saint Bernard are carved in wood.

Once transported to their desired location, the blocks were placed in their correct position in the altarpiece. Their own weight was sufficient to keep the sculptures stable (the bases being wider than the top). Joints were filled with a mortar of lime and sand. [Feyo 1945; AA.VV 1974]

The sculptures were polycromed using traditional contemporary methods. The paint layers were applied in-situ as the joints between each of the construction blocks are covered, but the inaccessible areas (the reverse) are not. Smaller sculptures were polychromed in the workshop, where they were polychomed in the round. The stratigraphy of the decorative layers is traditional. For the most, the process begins with an isolation layer to reduce the porosity of the clay. This layer consists of an organic material. Above this a preparation layer is applied, typically in a brown hue. Here the pigments are bound in an organic medium. The colour is achieved by mixing a gypsum (calcium sulphate) with a yellow dye (ginger) and some minor additions of lead antimony/lead tin yellow (tin sulphate) or vermilion (mercury sulphide). Raman IR spectroscopy identified the following pigments on both sculptures studied: malachite, azurite, lead white, chalk, yellow ochre, vermilion, red ochre, charcoal and carbon black. The binder is proteinaceous, with the exception of the red vermilion paint layers which are oil based. [AA.VV 1974; Moura et al. 2002] The leaf metal, an alloy of gold, was applied on a mordant layer containing ochre pigment bound in resinous medium (Figure 7). [Moura et al. 2002]

If the commissioned sculptures were transported local contracted painters would have applied the polychromy. It seems, however, that the painters may have been itinerant journeymen. The polychromy applied to the sculpture of *Saint John the Baptist* in Tarouca and that on the reliquary in the Sanctuary of the monastery in Alcobaça are by the same hand. However, the possibility that the entire workshop was itinerant cannot be excluded.

Figure 6. The blackened interior wall of a sculpture.

Figure 7. The polychromy decoration of a reliquary.

Conclusion

Contradictory to what is currently believed, the monumental clay sculptures of the Royal Monastery of Saint Mary in Alcobaça were not executed by one workshop but by at least two workshops. It is likely that both workshops produced sculptures for a short period simultaneously. While both workshops followed standard practices, there are clear differences in technique. The latter second workshop showed a more sophisticate understanding of the material and decorative processes. Both workshops used the same construction technique prior to firing the clay and used standard models for figures.

The artisans working in both workshops were probably not monks serving the monastery but lay brothers or/and (probably) secular employees. There are clear links between nearby monastery communities as is shown in the similarity of works produced in Alcobaça and in Tibães. Considering the timeline, it is possible that the famous Portuguese sculptor Fr. Cipriano da Cruz worked in the earlier workshop in Alcobaça before moving to Tibães, where he took his orders. It is also clear that these workshops also completed commissions for other locations. Similar features, as well as documentation, help to identify sculptures obviously produced in Alcobaça.

The preliminary historical, technical and material study of the sculptures of *Saint Mary Magdalene* from the Saint Mary Magdalene Convent in Alcobaça and of *King D. Afonso I (?) of Portugal* probably from the monastery in Alcobaça both showed similarities with other sculptures from the production of the first workshop in Alcobaça. Further analysis will confirm this initial classification by the authors.

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References

AA.VV, 1974-1979. *Problemas de alteração e conservação do conjunto em terracota da Morte de S. Bernardo no Mosteiro de Alcobaça*, (3 volumes), vol. 1 (1974), Alcobaça: ADEPA.

Batista, V.R., Nascimento, J.J.S. and Lima, A.G.B. de, 2009. 'Secagem e retração volumétrica de tijolos cerâmicos maciços e vazados: uma investigação teórica e experimental', *Revista Matéria*, 14 (4), 1088-1100.

Castro, J. M. de. 1937. *Dicionário de Escultura*, facsimile edition (the original manuscript dated circa 1812), Lisbon: Livr. Coelho.

Feyo, B., 1945. *A Escultura de Alcobaça*, Lisbon: Edições Ática.

Moura, C. 2006. *A Escultura de Alcobaça e a Imaginária Monástico - Conventual (1590-1700)*. Ph.D. dissertation, Faculty of Human and Social Sciences, New University of Lisbon.

Moura, C., Barreiro, A. and Ribeiro, I. 2002. 'Os Bustos-Relicário – Alguns casos notáveis da Escultura Seiscentista de barro em Alcobaça', *POLICROMIA*, Lisbon: IPCR, 63-70.

Nascimento, A.N., 1999. *Cister - Os Documentos Primitivos*, Lisbon: Edições Colibri.

Natividade, M.V., 1885. *O Mosteiro de Alcobaça, Coimbra*: Imprensa Progresso.

Nunes, F., 1982. *Arte de Pintvra. Symmetria, e Perspectiva*, facsimile edition (the original manuscript dated circa 1615), Oporto: Editorial Paisagem.

Piedade, F.A., 1728. *Espelho de Penitentes (…)*, Lisbon: Oficina José António da Sylva.

Remígio, A.V., 2009a. 'Relicários do Santuário do Mosteiro de Santa Maria de Alcobaça'. In: *A Prática da Teoria, Tratamentos de Conservação e Restauro*, Lisbon: ARP, 33-42.

Remígio, A.V., 2009b. 'O retábulo da capela-mor da igreja do Mosteiro de Santa Maria de Alcobaça e o tratamento de Conservação e Restauro da escultura da Virgem com o Menino'. In: *Actas IV Congresso Internacional Cister en Portugal y en Galicia, Tomo II, Braga – Osseira*: Ediciones Monte Casino, 905-928.

Remígio, A.V., 2012. 'O retábulo do Trânsito de São Bernardo do Real Mosteiro de Santa Maria de Alcobaça: história, execução e conservação', *Conservar Património* (15-16) 3-30.

Remígio, A. V.; Moura, C., Veiga, J.P., 2014. 'Um contributo da Conservação e Restauro para o estudo da escultura monumental em barro cozido policromado do Real Mosteiro de Santa Maria de Alcobaça - os escultores', *Actas do*

IV Congresso de História da Arte Portuguesa em Homenagem a José-Augusto França - Sessões simultâneas. Lisbon: APHA. (in printting)

Santos, F.M., 1974-1979. *Descrição do Real Mosteiro de Alcobaça*, facsimile edition (the original manuscript dated circa 1810), (3 volumes), vol. 1 (1979), Alcobaça: ADEPA.

Santos, J., 1924. *Catálogo da Notável e Preciosa Livraria (…)*, Oporto: Tip. Da Sociedade de Papelaria.

Smith, R.C., 1968. *Frei Cipriano da Cruz, Escultor de Tibães*, Oporto: Livraria Civilização.

Vasconcellos, I.P., 1733. *Artefactos Symmetriacos, e Geometricos (…)*, Lisbon: Officina de Joseph Antonio da Sylva.

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The technical study of a Portuguese 18th century clay Nativity Scene.

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Abstract

The Nativity Scene (*Presépio*), from the Santuário de Nossa Senhora dos Remédios, in Lamego (Portugal), is a rare and precious example of Portuguese clay sculpture from the 18th century. This Nativity Scene comprises more than 60 individual polychrome clay figurines, all measuring between 8 and 15 cm in height, placed in a decorative setting with appropriate accoutrements and paraphernalia. The main figures are depicted in costumes with rich decorative details. These figurines are decorated in a similar manner to wooden polychrome sculptures of the same period. Artistic techniques including gilding and glazing are used to imitate materials such as lace or brocade; while actual materials such as glass eyes, sequins, silver halos are used to embellish the figures. The *Presépio* is contained within a polychromed wooden structure – a reliquary. Several analytical techniques were used in order to characterise some of the chemical composition of the materials used. The qualitative and semi-quantitative analyses of the pigments were performed by optical microscopy (OM) of cross-sections, using reflected and polarised light, and by scanning electron microscopy (SEM) in combination with energy dispersive spectroscopy (EDS). The technical investigation preceded the conservation and restoration of the sculptures.

Keywords: clay sculpture; Nativity Scene; Baroque; techniques; conservation.

Introduction

The first documentary references to carved Nativity Scenes (*Presépios*) in Portugal date back to the 16th century. However, the dramatisation and staging of Christmas plays depicting the birth of Jesus had been performed since the Middle Age. [Franco 2010] The word *Presépio* has its origin in the Latin word *præspium* (barn) or *præsæpe* (manger). The iconographical representation of this scene took various forms, originally based on descriptive imagery narrated in the gospels of St. Mathew and St. Luke. Initial compositions transcended geographical borders, but over time the iconography displayed in Portuguese representations underwent great stylistic change, moving towards a more naive and popular representation of the figures and the story depicted. Local characteristic features were incorporated with a rising taste for allegories. [Pais 2003] The iconography of the *Presépios* began to capture the nobleman's view of the city or country populace. The lower classes were represented happy in their idealistic labour. [Pimentel 2010] These genre sculptures provided a rich source of images and figures that were sometimes not very well accepted by the Catholic Church.

These Portuguese Nativity Scenes, often conceived in the form of artistic panoramas, became one of the most individual and peculiar art forms specific to the local culture in the 18th century. The choice of figures and scenes represented owed very little to external influences and much to local resources, specifically in the tradition of clay modelling. [Pais 2003] These representations are a joining of opposites: the popular and the erudite, the classic and the anti-classic, the sacred and the profane. [Saldanha 2010] The altarpiece studied here is one of these examples where opposing influences came together to create a homogenous object filled with rich features. Attention is immediately drawn to the main scene – the Nativity. However, the large number details present makes the viewer's eyes wander over the contents and the variety of materials,

objects and images represented, compelling the viewer to stop and to reflex on each scene separately in order to capture the total effect and individual aspects.

The Depicted Scenes

The Nativity Scene (*Presépio*), from the Santuário de Nossa Senhora dos Remédios, in Lamego (Portugal), is a rare and precious example of Portuguese clay sculpture from the 18th century. Its historical, artistic and aesthetic values make this work of art unique. The reading of the reliquary evolves clockwise from the top left of the wooden structure. The wooden box is divided into three levels, which aids the viewer envision a space in which the story of the Nativity occurs: the first and lower comprises the ground level; the second is a hilly geography that outlines the stable placed in the foreground; and finally the third tier illustrates a city wall. The latter is constructed as a cardboard backdrop, which continues, at right angles to form the sides of the reliquary box.

Figure 1. The Nativity Scene before conservation. © Bidarra

Figure 2. The Nativity Scene after conservation. © Bidarra

The first scene, placed in the top left corner at the foot of the city wall, shows a dramatic representation of the *Massacre of the Innocents*. Dead corpses of babies lie at the feet of their executioners, depicted with cruelty and hatred in their faces. Mothers pleading for their children's lives are watched over by a calm King Herod surrounded by his guards. The second scene is placed in the top right corner. Here the *Annunciation to the Shepherds* is shown: an angel sent from above reveals the news of the Saviour's birth. The following chorographical scene takes place in the centre at the foot of the city wall. The *Three Magi* are shown descending into the city in their exotic garb with their entourage. Each king is shown riding a different animal: a white horse, an elephant and a camel. Their servants lead more animals, all decked with elaborate harnesses. The action represented leads the viewer from the upper and middle tiers to the lower one, where the main scene is shown. *The Nativity* story takes place in a stable in the middle foreground, in which an ox and mule are placed. The main characters of baby Jesus, the Virgin Mary and Saint Joseph are placed in central focus in front of the stable. The final scene, the *Flight into Egypt*, can be found in the lower left corner of the reliquary, though only the figurine representing the Virgin, holding baby Jesus, riding a donkey remains.

In addition to the scenes representing the story of the Nativity, many other characters are shown. These include numerous angels and musicians playing instruments or singing; various tradesmen and women such a washerwoman and shepherds herding their flock; peasants going about their daily business of collecting water or even fighting. Animals are depicted, as are every day objects.

Condition of the *Presépio*

The *Presépio* is no longer complete. Some of the expected figures are absent entirely or remain only as feet planted in the surrounding ground. Moreover, before conservation treatment commenced many of the details were obscured by dirt and debris. A considerable number of figurines were broken, the pottery shards lying at the feet of adjacent figures or hidden at the back, beneath the floor of the reliquary (Figure 1). Detached figures were replaced in erroneous positions, some even reconstructed from mismatched fragments. The result led to difficulty in deciphering individual scenes.

The clay figurines

There are 60 clay polychrome figurines present in the reliquary. Their heights range from 8 to 15 cm. The clay figurines are embellished and painted to imitate costumes consistent of period and rank of the personage depicted. The quality of polychromy and degree of decoration present varies enormously. The use of surface decorations is integral to each of the sculptures and creates a complex and heterogeneous composition. These elements, the level of details, their location and careful positioning, are critical to the formal finishing and the final expression of the figures, and contribute to the perceived dimensionality of the work. The techniques used to imitate these surfaces and textures are similar to those represented on contemporary wooden Baroque sculptures. Though in places the surface decoration is missing or has changed in transparency, it is evident that glazes were used to achieve a high decorative finish.

The quality of the artistic rendering of each figurine relates to the individual figure's symbolic significance within the Nativity story (Figure 3). The most important figures are depicted in elaborate clothes rich in detail. These include the Holy Family, the Magi and their entourage, as well as King Herod. Decorative elements include lace, gilt embroidery and sequins and King Herod's soldiers have gilded highlights to their armour. The most colourful figurines in the set are the Magi and their entourage (Figure 4). The Magi, the Virgin Mary and Saint Joseph have glass eyes.

Figure 3. The Holy Family figurines. © Bidarra

Figure 4. One of the Magi figurines. © Bidarra

The figurines representing peasantry or the local populace are less elaborately decorated. The colour palette used is simplified, consisting of predominately white, dark red, green, brown and black pigments. The clothing of these figures is also simplified. However, here also artistic techniques are used to imitate textures such as velour, providing additional detail to the sculptures. The three figurines placed at the back of the reliquary on the battlements of the city walls are moulded semi-in-the-round, indicating that they were designed for these specific locations as they could not be viewed in the round.

The low-relief embroidery decoration is modelled in a wax-resin mixture to achieve the desired textural effect; for the majority, these have retained their shape and remain attached to the supporting clay body. Many of the other decorative ornamentations had detached or were broken. However, a considerable amount of fragments were retained and it was possible to replace most of them during conservation treatment.

The figurines themselves are moulded in clay, subsequently fired, but other materials are used to enhance the perceived sense of reality. The wings of the angels playing musical instruments are constructed from painted paper, as are those of the angel announcing the birth of the Saviour to the shepherds. Some parts of the musical instruments are carved from wood. A silver crown is placed over the head of the Virgin, while St. Joseph's is depicted with a halo. Ribbons and other textiles are used to brighten the scene, though these are modern replacements.

The scenery

Wood was used to construct the box framework for the reliquary structure. However, the internal landscape is built-up using cork to create a fantasised landscape set against the backdrop of a walled city, painted on cardboard. Cork sections were assembled and glued, then carved and decorated to emulate a landscape in which the Nativity story takes places. This included a cliff-face, rocks, and a cave. The cork structure was painted and decorated with moss, dried plants and paper flowers to increase the sense of reality. Further structural elements such as the fountain are also fashioned from *papier maché*, painted to imitate stone. Sand was used to create texture where necessary. Additional organic material was to emulate clouds (cotton wool balls) and to represent 'real' objects such as the straw in the stable. Close examination of much of this material and its position revealed its non-original nature – these elements had been replaced in the past. This complex integration of organic and inorganic material was used to heighten the viewer's sense of reality. Decisions regarding the conservation or replacement of these were made with careful consideration to their position, history and intension. Many were deemed in too poor condition to be replaced and non-original. These were removed during conservation.

Material analysis

In order to achieve a better knowledge of the pigments and techniques applied in the production of the sculptures it was necessary to collect representative samples for microscopic examination or chemical analysis. While some new samples were selected from discrete but representative areas, many fragments already detached could be analysed. The samples were mounted in polyester resin (BYLAPOX 3085 A and B (2:1)) and polished using a Struers Planopol-V machine. These samples were examined using a variety of techniques.

Optical Microscopy (OM)

The prepared samples were observed using a Zeiss Stemi 2000-C optical microscope at 100x magnification. Polarised and transmitted light sources were used to study the material characteristics. Digital images were acquired using a AxioCam MRcS camera and the resulting images were processed using Axio Vs 40 V4.4 Carl Zeiss Vision GmbH software. The mounting and observation of the samples followed the standard procedure as sued for analysis of easel painting cross-section samples [Khandekar, 2003]. This allowed the study and determination of the number and thickness of individual layers; the adhesion and cohesion between layers; and the shape and grain size of the particles present. Non-original layers, such as overpaints, could be determined. [Calvo 2003]

Scanning-Electron Microscopy - Energy Dispersive Spectroscopy (SEM-EDS)

The SEM-EDS analyses were performed using a SU-70 UHR Schottky FESEM electron microscope with a Bruker AXS (XFlash Silicon Drift Detector) Quantax 400 EDS system. An

acceleration voltage of 15kV and a current of 32μA were used to elicit elemental response. Element analysis was taken of surface spot areas measuring 1 μm^2, with spectrum acquisition times of 60 seconds. The areas were scanned using an 8000x magnification and the elemental and semi-quantitative results were averaged after three consecutive measurements. The semi-quantitative results were based on a peak-to-background ZAF evaluation method (P/B-ZAF), being ZAF a matrix correction, mainly based on analytical expressions for atomic number (Z) depended X-ray yield, self-absorption (A) and secondary fluorescence enhancement (F), provided by the Esprit software. The semi-quantitative results were normalized to 100%. The samples were coated with carbon prior to study to ensure optimum conductivity of the surface. The use of SEM in combination with EDS increases the sensitivity for light elements, the spatial resolution for spot analysis is higher and it allows microstructure examination via line scans or two-dimensional mappings of the elemental distribution. [Goldstein 1975]

Table 1. Elemental pigment analysis from cross-section samples.

Figure	Colour	Element Detected with SU-70 UHR Schottky FESEM electron microscope with a Bruker AXS (XFlash Silicon Drift Detector) Quantax 400 EDS												
		Ag	Al	Ba	Ca	Cd	Cu	Fe	Hg	K	Mg	Pb	Si	Zn
The Virgin	Blue	X	X		X			X				X	X	
The Virgin	Metallic blue	X	X		X			X	X			X	X	
The Virgin	Red	X	X		X			X				X	X	
Baby Jesus	White		X	X								X	X	X
Saint Joseph	Blue		X		X	X					X	X	X	
Angel	Skin		X		X			X		X		X	X	
Mule	Brown		X		X			X			X	X	X	
Elephant	Grey		X		X			X				X	X	
Elephant	Black		X		X		X	X		X	X	X	X	

Figure 5. Cross-section viewed at 100x (OM image): Sample from blue colour on the cloak of the Virgin.

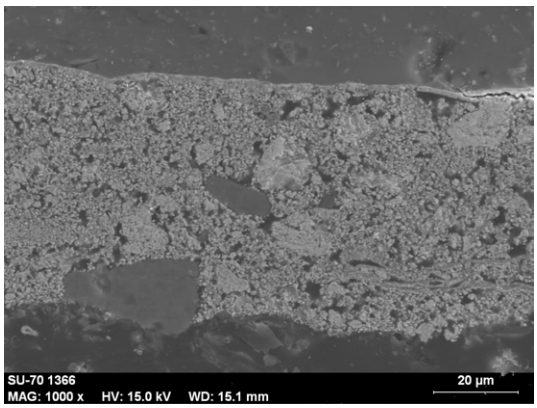

Figure 6. Cross-section viewed at 1000x (SEM image): Sample from blue colour on the cloak of the Virgin.

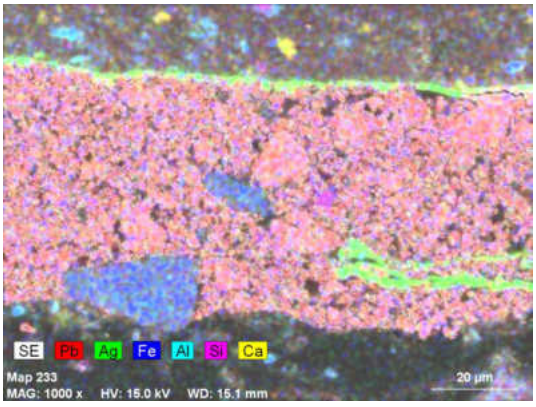

Figure 7. Cross-section viewed at 1000x (EDS mapping): Sample from blue colour on the cloak of the Virgin.

Results and discussion

The OM and SEM-EDS analyses, combined with an understanding of artistic practice, provided a more accurate evaluation of both technological and chemical aspects of the polychromy. The samples studied could be allocated to two specific categories. The first group of samples showed a characteristic use of two application layers: ground and paint. The second group could be typified due to an intermediate layer present between the ground and paint applications. The sample sites of the second set related to gilded areas, such as the costumes of the main figures. This indicates that the intermediate layer was applied as a preparatory coating for the application of metal leaf.

The pigments used to form the colour palette could be interpreted from the SEM-EDS analyses. Elements detected common to all samples were lead (Pb), aluminium (Al), calcium (Ca) and silicon (Si). It should be noted that the presence of calcium was not exclusive to samples removed from white areas. Other elements detected in many of the samples included iron (Fe), manganese (Mg) and potassium (K); elements identified in specific samples included mercury (Hg), copper (Cu) and silver (Ag). Anomalous elements that could relate to non-original layers include barium (Ba), cadmium (Cd) and zinc (Zn). The results are reported in Table 1.

Interpreting these results has led to new conclusions. Calcium and silicon were detected in large particles present in all ground layers, specifically to the lower strata. The presence of these elements indicates the use of calcium carbonate containing impurities within the preparatory layers. Lead, aluminium and iron responses were detected in all the (upper) ground layers. This suggests that the upper ground layer consisted of a homogenous mixture of lead white pigment combined / coloured with iron oxide earth pigments.

In other samples it was not possible to distinguish the ground from either the intermediate or paint layers chemically. The colour difference observed in these areas on the sculpture could be explained by a change in saturation induced by the application of a glue used as a mordant for the gliding directly applied onto the ground layer. The investigation techniques used in this project were not appropriate for the identification of organic material. Thus this material remains unspecified. No bole layer was observed in any of the figurines. It was expected to find gold (Au) in the gilt applications; however, surprisingly silver (Ag) was detected instead. Glazes applied over the silver metal leaf were used to imitate the more precious metal. These silver metal applications can be pinpointed in the cross-sections shown in Figures 5, 6 and 7. Mercury (Hg) was detected in a paint sample taken from the blue robe of the Virgin figurine. This element is not typically associated with the rendition of the colour blue, nor was it detected in any other sample. The presence of mercury remains open to interpretation. Hypothetically it could be associated with mordant application for the gilding, as these often contained lead white ($PbCO_3.2H_2O$) and vermillion (HgS) as siccatives. [Bidarra 2009] However, no sulphur (S) was detected. The brown and black pigments used are most likely derived from organic material undetectable by EDS analysis.

Elemental analysis of the white paint applied to create the swaddling cloth on the baby Jesus figurine revealed both zinc (Zn) and barium (Ba), as well as lead (Pb). These two elements were identified in particles in the same strata as lead containing particles, indicating that white paint was composed of a mixture containing these three elements. This association of white pigments was unexpected and is not typical of this period. Barium is present in both naturally occurring minerals barite (barium sulphate, $BaSO_4$) and witherite (barium carbonate, $BaCO_3$). Although there are not many references to the use of barite as a pigment, the mineral was known since the 16th century, and it has been used as an alternative to lead white. [Eastaugh 2008] Again here the element sulphur (S) was not detected using EDS, pinpointing the use of the carbonate rather than the sulphate version of the mineral. Zinc oxide (ZnO) was known as a pigment since antiquity and was, by the late 18th century a common replacement for the more toxic lead white.

Its popularity as a white pigment for oil paint faded towards the end of the 19th century due to its poor covering power and inefficient manufacturing methods, but remained popular as a watercolour. [Eastaugh 2008] The use of zinc white combined with barium sulphate as a common 19th century paint was ruled out as an alternative scenario, as no overpaint layers were detected on any of the figurines.

Conclusions

Analysis of the stylistic features of the *Presépio,* and the study of the pigments and painting techniques used in its creation, point to a date of construction towards the end of the 18th century. Although this falls within the period of Portuguese Rococo, it has markedly Baroque characteristics. Since there is no written information on the commission, purchase or donation of the *Presépio*, this is now the probable chronological dating of the work, and the results will be compared with other Baroque clay Nativity Scenes.

The main aim of this project is to promote understanding of an important area of Portuguese cultural heritage, by creating an inventory of these often incomplete artworks, including their historical and material characterisation, and by allowing the public a closer look of these rare works of art.

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References

Bidarra, A., Coroado, J., Rocha, F. 2009. 'Gold leaf analysis of three Porto Baroque altarpieces'. *Archeo Science, Revue d'Archéométrie* 33:417-422.

Calvo, A. 2003. *Conservación y Restauración. Materiales técnicas y procedimientos. De la A a la Z*. Tercera edición. Ediciones del Serbal, Barcelona.

Franco, A. 2010. 'Histórias dos Presépios em Portugal'. In Henriques, A. C. (ed.) *Esculturas de género - Presépio e Naturalismo em Portugal*. MC, IMC e MNAA, Lisboa, 26-39.

Eastaugh, N., Walsh, V., Chaplin, T. et al. 2008. *Pigment Compendium: A Dictionary and Optical Microscopy of Historical Pigments*. Butterworth-Heinemann, Oxford, UK.

Goldstein J.I. 1975. 'Electron beam – specimen interaction'. In Goldstein J. I., Yakowitz H (ed.) *Practical scanning electron microscopy. Electron and ion microprobe analysis*. Plenum Press, New York, 49 – 94.

Khandekar, N. 2003. 'Preparation of cross sections from easel paintings'. *Reviews in Conservation* 4: 52-64.

Pais, A. N. 2003. 'O Presépio'. In Carvalho, A. (ed.) *O Presépio da Madre de Deus*. IPM, Lisboa, 26-127.

Pimentel, A. F. 2010. 'Esculturas de género'. In Henriques, A. C. (ed.) *Esculturas de género - Presépio e Naturalismo em Portugal*. MC, IMC e MNAA, Lisboa, 4-12.

Saldanha, N. 2010. 'Naturalismo e Presépios'. In Henriques, A. C. (ed.) *Esculturas de género - Presépio e Naturalismo em Portugal*. MC, IMC e MNAA, Lisboa, 12-25.

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On the trail of a select group of central European reliquary busts. Using construction typology for authorship attribution.

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Abstract

On the basis of the conclusions drawn from the technical study of a group of 5 reliquary busts in Vitoria, Spain, which define a specific typology and can be attributed to an important Central European workshop, we have undertaken an extensive study to look for similar examples, thoroughly searching museum catalogues, collections and documentary holdings. The study of 25 further cases scattered around churches and museums in various countries has enabled us to compare their technical and constructive features and certify 15 additional pieces manufactured at the same workshop, some of them hitherto unknown. This approach proves to be a decisive scientific method to determine attribution, particularly in cases where accurate documentary sources are lacking. Our study has allowed us to explore historical-artistic issues such as authorship, stylistic influences or the nature of commissions in more detail.

Keywords: Reliquary bust, Saint Ursula, Cologne, non-destructive techniques, constructive technology, sculpture, Renaissance, Charles V.

Figure 1. View of the five busts held at the Museum of Sacred Art in Vitoria.

Introduction

Five reliquary busts of outstanding quality, dating to the 16th century, which depict martyred virgins in Saint Ursula's retinue, are exhibited at the Diocesan Museum of Sacred Art in Vitoria (Figure 1). These pieces are held on loan from Saint Vincent's church in Vitoria. They originally stood beneath five shell-shaped canopies, within a side niche of the plateresque style, at the former chapel of the Cross or the Eleven Thousand Virgins. The chapel was commissioned as a family burial site by Ortuño Ibáñez de Aguirre, 'Oidor' (Judge) for the Royal Council and the Inquisition.

The Alava Provincial Government Restoration Department carried out the initial technical studies of this set in the late 1990s. At that time, the aim was to study the pieces using non-destructive techniques (X-radiography, endoscopy and tomography), and to avoid more drastic interventions such as dismantling the sculptures from their settings (Figure 2). These techniques were combined with other specific tests in order to provide a wealth of information about different aspects of their execution: their structure, the materials employed, number of elements, assembly systems, manufacturing stages, etc. The research also enabled the identification of a very specific typology of reliquary bust, which could then be used for comparison with other pieces exhibiting similar features, as described by García and Ruiz de Arcaute. [1999a, 1999b, 2000, 2001].

Figure 2. CT Scan slices of Saint Balbina's bust in Vitoria.

Figure 3. Arrangement of the pieces for Saint Balbina's bust in Vitoria. Digital reconstruction.

Reliquary Busts: Construction Technique

All these busts are carved in oak and are made up of a large number of different pieces. The sculptor started with a core block, made up of three radially-cut boards of maximum thickness 7 to 8 cm. These were assembled and then finished off to the sides with additional blocks of wood. The total number of pieces may vary, depending on how complex the figure is, and whether it includes the arms. *Saint Balbina* from Vitoria is an example with a total of 14 pieces (Figure 3). The technique employed for cutting the wood, the substantial narrowing of the boards at one end and their position "against the grain" to compensate for warping, indicate that dry wood was used for the carving with the intention of minimising potential wood movement.

Figure 4. Detail of tapered wedges inserted in a joint.

Figure 5. Assembly system for the two main elements. Digital reconstruction.

Simple glued joints were used to assemble the different parts, with the occasional wooden peg being added on the sides for reinforcement, and slivers of wood used to conceal minor defects and imperfections (Figure 4). The front and the back halves of the busts were hollowed-out separately, and consequently the edges do not line up perfectly but leave a gap starting at the head and running all the way down the neck. There is similarly also a gap starting at shoulder level and running down to few centimetres from the base of the bust. The reliquary bones were concealed inside, wrapped in pieces of rich fabric some time decorated with gold, embroidery or sequins. Some fragments remain visible for contemplation. As there was a requirement for the relics to be seen, each bust had a discreet trap door on top of the head – the shape and size varying in each case (round, square, rectangular, triangular or hexagonal). Some examples also include a 'theca' on the chest. In all these examples, almost identical tools and techniques were used to craft the details and decorative elements.

It seems evident that the relics were placed inside before the busts were completed, or at least before the two main parts for the front and back were joined. The union of pieces was reinforced at the neck, shoulders and trunk with wooden pegs, and the priming, gilding and polychromy were then applied (Figure 5). The figure was finally mounted on a base, secured by a rectangular block of wood inserted into the base of the bust.

Figure 6. Detail of the gap down the side joints. Reliquary bust in Astorga.

Figure 7. Detail view of the finish on the sculpture. Bust No. 005224-000. MNAC, Barcelona.

The simplicity and finesse of the polychrome finish on these carved pieces is remarkable, particularly as regards the embroidered fabrics and decorated headdresses. The decoration was applied over a thin preparation layer of calcium carbonate bound with animal glue. Mordant leaf gilding was used for the golden robes and hair, with silver leaf used for some decorative elements. The gold or silver leaf was laid over a ground layer containing ochres and minimum pigments bound in oil. The remaining skin tones and decorations are rendered in oil paint, except for the cases of azurite blue on the bases, which is applied with a glue binder. This distinctive workmanship is well known and is characteristic of Central European workshops, rather than those of Spain.

Most of the features described above are visible to the naked eye. This is particularly true for the structural aspects, such as the gaps where the parts join, which tend to split open, and the peg heads, which tend to stick out, etc. (Figure 6). As a result, identification of the reliquary busts made using this construction system is relatively easy.

Correlating the Busts: Research and Analysis

The conclusions of these initial studies were the starting point for a more extensive research. We have searched museum and collection catalogues, documentary records, online information (websites and blogs) and visited a number of examples, to enable direct input [1]. In addition to the Vitoria busts, the analyses have covered a total of 25 busts, all exhibiting similar features, with some listed below as references, and further examples discovered during our research.

The group discussed here includes 15 that undoubtedly came from the workshop that produced the Vitoria set. They are: the four held at The Cloisters Collection, Metropolitan Museum of Art, New York; one at Los Angeles Country Museum of Art; the bishop saint at the Bode-Museum in Berlin; the bust from the Saviour's Chapel in Úbeda; two held at the Pilgrim Trails Museum in Astorga; two at the Catalonian Art Museum in Barcelona; two recently discovered at the church in Joarilla de las Matas; and two other busts of bishops at the Shrine of Our Lady of Charity in Sanlúcar de Barrameda, which originally were from Sanlúcar de Barrameda. The last two are since lost and although documentary references were used for the purposes of this study they appear very similar to the Berlin example. With the five pieces in Vitoria and another three that disappeared from the Saviour's Chapel in Úbeda, during the Spanish Civil War [2], we propose that all 23 works were crafted by the same hands.

Table 1: Reliquary Busts

Name	Registration No.	Location	Dimensions (cm)		
			Height	Width	Depth
St. Balbina	311	Vitoria	58	39	17/23
Holy Virgin	312	Vitoria	47	35	17/23
Holy Virgin	309	Vitoria	46.4	34	17/25
Holy Virgin	310	Vitoria	48.5	37	18/25
Holy Virgin	491	Vitoria	46.6	31	17/25
One of the 11,000 virgins		Astorga	44	38	17
One of the 11,000 virgins		Astorga	43	37	18
St. Aurelia		Ubeda	39.5	34	22
One of the 11,000 virgins		Joarilla	45	39	21
One of the 11,000 virgins		Joarilla	47	39	20
Saint Bishop		Sanlúcar	65.5	37	16
Saint Bishop		Sanlúcar	64	38.5	16.5
Holy Virgin	005224-000	Barcelona	43.7	31.4	17.3
Holy Virgin	005220-000	Barcelona	46.5	40	19
Reliquary Bust	William Randolph Hearst Collection (48.24.19)	Los Angeles	41.91	38.10	17.78
Female saint	59.70	New York	42.4	32.4	15.9
Female saint	1976.89	New York	51.1	36.2	16.8
St. Balbina	67.155.23	New York	44.5	40.6	15.9
Companion of St. Ursula	17.190.728	New York	45.4		
Saint Bishop	2/61 (116)	Berlin	72.5		

In a number of these cases, both the context and the relics are now missing. Although they all seem to come from churches in Spain, information on their origin was lost when they were sold in the late 19th or early 20th century, to collectors such as William Randolph Hearst, S. Carlton Clark, J. Pierport Morgan or Lluís Plandiura i Pou. Many busts have also totally or partially lost their bases, undergone alteration, mutilation or overpainting, but they all present the same basic construction and highly similar measurements (Table 1) – except for the elements that make up those with arms and hands, like the five cases in Vitoria, the one in Berlin, or the two missing from Úbeda. In spite of these differences, the idea that they all came from one single Central European workshop is further reinforced by the fact that they all possess a highly characteristic and very narrow profile, exquisite crafting of details, even on the back, and in every case, the carving and polychromy expresses very similar ornamental details (bows, pendants, necklaces, broaches and gems) that replicate designs and decorations on fabrics and headdresses. One of the

Barcelona busts was stripped to the bare wood in the past. It was particularly interesting to appreciate the fine workmanship of the carving on this bust and it confirmed the soundness of our initial conclusions regarding the nature of their construction (Figure 7).

The remaining ten cases in our study area include the bust at the Gogwin-Ternbach Museum in New York, one at the Musée Goya in Castres, one at the National Museum Colegio de San Gregorio in Valladolid, one at the Fine Arts Museum in Bilbao, two busts at the Frederic Marès Museum in Barcelona, and two at the Cathedral Museum in Ávila that are noteworthy for their high quality and for bearing an inscription revealing their German origin [3]. There are also two examples only studied from documents: one from Our Lady of Charity Church in Sanlúcar de Barrameda, and a second one from a private collection. This groups share some stylistic features, but they differ in quality, materials and techniques, and were clearly manufactured at a different workshop. However, these works were systematically connected in the literature, frequently leading to historic confusion and errors about their origin.

Attributions of Authorship

The comparison of the features of technique and construction has allowed us to establish that there was a specific individual workshop, which was producing pieces that we can differentiate from other artists or workshops. This opens up our study to include a discussion of historical and artistic issues, such as authorship, stylistic influences or the nature of these commissions.

Furthermore, our work was focussed on the issue of origin. Although this type of work is attributed by many sources to workshops in Flanders, Brabant or probably Brussels [Enciso 1968, Steppe 1985], a German origin (perhaps Cologne) has also been occasionally considered. [Apráiz 1914] This range of opinions has mainly been based on stylistic aspects, given the limited documentary sources and lack of thorough historical studies. There are no commissioning contracts or signatures. Texts and opinions from the past have, consequently, been used to support this controversy.

According to some authors, Flemish attribution would be based on the 'excellent' quality of the pieces. The similarity between one of the Vitoria busts and the tomb with Mary of Burgundy's recumbent effigy in Bruges would support this. The rich robes and jewellery on the busts are mentioned as characteristic of Burgundian court circles, which had a major influence on Flemish art and on the close links between Spain and Flanders during that period. However, there is a seeming contradiction when Steppe, one of the main defenders of this theory, maintains that four of the five carvings in Vitoria come from a workshop in Brabant, with the fifth one dating from five or ten years later, and originating from Cologne. He states that their headdresses are typical of those found in the Rhine area around 1500, and that Spanish dignitaries would have often purchased reliquary busts in the Netherlands, especially in the Rhineland, Cologne and Trier areas. [Steppe 1985, 518-519]

The iconography of the pieces we studied would support an argument in favour of a German origin, as legends hold that they were martyred in Cologne with Saint Ursula as part of her retinue. Furthermore, it is well documented that Emperor Charles V frequently passed through Cologne and, on one occasion, purchased four heads of the Eleven Thousand Virgins from Cologne, together with a certificate of authenticity for the relics. He subsequently gave these as a gift to his secretary, Don Francisco de Cobos. The 'Annales Colonienses' tell us that the king travelled with his large entourage of counsellors and noblemen and visited Saint Ursula's church in the city. It also tells us how these trips brought many relics from Cologne to Spain. [Ferreiro 1991] We can also verify that those pieces in our study, where the context has been preserved, actually did belong to important people in the emperor's closest circle [4]. This connection is further illustrated in the four medallions carved on the bishop's mitre on the Bode – Museum

example, where Alexander the Great and Julius Caesar are matched on one side, with emperors Maximilian I and Charles V on the other (Figure 8).

In any case, the fact that Flemish sculpture of the period was of higher quality than German pieces cannot be an argument, as highly relevant examples can be found in both cases, and much evidence exists for mutual stylistic influences. Regarding this subject, a mention should be made of outstanding works by sculptors who were active at that time, like Tilman Riemenschneider, Conrad Meit, Michel Erhart, or Tilman van der Burch, who was originally Flemish but settled in a Cologne workshop.

Figure 8. Alexander the Great with Caesar and Maximilian I with Charles V. Miter Berlin bishop.

Specialists have not managed to fully agree when dating these works. Once again, stylistic considerations, such as costume typology or decorative elements, have been put forward to date some pieces in the early 16th century and others in 1530. It is true that some clothing seems to date clearly from the Renaissance period, whereas other cases appear Gothic and archaic. However, the naturalism of these figures would seem to be the most logical explanation, in an attempt to distinguish different characters on the basis of their age and to dress them accordingly. We mentioned how Steppe establishes a different origin and date for one of the Vitoria busts, based on differences in clothing, whereas our technical analysis clearly shows it to be part of the set. Although these reliquary busts depict saints, their realistic faces, the differences according to age, and the rich variety of robes and headdresses, make us wonder if they might in fact be portraits of people close to the commissioner and therefore conforming to the humanistic taste fashionable in the court of Charles V. The tradition of the Renaissance court portrait might have been influential for these works. More particularly, artists like Pietro di Torrigiano spread the influence of these busts from the Italian Quattrocento to courts around Europe in the 16th century. Some good examples include his busts of John Fischer, Bishop of Rochester, at the Metropolitan Museum of Art, and of Henry VII at the Victoria and Albert Museum, the two busts of Charles V by Conrad Meit held at the Stadsmuseum in Ghent and the Gruuthuse museum in Bruges, the Bust of Cardinal Duprat from the Musée du Louvre, and another bust of Charles V from the National Sculpture Museum in Valladolid, whose author is unknown.

Given the quality of this select group of reliquary busts and the social background of the people who commissioned their production, we believe they must have been produced at a workshop of the finest standing during the reign of Emperor Charles V (1520–1558). In the absence of further

documentary information, it would seem appropriate to date all these busts to that period. In any case, given the techniques used on these pieces, which display the radial cuts on the oak board of the base, it would not prove difficult to settle this issue using a dendrochronological analysis.

Conclusions:

For many years we have studied and consequently identified a select group of reliquary busts that are currently scattered around various museums and churches across Europe and the United States. They have been distinguished on the basis of the craft techniques employed and, most particularly, on the key features defining their construction. After an initial study based on non-destructive methods, we have established a very specific typology and confirmed that 23 pieces were most probably produced by the same hands. We have also clarified some aspects connected with the origin of these works.

These pieces, designed to hold relics of Saint Ursula's retinue, were undoubtedly commissioned by people close to Emperor Charles V, and were produced at an important workshop, probably located in the Rhine area. In this case, the method of studying the technical and technological aspects has been fundamental to further defining attribution. It has worked not so much as an additional element to historical and stylistic studies but rather as a conclusive tool to determine that these carvings belong to a specific workshop, and that similar contemporary examples were manufactured using different techniques and were therefore that produced by other workshops.

Finally, we feel that the need for such work, and the benefits of this approach are clearly demonstrated by this example, in which our study was based on a comparison of constructive and technical typologies. This is particularly the case when documentary sources are lacking or not sufficiently precise.

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Endnotes

1. Technical visits were made in Spain to Úbeda, Ávila, Astorga, Barcelona, Bilbao, Valladolid, Simancas and Joarilla de las Matas and abroad to New York, Paris, Berlin and Cologne.

2. Only one has been preserved, identified as Saint Aurelia, but there were originally four (some sources name them as belonging to Saint Aurelia, Saint Ursula, Saint Pinosa and Saint Gregoria, whereas others mention Saint Marta, Saint Benedicta, Saint Paula and Saint Edigia.

3. *'Esta Virgen traxo de Alemania el doctor Luis Dávila et de Lobera, médico de la Magestae cuyas armas son estas...'.*

4. Apart from the four figures from the Holy Chapel in Úbeda, given by Charles V to Francisco de los Cobos, the two busts held at the Pilgrim Trails Museum in Astorga and originally from Trinity Chapel at the Collegiate Church in Villafranca del Bierzo belonged to Don Pedro de Toledo, Marquis of Villafranca and Viceroy of Naples during Charles V's reign; the five from Vitoria came from the family chapel commissioned by the emperor's counsellor, don Hortuño Ibañez de Aguirre; the two busts from the Shrine of Our Lady of Charity in Sanlúcar de Barrameda, belonged to the House of Dukes of Medina Sidonia, another important family close to the Emperor.

References

Apráiz de, A. 1914. 'Notas de un viaje'. *Ateneo* 15, 11-13.

Enciso, E. et al. 1968. *Catálogo Monumental. Diócesis de Vitoria. Tomo III. Ciudad de Vitoria*. ed. Vitoria: Publicaciones del Obispado de Vitoria y de la Obra Social de la Caja de Ahorros Municipal de Vitoria.

Ferreiro, J. 1991. *La leyenda de las once mil vírgenes Sus reliquias, culto e iconografía*. ed. Murcia: Universidad de Murcia.

García, R. and Ruiz de Arcaute, E. 1999a. 'Técnicas de estudio de la escultura policromada'. In Asociación Española de Ensayos No Destructivos (ed.) Vitoria *Ponencias of the 9th Congreso Nacional END*, 203-211.

García, R. and Ruiz de Arcaute, E. 1999b. 'The conservation and restoration of the polychrome sculpture in Álava. The main altarpiece of San Vicente de Arana and the bust-reliquaries of the Church of San Miguel de Vitoria'. In Hochschule für Bildende Künste Dresden (ed.) Dresden: *Polychrome Skulptur in Europa. Technologie, Konservierung, Restaurierung. Tagungsbeiträge*., 84-89.

García, R. and Ruiz de Arcaute, E. 2000. 'Los Bustos relicarios de las once mil vírgenes. Claves para su estudio'. *AKOBE* 1, 18-21.

García, R. and Ruiz de Arcaute, E. 2001. 'La escultura policromada. Criterios de intervención y técnicas de estudio'. *Arbor* CLXIX, 667-668, 645-676.

Steppe, J.K. 1985. 'Mécénat espagnol et art flamand au XVIe siècle' & 'C 36 – C 39. Atelier Brabançon(?) (vers 1520). C 40. Atelier de Cologne (?) (vers 1525-1530)'. In Crédit Comunal (ed.) Bruxelles: *Splendeurs d'Espagne et les villes belges 1500-1700*. Europalia 85, España, 247-282 & 518-520.

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The Grip altarpiece – an 18th century (?) altarpiece dated to the first part of the 16th century

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Abstract

The early 16th century Grip altarpiece, still in the church of that name, on a small island off the Norwegian coast, has its provenance ascribed to the Northern Netherlands. This paper describes the construction techniques used to create the altarpiece. The individual characteristics of this altarpiece are compared to others in Norway with a similar provenance. Furthermore, traces of 'mass production' found in the object are discussed.

Keywords: medieval, altarpiece, polychrome, construction, wood

Introduction and background

The Grip altarpiece (Figure 1), dated to about 1520, is found in a stave church on Gripholmen, an islet about 14 kilometres into the Norwegian Sea, north-west of the city of Kristiansund. Gripholmen (total area of 0.04 km^2 with the highest point just 10 metres above mean sea level) is the largest and only habitable isle within the Grip archipelago. Storm surges destroyed most of the Grip fishing village in the mid-1600s, in 1796, and again in 1804, leaving only the church and a few other houses that still exist today. The community on Gripholmen is first mentioned in written sources in 1338. Since the mid-1970s Gripholmen has been inhabited only during summer [1].

The altarpiece is divided into three arched niches, with the middle niche taller than the flanking ones, and stands on a predella [2, 3]. In each niche a sculpture rests on a base below a canopy. The height of the standing sculptures reflects the relative height of the niches, so the central sculpture of *Virgin and Child* is taller than the flanking figures of *Saint Olav* and *Saint Margaret*. Two twisted columns hide the front faces of the dividing walls between the niches. All visible surfaces are painted, with blue, brown and red being the dominant colours of the visible paint layer. The arched top of each niche is decorated with carved latticework. Carved ornaments to the front of the canopies appear to have been somewhat randomly placed. The wings of the altarpiece are lost.

The later 18th century overpaint and the changes to the elements in the altarpiece dominated the object to such a degree that it was assumed that it current form dates from this period and was constructed by assembling parts from several medieval altarpieces. The previous alterations had involved dismantling and remounting the individual elements, which allowed the individual sections to be partly disassembled in the current study as the connections were already open. Separating the sections permitted a detailed study of the individual elements. The original construction processes used to connect the ensemble could, therefore, be more fully understood [4].

This paper will introduce the Grip altarpiece and give a description of its original construction. Where appropriate, comparisons to other altarpieces in Norway with a similar provenance and dating will be made, and possible evidence of 'mass production' will be discussed.

The provenance of the Grip altarpiece

The Norwegian art historian Eivind Engelstad (1900-1969) placed the Grip exemplar within a group of altarpieces to which he gave a Northern Netherlands' provenance, and he dated them to the first quarter of the 16th century. These altarpieces can be found in the Norwegian churches of Røst, Kinn (only sculptures), Grip, Leka and Hadsel. The altarpiece in Ørsta church is also linked to this group. [Engelstad 1936] The Dutch art historian Jaap Leuwenberg supported Engelstad attribution in the 1950s, and claimed that the so-called 'Master of the female head in stone from Utrecht' was responsible for the group. [Leuwenberg 1959] In 2003, another Dutch art historian, Anneke Welle, supported Engelstad's grouping. [Welle 2003] However, The Northern Netherlands' provenance may be called into question by the discovery of two identical decorations, possibly a coat of arms, in the Virgin's niche, one on either side of the figure (Figure 2). Both are placed within painted illusory windows, in the same way as in, for example, the Enånger winged triptych in Hälsingland, Sweden [5]. Their almost hidden position on the walls behind the Virgin would be unusual for a typical donor's coat-of-arms. The decorative element has, with reservations, been proposed to be the 'Stadtschield' of Lübeck [6], and this may mean that Lübeck is the correct provenance for the altarpiece, provided that this is the correct interpretation [7]. More information about the ornament is needed to understand its eventual significance.

Figure 1. The altarpiece after treatment in 2003. Photo: Arve Kjersheim © Riksantikvaren

Figure 2. IR-examination revealed a coat of arms (?) on the reverse wall behind Mary (see also Figure 1). The secondary paint was removed from the ornamentation only. Photo: Birger Lindstad © Riksantikvaren

A chronology of the altarpiece's history

About 1520: The winged altarpiece was made and exported to Grip; the Church was still prominent, the fisheries prosperous [Iversen 1998], and the fact that the priest lived on Gripholmen shows that this community and its church were of importance. [Yderstad 1951]

Mid 18th century: The altarpiece was partly dismantled, repainted and remounted [8]. The inner walls of the niches, were nailed to the back wall of the retable. One wall is missing. The wings and some smaller elements were taken off or lost before repainting was carried out. Some of the carved decoration in the upper part of the niches was newly carved before repainting. The

repainting was probably done to change the altarpiece into an object that suited the Reformed Church better. [Olstad 2003]

1773: First mention of the altarpiece in a written source. [Schøning 1910]

1860s: The altarpiece was stored in the sacristy. [Olstad 2003]

1920-30: The altarpiece's paint layer was consolidated with warm animal glue brushed on the surface. [Olstad 2003]

1932-33: The church was restored and the altarpiece put back on the altar.

2001-2003: The altarpiece was examined and treated at NIKU, Oslo, and returned to the church. [Olstad 2003]

The construction of the altarpiece

The wood used is oak, most probably from the Baltic area. Traces of a tool mark are present on one of the division walls in corpus. These marks are found on wood sorted and shipped through Gdansk in Poland. [Wazny 2002, Rief 2006] These marks consist of lines cut into the wood with a small tool. [Glatigny 1993] There are several suggestions for the function of these marks: sorting of timber quality; denoting geographical origin; or providing information about who should receive payment for the wainscots. [Rief 2006] 'Wainscot of oak' was a term for imported planks made from Baltic oak. According to Rief, the wainscots were taken from an oak trunk 3-5.4 m long and with a diameter of 80-90 cm. The split trunk would give planks that were 30-40 cm wide and 2-14 cm thick. [Rief 2006]

The original surface of the altarpiece was decorated when construction was complete. The finishing layers were applied to all visible parts, and consisted of polychromy and gilding. The individual wooden elements were assembled using wooden dowels and pegs, glue and metal nails. The sculptures are housed in a rectangular, three-sided wooden case to which the arched upper part is added [9]. The sides and bottom of the case are each made from one board, about 3.5 cm thick and about 22 cm wide. The sides are connected to the bottom with dovetail joints in such a way that the connection is strongest sideways.

The back wall is a rectangular frame-and-panel construction that is nailed to the three-sided case (Figure 3). The frames are assembled with mortise and tenon joints, reinforced with visible wooden pegs. The panels are thinned/tapered down toward the edges on one side (bevelled), and inserted in grooves in the frames. The flat un-thinned sides of the panels are visible inside the case. The width of the lowest horizontal frame-board in the back wall tapers from 5.5 cm on the right-hand side to 4 cm on the left. It has not been possible to establish why it was adjusted by planing before being nailed to the side-boards and the bottom. The two division walls (1-1.5 cm thick boards) were inserted and nailed to the back wall. The surfaces are quite rough, and are only partly worked where they would not be visible.

The central arched upper part was probably finished separately and then connected with the lower part of the structure. The side-boards of the higher central arched part are placed on top of the division walls in the lower part. The two flanking arched upper parts were then constructed, and nailed to the central one, and to the lower section. The upper back walls are also a kind of frame-and-panel construction, but with the three uppermost rounded panels simply nailed to the back of the frame. These boards (1.2-1.7cm thick) have the same width as the height of the arched upper part and a length corresponding to the width of each niche, and are integral elements in the structure of the arched upper parts.

The arched top of each niche is made from short boards nailed to rebates in the upper part of the back wall and in the upper moulded arched element at the front. The elements carrying the upper

moulding are important parts of the construction, and were finished (except for the lower part of the moulding) before it was added to the upper part of the case (Figure 4); the inner arched moulded elements with the carvings are purely decorative.

When the main case was finished, the vaulted canopies that form the ceilings inside each niche were adjusted and nailed to the central division and side walls. The inner walls in each niche were nailed to the canopies before they were put in place. The inner side walls in each niche were thus diagonally placed between the division walls and the back wall. Each canopy is made from a plank with a length corresponding to the width of the niche, a width corresponding to the depth of the niche, and a thickness corresponding to the height of the canopy. The design of the vaults to the central canopy differs somewhat from the two others. The canopies, with the inner walls fixed to them, were placed in the two side niches first, then in the central one. Carved decorative elements, some of which still remain, were probably fixed to the unpainted front of the canopies after the latter were put in place.

Figure 3. The reverse of the altarpiece.
Photo: Birger Lindstad © Riksantikvaren

Figure 4. The side of the altarpiece showing the construction of the arched top.
Photo: Birger Lindstad © Riksantikvaren

The case was completed once the moulded element with open-work carvings (tracery) in the upper part of each niche had been nailed to the outer, upper profile and when the columns with high bases, twisted shafts, and capitals with open-worked carvings had been nailed to the division walls. The hexagonal bases for the figures are made from seven pieces of oak, top, bottom, and five sides, with open-work tracery carving, and these were placed in each niche before the sculptures were finally positioned with in the altarpiece [10].

The polychrome sculptures

The figures are carved from oak. The carving was done with a collection of sharp tools wielded by an experienced hand, and the surfaces are finished in those parts even where it would have been difficult to shape the wood. Tool marks and carving technique are visible on the flat rear side.

The lateral figures are made from blocks of consisting of two planks, while the central figure is made from a block of three planks glued together. The sculptures clearly exhibit the good quality of the wood used and the craftsmen's knowledge about wood as a material. The joints between the planks are, despite having been kept under unfavourable climatic conditions for so many years, still very good and have opened only a very little. Seasoned wood was probably used for the glued blocks. [Tångeberg 1986]

The posterior plank in the figure of St. Margaret and the front plank in the figure of the Virgin are the thickest planks used, at about 7.5 cm. The 35 cm-wide middle plank in the figure of the Virgin is the widest – and must have been still wider originally since the sapwood has been removed – but probably still within the range of wainscot dimensions. The planks seem to have been split from the trunk, and the growth-rings visible in the glued planks are more or less parallel, indicating a radial section.

The undersides of the figures were only partly worked after the planks had been glued together, and different kinds of marks left by woodworking tools indicate that the pieces were moved during the work, not only on the same workbench but also from one workbench to another. The unevenness of the undersides may tell us that the block for each sculpture was glued individually.

The original paint

A white chalk-glue ground was put on all areas to be painted. Incision lines to define the areas for the gilding are found on the side, division and inner walls in the niches. The division and side walls were gilded before the other elements in the niches were mounted. The canopies were probably mounted together with their respective inner walls, after gilding and paint was applied. It is highly likely that the columns and ornaments on the canopies were also gilded and painted before they were mounted.

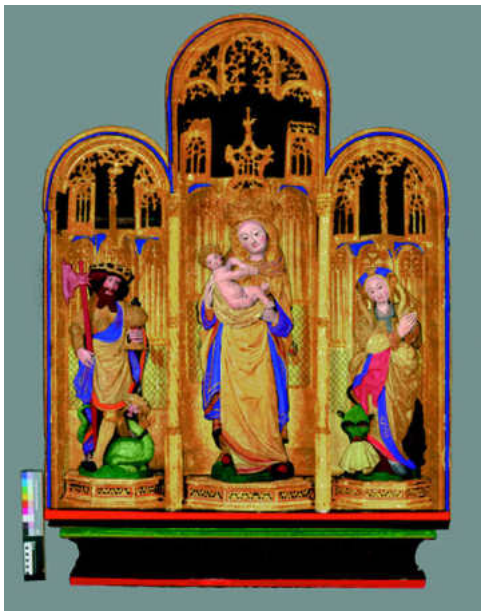

Figure 5. The original colours digitally reconstructed. Reconstruction: Anja Sandtrø ©NIKU

Figure 6. A proposed reconstruction of the ornaments on the central canopy. Digital reconstruction: Even Brænne Olstad ©NIKU

Gold dominated the architectural elements; azurite [11] was used for the vaults of the canopies, on part of the capitals and, together with red, on the mouldings at the front of the case. The red colour was also applied on mouldings on the bases for the figures.

The sculptures were dominated by gold as well. Blue and reds are, partly together with gold, used for the lining of the garments and for the decorative, painted ornamental trimmings on the clothing. Green is found on the beasts and on the bases. The outside of the altarpiece seems to have had a 'black marbling' [12]. A digital reconstruction of the original colour scheme is shown in Figure 5.

The Grip altarpiece and the Leka group: possible links

The same frame-and-panel construction is found in the reverse walls of the Grip and the Hadsel altarpieces. The dimensions of the panels and frames, and the way the panels are inserted into the frames, are very much the same in these two objects. The frame-and-panel construction allows the use of wood with smaller dimensions, and the construction stiffens the case – though this could also have been achieved by means of a reverse wall made from standing boards connected to each other and reinforced with a batten, as in the Ørsta altarpiece for instance. This time-consuming construction method could be a connection between the Grip and the Hadsel altarpieces – or it may have been just coincidental, no more than a way of saving materials and thus money. That the interior walls are mounted to the canopies and placed in the niches in the same way in the Grip and the Hadsel altarpieces may be a link between the two objects.

The original ornaments on the front of the canopies would probably have been different from those that are seen today; the existing elements do not fit in shape or size, and do not cover the originally unpainted front of the canopies. An incised X on top of the central canopy corresponds with the incised X on the back of the central ornament, suggesting that this is an element in its original place.

A proposed reconstruction of the ornaments on the central canopy is based on the remaining central ornament in Grip, and the corresponding ornaments in the Hadsel altarpiece (Figure 6). Are all, not just two, of the remaining side ornaments in Grip secondary? There is no logical way of placing them, and holes and remaining nails indicate that they have been moved several times. The top of the arched upper part is constructed similarly in the Grip and the Ørsta altarpieces. This is probably because the method used is the only reasonable way of making the top of such an arched construction.

The Grip figures, as all the sculptures within the Leka group, are made from several planks glued together. [Olstad 2008] This, however, cannot be regarded as a truly defining characteristic for this group of altarpieces, as sculptures from contemporary altarpieces with different geographical origins were also made from planks glued together and not hollowed on the back. [Rief 2000]

Mass production?

An increased demand for altarpieces, combined with the workshops' need to reduce costs, resulted in what Lynn Jacobs describes as '*quasi-industrialized procedures*' for their fabrication. [Jacobs 1998, 209] In the case of Grip, small details point to an element of 'mass production': the carvings in the elements used for the bases of the sculptures are not identical, and a side element in one of the bases is adjusted to fit between other elements, but has been used in a place where such an adjustment is unnecessary. The columns seem to be identical, but one has an unnecessary groove on the side of the base, perhaps because it was intended for another altarpiece? The sides

of the capitals are adjusted as if they were intended for a different position, or perhaps because a decorative element next to the capital is missing. The columns may be reused – or it may be that the workshop produced a stock of almost identical columns for use in several on-going altarpieces, and these two columns were the ones available when the Grip altarpiece was made.

The sculpture of the Virgin has been trimmed at the reverse, probably with an axe. This seems to have been done after the sculpture was finished, so as to fit it to the niche. Might it have been made for another altarpiece originally and subsequently adjusted to fit the central niche in the Grip altarpiece?

The interior walls of the niches imitate Gothic windows. The carved windows are all slightly different, and it is not possible to combine the remaining five out of six loose walls, so that incised lines for the gilding, and the gilded areas, fully correspond with the shape of sculptures in the lateral niches. In the central niche there is correspondence between the lines and the shape of the sculptural figure.

Figure 7. The reverse of the sculpture of the Virgin showing tool marks.
Photo: Birger Lindstad © Riksantikvaren

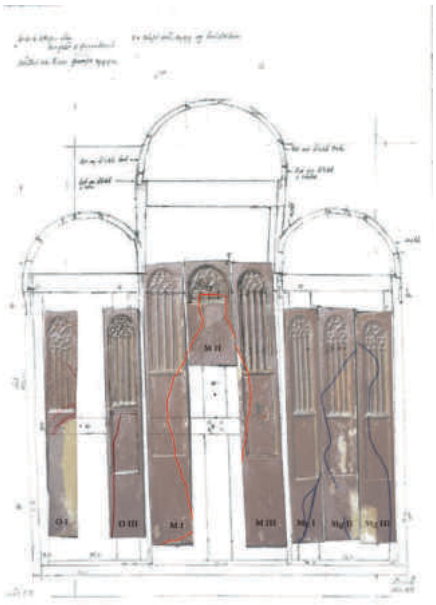

Figure 8. Architectural schematic showing the position of the inner walls.
Digital construction: Even Brænne Olstad ©NIKU

The preliminary measurement drawing by architect Arne Berg, NIKU (2001) and photos of the inner walls shows the incised lines for the gilding on the inner walls in the niches. The inner walls are rearranged in the 18th century. If walls with the 'same' carving pattern originally were grouped, board Mg I was originally the left wall in Olav's niche, while MG II was the left wall and OI was the Central board in Margaret's niche.

The length of the walls varies somewhat and was not adjusted after the walls were carved [13]. The fact that the walls are barely long enough, the probable 'mismatch' of the incisions and the sculptures, and the variation in the carved pattern may indicate the production of stock parts – and as in the case of the columns, what was currently available was used for the Grip altarpiece. Variation in the design is found also on the inner walls of the Hadsel altarpiece.

Conclusion

The examination of the object was mainly focussed on understanding the wooden construction and the correct placement of the various elements, together with mapping of the original paint layer. The construction method bears similarities to that found in the Hadsel and the Ørsta altarpieces. This may be evidence of a similar provenance and a connection between Grip and the so called Lekagroup – or perhaps it only means that this was how it was done at that time and in that general area; there are, after all, signs of 'mass production' in the Grip altarpiece. The earlier dismantling of the elements in the altarpiece made it possible to examine and to understand its original construction and to determine that it truly was a 16th century piece, rather than an 18th century pastiche.

Endnotes

1. More information can be found on the Wikipedia page dedicated to the island. http://en.wikipedia.org/wiki/Grip,_Norway (Accessed 20 February 2012)

2. The predella will not be further described.

3. The altarpiece is 165 cm high, 125 cm wide and 20 cm deep.

4. The resources allocated to this conservation project were mainly given to consolidation treatment. Examination of the altarpiece was therefore restricted almost exclusively to those examinations necessary for its treatment. Analysis of binding media and pigments were, for example, not part of the programme. The altarpiece was, however, measured so that its construction could be compared to that of the Hadsel, Røst, Leka and Ørsta altarpieces.

5. Information given by Ph.D. student Miriam Hoffman, Kiel, 2012.

6. Personal communication with Prof. Dr. Rolf Hammel-Kiesow, Lübeck, 2012.

7. The altarpiece and the coat of arms are discussed with the art historians Erla Hohler and Alf Hammervold, Oslo, who doubt that it is the Lübeck 'Stadtschield' and that the provenance is Lübeck.

8. There is no written documentation for the repainting. Prussian blue, whose first recorded use in Norway is in 1718, was used for the repainting. The overpaint was also therefore most probably paid for by the altarpiece's owner during the period of prosperity 1730-80s.

9. The term is applied here to describe the wooden construction that contains the architectural elements and the sculptures of the former central part of a winged altarpiece.

10. A metal pin fixed on top of the bases corresponds with a hole in the sculptures and holds the figures in place.

11. Identified by appearance as pigment identification was in general not carried out

12. The black original 'marbling' found in the upper part of the case, behind and above the canopies has much in common with the original 'marbling' on the outside of the altarpiece, but is not identical.

13. At either end of five of the eight boards were marks left from where the boards presumably had been fixed with nails to the workbench.

References

Engelstad, E. 1936. *Senmiddelalderens kunst i Norge,* Oslo.

Glatigny, J. A. 1993. 'Des marques enigmatiques'. *Antwerpse retables 15de-16de eeuw,* vol. 2, Museum voor Religieuze Kunst. Antwerp, 142−143.

Iversen, J. 1998. *Grip. Norges minste kommune. Et fiskevær gjennom 900 år.* Stavanger.

Jacobs, L. F. 1998 *Early Netherlandish Carved Altarpiece.* Cambridge University press, Cambridge.

Leuwenberg, J. 1959. 'Een nieuw facet aan de Utrechtse Beeldhouwkunst III. Vijf Utrechste Altaarkasten i Noorwegen', *Oud Holland*, 79−102.

Olstad, T. 2003. 'Alterskapet i Grip stavkirke – et 1700-talls alterskap fra middelalderen'. NIKU rapport 5, Unpublished report, Oslo.

Olstad, T. 2008. 'Alterskapet i Hadsel kirke – et alterskap fra senmiddelalderen attribuert til Lekagruppen'. NIKU rapport 2, Unpublished report, Oslo.

Rief, M. 2000. 'Blockverleimte spätgotische holzskulpturen aus dem gebiet der alten Niederlande', *Restauratorenblätter 18. Gefasste Skulpturen I. Mittelalter,* 77-84.

Rief, M. 2006. 'Eingekerbte Hausmarken auf baltischen Wagenschott-Brettern des 14.−16. Jahrhunderts', *Zeitschrift für Kunsttechnologie und Konservierung.* 20. Jahrgang 2006, Heft 2, 309−323.

Schøning, G. 1910. *Reise som giennem en deel af Norge i de aar 1773, 1774, 1775 paa Hans Majestæt Kongens bekostning er giort og beskreven.* Trondhjem: Selskabet, Trondheim (1910-1926)

Tångeberg, P. 1986. *Mittelalterliche Holzskulpturen und Altarschreine in Sweden,* KVHAA, Stockholm

Wazny, T. 2005. 'The origin, assortments and transport of Baltic timber'. In Van de Velde, C., Beeckman, H., Van Acker,J. and Verhaeghe, F. (eds.) *Constructing Wooden Images. Proceedings of the Symposium on the organization of labour and working practices of late Gothic carved altarpieces in the Low Countries,* Brussels 25-26 October 2002, , Brussels, 115−126.

Welle. A. 2003 'De Leka-groep. Over de herkomst en stichting van vijf laat-middeleeuwse altarretabels in Noorwegen'. Ph.D. thesis, Katholieke Universiteit Nijmegen.

Yderstad, O. 1951. *Grip kirkes Historie.* Kristiansund N.

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19th century construction and polychrome techniques of Pierre Cuypers and his studio. All that glitters is not gold.

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Abstract

This paper will discuss the construction of 19th century sculptures, specifically those produced in the studio workshop of Pierre Cuypers (1827-1921). Cuypers, and his 19th century workshop, prevailed in the Neo-Gothic, an artistic movement that aimed stylistically to return to the values expressed by medieval Gothic art. While these 19th century artists were clearly inspired by and copied stylistic elements of the earlier period, were they also so literal when dealing with the structural aspects? Were the 19th century sculptures constructed in the same manner as those from the medieval period? What are the essential differences and what sort of wood was used by those emulating the earlier period? How were these Neo-Gothic sculptures carved? Did the later artisans use similar workbenches and tools? A number of 19th century sculptures created in the Roermond studio of the architect Pierre Cuypers will be used to illustrate these questions.

Keywords: 19th century, Pierre Cuypers, Neo-Gothic, reconstruction, gold, platinum

Introduction

Pierre Cuypers (1827-1921) was the head of a large production studio and architectural firm. He himself was responsible for the design of the Rijksmuseum, the Central Station in Amsterdam and over 100 churches throughout The Netherlands (and some abroad); furthermore, he also instigated the renovation of a vast number of historic buildings and churches. Cuypers' idealised image of aesthetic dictated a complete unified vision moving from the exterior appearance to the interiors he designed or renovated. The interiors of churches were (re)decorated to impart a complete picture of the Neo-Gothic, which included not only the application of wall decorations to imitate expensive cloth or stonework, but also the revamping of any existing furniture and altars, including any medieval sculptures present.

The Cuypers' studio worked to a strict set of rules and models to create new decorative elements, including sculptures, on a mass scale. Throughout the first half of the 19th century artisans working in the studio accumulated a collection of drawings, engravings, lithographs and gypsum plaster casts. These were used as working models for new designs for, amongst other artefacts, polychrome sculptures. Once the wood had been carved, it was prepared for painting. This was carried out for the most part by painters from other disciplines, even though most of the carvers were familiar with the polychromy of original examples. The paint layers were applied onto a preparation layer and were further decorated with gilt metal leaf and other decorative elements. These techniques will be both illustrated and explained using examples in this paper.

A 19th century practice: Replicas and Reconstructions

Much attention has been given to the study of sculptures dating prior to the 19th century, as these are valued for their artistic and historic merits. However, artefacts from the 19th century also deserve attention as these form part of our collective history. Original pieces by well known artists have of course been studied, but to date, little is know about the mass production of

replica sculptures using plaster casting techniques or other copying processes. There was a market for such sculptures and ornaments in Belgium, France, Germany and The Netherlands. As the cult of the museum developed, so did the desire to have copies of original renowned artworks. Many museums display or have collections of plaster cast copies in their depots. Copies were also sold for the private market.

Figure 1. Images from the Cuypers' studio (date ca. 1886). Black and white photographs. © Cuypershuis Roermond

Figure 1 shows two black and white photographs ca. 1886 of Cuypers' studio in which the artisan is creating copies. Photographs of these sorts, while interesting, do not provide sufficient information on the reconstruction process. However, the photographs do show that not only plaster casts were made of original pieces, but also that other systems to copy original medieval sculptures were being used. A model constructed in clay can be seen in the foreground of the photograph. Copies were fabricated in wood, stone, clay and/or bronze. What is known about these replication techniques? The image reveals here a little more information as it is clear that the clay was applied to a wooden framework and then moulded. The form is determined by taking precise measurements from the plaster cast.

It is clear when studying the archives left by the Cuypers' studio that mass production techniques were employed by artisans in order to keep up with the demand for sculptures for the new buildings created. All of these buildings needed to be decorated and furnished. The artisans were well trained, mostly at Academies, as was Pierre Cuypers himself. Cuypers was born in 1827 in Roermond to a respectable and artistic family. His father and eldest brother Henri were both decoration painters and he himself married a famous singer. Cuypers studied architecture at the municipal school of art in Roermond and at the Academy of Fine Arts in Antwerp. He became on his return to Roermond the municipal architect. One of his first commissions, which he obtained when he was 23 years old, was the restoration of the Monastery of Onze Lieve Vrouwe Munsterkerk in Roermond. Together with the famous Catholic sculptor Edouard Georges (1817-1895), Stoltzenberg encouraged the young Cuypers to form a studio in 1852 that specialised in the production of Christian sculpture. [Schiphorst 2004] This studio traded under the name of Atelier Georges, Cuypers and Stoltzenberg. The studio itself was situated in an old factory building, now the Cuypershuis museum in Roermond. Before his departure in 1854, Georges was responsible for the daily running of the studio and the sculpture production, while Cuypers was in charge of the church renovations and furniture. Sloltzenberg oversaw the administration.

Cuypers was initially schooled in the classical style. The production of the workshop in the early years was mainly in this style. After the departure of Georges from the business, Cuypers became more influenced by the Gothic revival architecture of Augustus Pugin (1812-1852), an English architect later responsible for the design of the Palace of Westminster in London. At this time, sculptors from Louvain were hired to carry out work in the Atelier Cuypers-Stoltzenberg. They introduced styles from Cologne, Strasbourg, Naumbourg and Bamberg. From this period onwards, the middle ages inspired the sculptures created in the Cuypers-Stoltzenberg studio. Cuypers other main influence was the French architect Eugène Viollet-le-Duc (1814-1879), with whom he became friends. By the mid 1860s, the Roermond studio had grown in size and was accepting commissions throughout the country to renovate or build churches, public buildings, castles, town halls, etc. The studio also offered practical training to sculptors and cabinetmakers in stone and wood.

Figure 2. Antwerp Retable, Monastery of Onze Lieve Vrouwe Munsterkerk, Roermond. The figures in the foreground (seen in the detail, right) were inserted into the original medieval composition. ©SRAL

The renovation work carried out by Cuypers and his studio typically involved the integration of the old with the new. Existing sculptures were incorporated into a new vision of the Neo-Gothic, receiving new layers of polychromy, either applied on top of existing paint layers or on the stripped wooden surfaces, and repairs to missing elements. The dazzling effect of the whole, transported viewers back to a vision of the pristine medieval world. Of course these, reconstructions were inspired by a romantic vision of the past and a highly established sense of the aesthetic. The restoration of the 16th century Antwerp retable in 1866 belonging to the Monastery of Onze Lieve Vrouwe Munsterkerk in Roermond epitomises Cuypers' approach (Figure 2). Here Cuypers reconstructed/invented the missing sculptures using models and integrated these into the existing altar. In this case, the original polychromy was retained and used as exemplars for the reconstructions applied to the new sculptures; in other cases entire existing polychromies were repainted.

Not only were plaster copies of existing sculptures made in Cuypers studio. The craftsmen and artisans working in Cuypers studio, and there were many, learned to copy models of medieval sculptures in wood, keeping close to the authentic style of the old masters. These artisans also were capable of carving sculptures to their own designs, and often created amalgamations of the new with the old, combining elements of several existing sculptures in one image. A number of examples exist in which the copy and the original medieval piece used as a model can be identified. Figure 3 shows a 14th century sculpture still kept in a church in the town of Simpelveld and its 19th century copy, produced ca. 1892, which is today found in Castle de Haar (Haarzuilens, Utrecht). The similarities in design are so striking that the copy must have been

carved using a *macchinetta di punta* (pointing machine) or similar device, such as a pantograph. In such manner, copies could be scaled up or down according to desire. However, the Cuypers' workshop often produced exact 1:1 copies. Cuypers often embellished the copies created, introducing missing elements or what he perceived as missing, such as canopies or attributes.

Figure 3. Virgin and Child. Left: the original medieval *Sedes Sapientiae* from the St. Remigius Church in Simpelveld. Right the 19th century Neo-Gothic copy from Cuypers' workshop, now in the collection of Kasteel de Haar (Haarzuilens). The throne has been embellished in the copy to create a sense of 'completeness'. ©SRAL

Copies: 19th century production of wooden sculptures

Unlike 15th and 16th century sculptures, which often were made from a single block of wood, the sculptures from the workshop of Pierre Cuypers were constructed by first forming a block by joining/gluing several planks of wood together. While examples dating from the middle ages using this technique do exist, it was not commonplace. The system used by Cuypers' studio was efficient and pragmatic. A block of sufficient dimensions to hold the figure could be assembled quickly from cheap timber. The planks of wood were joined together with animal glue and often a hollow space was left inside so as to reduce weight, save on timber, and prevent cracks forming over time. This effective construction process was not hidden or disguised – often it can be clearly seen if the underside of the sculptures is viewed.

The form of the figure was carved out of the assembled planks. Often linden wood was used for this. This meant that by the time the carving process was complete the majority of the plank had been carved away leaving a somewhat fragile structure. To ensure stability and prevent the assembled planks from separating at a later date, long iron nails were driven deeply into the remaining wood (see Figure 4, right). The heads of the nails would be pushed beneath the surface of the wood and the resulting hole was filled with a putty filler consisting of linseed oil and chalk, as can be seen in Figure 4, indicated with the red arrow in the upper section of the x-radiograph. The condition of these sculptures today is much influenced by this combination – the iron nails oxidise, a process exasperated by the acid content of the wood, which in turn oxidise the linseed oil component of the putty. Linseed oil, prior to the 1930s, was extracted from flax seeds and its

main consistent is α-linolenic acid, which is very sensitive to oxidation degradation. Thus, often what is visible today on the surface of these 19th century sculptures is the effect of the degradation of the materials used to create them. The rusty nails expand and in turn cause the putty to degrade simultaneously pushing the plug of putty outwards. It is these characteristics that can often be used to identify a re-polychromed original sculpture from its identical 19th century copy.

Figure 4. Joseph with Child. Studio Thissen, 1884. Petruskerk, Venray. The nails used to hold the carved wooden support together are visible in the X-radiograph. The arrow (red) indicates a putty filler used to cover the nail head. ©SRAL

The painting process of the copies followed a similar methodology to their medieval counterparts. The carved wooden (or plaster) form was prepared to reduce the porosity of the support, in order that the binding media of the subsequent paint layers did not 'sink-in' to the support, and to create a smooth surface to the finished sculpture. The ground layers typically consisted of chalk (calcium carbonate, $CaCO_3$) mixed with animal glue. The surface would initially be sized using animal glue. Contemporary recipes mention that the glue was boiled (i.e. it reached 100°C), as it was understood that hot glue would penetrate deeply into the wood. [*Geïllustreerd Schildersblad* 1903] This miscomprehension of the technological aspects of the materials used, shows the artisans' reliance on craft practice. Animal glue proteins denature at temperatures higher than 60°C and samples show that the glue rarely penetrated beyond the initial 3 mm of the wood surface, thus not functioning as the artisans or contemporary sources supposed.

The sanded ground layers would provide a white base for the subsequent polychromy and gilding. This part of the production process was carried out by specialists. Documents indicate that Cuypers imported an expert guilder from Paris to work in his studio. Again this practice reflected that practiced in the medieval period where the master carver would employ painters and gilders to apply the finishing layers to their sculptures. Pigments used were commonplace in the 19th century and the palette included contemporary innovations as they became available on the market. The binding medium for the most part was linseed oil.

A variety of decorative techniques were used to create the polychromy. Templates were used to recreate decorative patterns (Figure 5). Many of these still exist in the Cuypers' archives at the Cuypershuis in Roermond [1]. Cartoons were used for the more intricate patterns. Small holes were punched into a stiff card on which the design was implemented. Paint was pushed through the holes to the appropriate surface leaving small dots behind when the cartoon was removed.

The decoration could be finished by connecting the dots by forming lines, and filling in the zones with the desired paint. This can be seen in the altarpiece in the Monastery of Onze Lieve Vrouwe Munsterkerk in Roermond, discussed earlier.

Figure 5. Centre: Maria and Child. 19th century copy, Heilig Hartkerk, Maarsen. Left: Detail of the clothing of the Christ Child. Right: Template used to create the pattern. ©SRAL

Studying the corpus of Cuypers' studio, it is clear that the same templates and cartoons were used for different projects. A signed and dated drawing depicting the main altar of the Ewalduskerk in Druten was found in the archives. The signature is of P.J.H. Cuypers and A.F. Martin and is dated 1877. The drawing of the main altar is carved in wood and is still preserved in the church in Druten. The same design was used by the workshop as a template to create the main altar in Oostrum. In 2008 the remnants of this altarpiece were found in the loft of the priest house in Oostrum. The altar was in desperate need of conservation treatment, but once restored it became clear that this was a high end product from the workshop (Figure 6). It seems that even though, the materials used here (see below) were expensive the design was not exclusive. Cuypers' studio thus specialised in delivering high quality products in terms of craft and material to their client, but as the stylistic aspects imitated the Neo-Gothic the images created could be used over and over again.

Figure 6. Retable Oostrum. 19th century. Left: A poscard showing the altarpiece in-situ dating 1937. Right: After restoration. ©SRAL

Figure 7. Detail from the Oostrum Altarpiece (Figure 6). The tunic of the almost life-siae solider presenting the chalice is oil gilded using gold leaf. His gardbrace (shoulder) is gilded using silver, now oxidised. His couter (elbow) and vambrance (arm) are gilded using platinum foil. ©SRAL

The gilding was in many cases also carried out using traditional techniques. Instances of both water gilding and oil gilding have been found. The quality of the metal leaf varies and in some cases the gold contains a high degree of copper. This was not solely in order to save on costs as the different colours obtained by adulterating the gold to form alloys were used effectively to imitate medieval gilt surfaces. The colour of the new gildings could be matched with that of existing when incorporating old objects in a new context.

However, not all that glitters is gold ! Analysis of metal leaf found in the Oostrum altarpiece has shown the presence of platinum as well as gold and silver (Figure 7) [2]. Contemporary recipes provide insight into the use of this precious metal: it should be applied on a white ground without a bolus layer [2]. [Burg 1883] And indeed this is the case here. The church records of the St. Martinus parish in Tegelen record that H. Cuypers used 'heavy gold and plettina [platinum]' to gild the statue of Maria in 1872. [AMT Archief 1872]

As mentioned the tasks within Cuypers studio were divided between the craftsmen carving the wooden sculptures and the painters and decorators applying the polychromy. It seems however that at times more than one craftsman would work on one individual sculpture. Records indicate that it was not uncommon that several carvers would work on one sculpture. Specific tasks were not mentioned and it is likely that unless time was pressing one carver would be responsible for one piece of work. It is known that a large number of carvers worked in the Cuypers' studio and many were employed for a number of years. However, Cuypers also trained many craftsmen who

went on to set up their own studios. Artworks produced by these studios are mostly signed and dated, contrary to the practice in Cuypers' own studio (Figure 8). No signed pieces have come to light yet that can be traced to the master's studio.

Figure 8. Joseph and Child. Studio Thissen, 1884. Left: Full length of Figure 4. Right: Detail of signature. ©SRAL

Conclusion

Cuypers, and his 19th century workshop, prevailed in the Neo-Gothic, an artistic movement that aimed stylistically to return to the values expressed by medieval Gothic art. Even though the artworks discussed in this paper are production pieces, being manufactured at speed to supply an insatiable demand for Neo-Gothic decorative art, the quality of these 19th century pieces is high. The craftsmanship of the resulting pieces is excellent, even if the craftsman did not fully understand the long-term behaviour of the materials they were working with. The highly romanticised 19th century vision of the Neo-Gothic used past practices to produce artworks, adapting processes for efficiency of work. Surface effects were created to have the same appearance as the models which inspired these, but new materials were often used to fashion these surfaces, such as the use of platinum to imitate metal surfaces. These beautiful, but often little appreciated, sculptures whether in plaster or wood earn a place in our history and are of no less importance than the pieces they emulate.

Endnotes

1. A number of templates and cartoons were discovered during the recent 2008 restoration of the Cuypershuis in Roermond. This provided a wealth of information on pigment usage for the reconstruction of the 'colours of Cuypers' in the Rijksmuseum (2004-2013) by the Stichting Restauratie Atelier Limburg.

2. "Silver should immediately be covered by glue and a clear varnish. Silver can be willingly replaced with aluminium foils. Platinum foils, above all, provide the highest gloss and clarity, but this is unfortunately so high in price that it can only be used in exceptional cases". (translated from Dutch by authors)

2. XRF analysis was carried out by Luc Meegens, Rijksdienst voor Cultureel Erfgoed (RCE), Amsterdam. SEM analysis was carried out by Dr. Paul van Kan, Hogeschool Nijmegen.

Acknowledgements

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References

AMT Archief. 1872. St. Martinusparochie Tegelen, Gemeentehuis Tegelen, inv. Nr. 141.

Burg, P. van der. 1883. Handboek voor den schilder Rotterdam p. 20. and p. 24

Geïllustreerd Schildersblad; Publisher: WA. Eisma (1899-1941) , Tuinen Oosterkade Leeuwarden nr. 6 (5de jaargang) 15 juli 1903)

Shiphorst, L. 2004. *Een toevloed van werk, van wijd en zijd. De beginjaren van het Atelier Cuypers/Stoltzenberg, Roermond 1852 – ca. 1865*. Nijmegen. University Press.

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Posters

Wooden polychromed sculpture. A case study: the Virgin of the Immaculate Conception.

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Abstract

The Immaculate Conception belonging to the Monastery of St. Jerome in Granada, Spain is a polychromed wooden sculpture dating from the 18th century. Over the years the sculpture has undergone multiple restorations, mainly concerning the polychrome layers. The latest applied overpaints are of poor quality and are aesthetically disturbing. The sculpture was carefully examined prior to treatment. Material analyses were carried out to determine the structural and artistic construction techniques. The results of the analyses showed that a previous polychromy layer exists under the current upper visible layer. This hidden polychromy, while perhaps not original to the conception of the sculpture is of higher quality. In this pictorial scheme the garments of the Virgin are gilded and decorated with a *sgraffito* pattern. The presence of this layer, determined via the examination and documentation of the object, justified recovering this hidden polychromy. Prior to commencing treatment a complex and careful methodology was established to aid the removal of the overpaint layer. This paper will discuss the analysis, the results and the treatment of this sculpture.

Keywords: polychrome wooden sculpture, scientific studies, recovering original polychromy

Introduction

The sculpture representing the *Immaculate Conception*, belonging to the Monastery of St. Jerome, is a devotional religious sculpture of great significance in Granada's Baroque Art. It can be dated to the 17th or 18th century. It is a polychrome wooden sculpture carved and decorated in a typical Spanish technique from this period. The artist is unknown, although it can be attributed to the workshop of Alonso Cano (1601-1667), arguably the most competent Spanish Golden Age artist. There are some other Immaculate Conception sculptures carved by Alonso Cano or one of his many disciples, Pedro de Mena, Joseph Smiley, Sebastian Herrera Barnuevo and José de Mora that are similar to this devotional image in terms of aesthetics, technical and artistic quality. This paper will discuss the art historical and technical investigation of the St. Jerome *Immaculate Conception*, aiming to more fully understand the construction processes carried out by the artisan.

Iconography

This Spanish Baroque work of art is a polychromed wooden sculpture in the round. It is almost life-size, measuring 157 x 54 x 60 cm. It represents the Virgin of the Immaculate Conception. The figure is given an expression of great serenity. Movement is suggested by the position of the figure: the body twists slightly, the head is turned and one hand gestures (Figure 1). The meticulous work carried out on the drapery enhances the beauty of the Virgin while at the same time providing a sense of ascension. This type of image is made in the Spanish Baroque style, have a fragile and delicate look, full of sweetness and beauty. The Virgin is represented as a young girl, typical of Andalusian style, which is usually employed by Cano and his disciples in these kinds of works.

Figure 1. Condition of *Inmaculada Concepcion* (157 x 54 x 60 cm) from the Monastery of St. Jerome in Granada. Before Treatment. Wooden polychrome sculpture, 18th century.

Figure 2. Details showing the condition of sculpture before treatment. Extent of overpaint, losses to polychromy, surface dirt and *sgraffito* (top left to bottom right).

State of conservation

The *Immaculate Conception* came to the Department of Polychrome Sculpture at the Heritage Conservation Institute in Valencia in a bad state of conservation. The most urgent problem that required addressing was the stability of the sculpture. The four metal struts used to hold the body of the sculpture to the pedestal base had failed and the wooden support was worm damaged, especially in the lower section of the pedestal. The structure of the sculpture was split by a number of vertical cracks running across the body further weakening the structural stability of the object. The polychromy presented numerous lacunae and the polychrome layers were lifting and flaking, exposing the bare wood of the support. Furthermore, three of the fingers of the Virgin's right hand were missing.

The artistic characteristics of the sculpture and the pictorial quality apparently did not match the traditional colours of the Spanish Baroque sculptures. This, in fact, was the initial suggestion that the sculpture could have a hidden original polychromy. In a first visual inspection of the work, the authors observed three stratigraphy windows presumably carried out to establish the layer build up of the polychromy in order to determine the presence of earlier painting campaigns. The three windows showing a graduated layer build-up of all under layers were made in three key areas: one in the head of one of the cherubims; the second in the blue robe of the Virgin; and the third in her red cloak. These windows into the lower paint layers revealed the higher artistic quality of the layer beneath the upper overpaints. At this stage it was important to determine the extent of this earlier polychromy and its condition. Analysis of the materials would aid in determining the quality of this layer.

Studying the sculpture closely provided information confirming the supposition that the sculpture had been restored at least once in the past. In this campaign, the beauty of the original image had been hidden by a lower quality overpaint. Since that date the sculpture had been exposed, and consequently there was a great accumulation of dirt on its surface. A large number of deposits and wax residue covered the surface, folds of drapery and concavities of the support, hiding the polychromy (Figure 2).

Previous restorations

The sculpture was analysed before the restoration with the aim of obtaining information about its structure, materials and technique. These scientific studies also provided information about the state of conservation of the sculpture and previous interventions.

The methodology used for this study is the regular routine carried out by the conservation staff at the Heritage Conservation Institute in Valencia. This takes into account the highest respect for artistic, historical and immaterial values of the work of art. [Pérez 2010] It begins with global studies without sampling. In the first place a study with visible and ultraviolet (UV) light and medical computed tomography (CT) was carried out. The results of these techniques provided the sites for the subsequent micro-sampling analysis. The micro-samples were prepared in cross section, and analysed by optical microscopy (OM) and scanning electron microscopy coupled to an X-ray spectrometer (SEM-EDX).

The simple visual inspection and observation by stereomicroscope showed evidence of the older polychromy already noted in the stratigraphic windows. It became clear that this earlier polychromy was also present underneath other areas, such as the Virgin's white dress. Here the overpainted areas were thinner (Figure 2).

The computer tomography study was made in order to evaluate, from a structural point of view, the state of conservation of the sculpture and the technique employed to construct the support. [Juanes 2010] The sculpture was carved using multiple pieces of wood, probably of different species, as seen in the different axial, coronal and sagittal tomography sections. It is likely that one species was used for the back piece and another species for the rest.

Most of the structure of the support is in good condition with the exception of small shrinkage gaps that appear between planks that were observed in the axial tomography sections (Figure 3). The presence of holes in the support were also noted in the axial tomography sections. Some of these were relatively new, while others were filled and repainted in previous interventions. The CT analysis also revealed the extreme thinness of the support in some areas of the front and reverse of the sculpture. This increases the difficulty of handling and manipulating the sculpture securely and without risk (Figure 4).

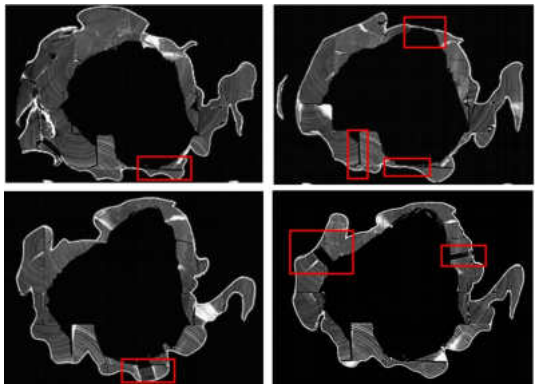

Figure 3. CT analysis. Different axial tomography sections showing the presence of holes and shrinkage gaps between planks.

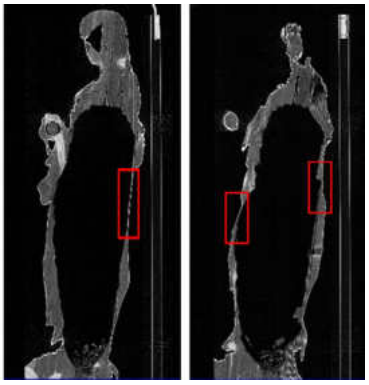

Figure 4. CT analysis. Different sagittal tomography sections showing the extreme thinness of the support in some areas of the front and reverse of the sculpture

Finally, the location of gold leaf under the polychrome applied in previous interventions became apparent when studying the axial CT sections and creating a 3D transparency reconstruction (Figure 5). The CT study results suggest that there were extensive gilded areas under the white and red upper polychromy. However, under the blue robe, the gilding was only applied place to the edge of the garment. This was later confirmed with the stratigraphic studies and cleaning test windows.

Figure 5. CT analysis. 3D transparency reconstruction showing the location of gold leaf under the upper polychromy.

The CT study results were the basis for sites for the micro-sampling. Once removed, these were studied and analysed as cross sections by optical microscopy (OM) and scanning electron microscopy, coupled with energy dispersive X-Ray spectroscopy SEM-EDX, and micro-chemical tests were carried out on scrapings. Results gave insight into the painting process and material use, as well as the state of conservation. The microscopic techniques were used to determine the inorganic and organic nature of the different materials used in this work of art (binding media, fillers, pigments, dyes, metal foils, varnishes, etc.), and establish the layer build up of original and later applied materials. The oldest identified polychromy, and possibly the original, was composed of pigments consistent from the Baroque period, such as lead white, vermillion, smalt blue, ochre earth tones and lead tin yellow.

Figure 6 shows a sample removed from the flesh tones of one of the figures on the left hand of the Virgin. The original paint layers are visible. The cross sections showed that a preparation layer consisting of gypsum bound in animal glue was applied to the wooden support (Figure 6, layer 1). This layer was sealed with a very thin glue layer to isolate the ground from the subsequent polychromy (Figure 6, layer 2). Here, the original paint layers contain various degrees of lead white and vermilion pigments to achieve the colour modelling (Figure 6, layer 3).

The overpaints applied to the sculpture were clearly visible in the various cross sections removed from different colours and non-original gilding. In the sample removed from the Virgin's finger, three overpaint layers are visible. The overpaint layers (Figure 6, layers 4-6) also contains lead white and vermillion with the addition of red lead and synthetic ultramarine blue pigment. The presence of this last pigment in the flesh painting and the blue cloak in the Virgin, suggests that the aforementioned restoration was carried during the mid-19th century [Gettens and Stout 1966, Estaugh et al. 2004].

This analysis showed that the Virgin had originally a beautiful *sgraffito* along the border of her dress and cloak. This original gilding was applied on a red bole on top of the ground layer. An example is the *stofato* on the white dress (Figure 7). The cross section of the micro-sample shows the original gold leaf on red bole (Figure 7, layers 3 and 4). The overpaint consists of a layer containing lead white (Figure 7, layer 5), a yellow layer made with yellow earths and a small amount of lead white (Figure 7, layer 6), and finally, a thick false gold made with tin purpurine (Figure7, layer 7).

Figure 6. OM cross section flesh tone of the finger of the left hand.

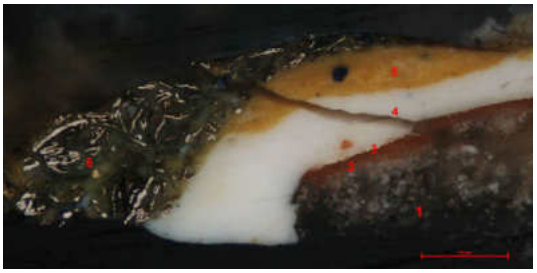

Figure 7. OM cross section from the *stofato* on the white dress.

Conservation

Currently *The Immaculate Conception* was restored in the Department of Polychrome Sculpture at the Heritage Conservation Institute in Valencia. A systematic methodology aided the conservators in devising conservation strategy. The results of the analysis, described above, determined the extent of the original polychromy layers (roughly 90% of the surface).

The entire sculpture was first treated in an anoxic system to prevent any possible insect activity. The aesthetic treatment proposed consisted of removing the overpaints to reveal the damaged, but original, layers beneath. This was carried out taking into consideration all the analytical results, the artistic merits, the intangible values, the wishes of the owners and the long-term conservation of the sculpture.

The cleaning process consists of two stages: the first system used mechanical means to remove loose particulates. This was achieved by dry vacuum suction and soft brushes in order to remove solids, accumulation of dirt and deposits present on the surface. The second system employed chemical processes to remove the overpaint. At this stage, a gelled emulsion containing a soap and solvents based on aromatic hydrocarbons solutions (Figure 8) was used to soften and solubilise the paint layer for easier removal with cotton swabs.

The cleaning process took into account different points of interest: knowledge of the support, the nature of the components of the products to be removed, causes that have led to its deterioration, the previous stratigraphic study to identify the presence of glazes, patinas and repainted layers. The choice of the cleaning method depends mainly on the type, extension, thickness and uniformity of the layer to be removed, and the characteristics of the work of art and its state of conservation.

The cleaning process was carried out methodically removing unwanted stratae "layer by layer" reducing the thickness of each layer in a controlled way. This is the most difficult part of the intervention due to the thickness of the repainted layer that covers the entire image. The application of the cleaning emulsion requires considerable time to effect a positive reaction required to soften the undesired paint layers for ease of removal.

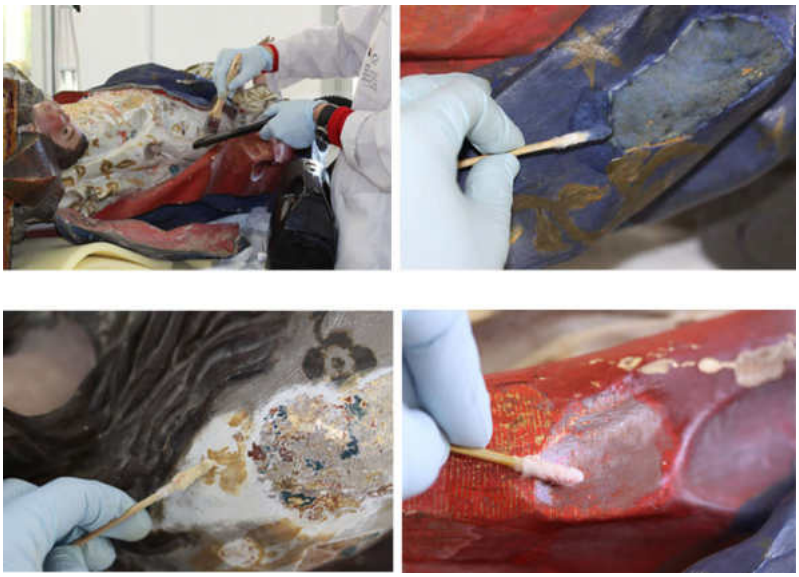

Figure 8. Details of the mechanical cleaning process of the painted surface and the chemical removal of overpaint.

The cleaning system employed varied according to the colour zone and its chemical properties. The first stage cleaning the blue cloak was carried out using a solution of benzyl alcohol applied with a swab while scraping the surface with a surgical blade. By this means, the outermost layer can be removed permitting the underlayer of a blue-green hue to be revealed. An emulsion containing a thickened solvent was used to remove the red and white overpaint in the dress and cloak. Here the solvent is kept contact with the surface for a minimum of 0.5 to 1 minute to prevent solvent from penetrating the lower original layers and being retained in them. The cleaning process is repeated only in the white areas, due to thicker application of overpaint, with a second phase consisting of a gelled fatty emulsion and a reaction time between 0.3 and 0.5 minutes.

The cherubim's repainted flesh tone is being removed by a combination of chemical and mechanical cleaning. First a gelled solvent in an emulsion is applied by brush to remove the majority of the layer. The surface is then rinsed to remove any traces of the product from the area so as to avoid leaving any residues on the surface. Subsequently, in this particular case, it is more efficient and uniform to eliminate the remainder of the overpaint mechanically.

Future conservation processes will resolve other problems presented by the sculpture, such as: consolidation of the paint layer, especially in areas of missing polychromy and areas where the pictorial layer has a higher level of surface abrasion or weakness. These processes will be made with products that do not alter the physico-chemical properties of the materials.

A volumetric reconstruction of the missing three fingers of the right hand of the Virgin will be made out of wood, resin (?), as well as the adhesion of the strips and volutes of the base of the sculpture. An intervention on structural cracks of the support will be made using a synthetic material, in order to recover the stability of the sculpture. Finally, colour retouching will be made on the missing areas using safe, reversible and discernible materials.

Conclusion

The restoration of the sculpture of the *Immaculate Conception* from the Monastery of St. Jerome in Granada, Spain was undertaken at the Department of Polychrome Sculpture at the Heritage Conservation Institute in Valencia. The original is in a relatively good state of conservation despite of the environmental deterioration that the repainted image has suffered. The wooden sculpture is entirely covered by a thick overpaint applied during a previous intervention, changing

its aesthetic values, hiding the original paint layer and distorting the appreciation of the beauty of the original carving.

The scientific studies carried out prior to treatment suggested that the original polychromy was in excellent state over the majority of the sculpture beneath the overpaint. This together with iconographic studies, a prolonged observation of the surface, a consensus and dialogue with the community of parishioners and the owner, led to the decision to recover the hidden polychrome layer. The conservators used a meticulous methodology to determine the process for cleaning unwanted superficial layers of dirt and overpaint. The restoration has not been completed yet due to the meticulousness of the processes chosen.

References

Cremonesi, P. 2004. *L'uso di tensioattivi e chelanti nella pulitura di opere policrome*. 2. ed ed. Saonara: Il Prato.

Eastaugh, N., Walsh, V., Chaplin, T., & Siddall, R. 2004. *The Pigment Compendium. A dictionary of historical pigments*: Elsevier Butterworth-Heinemann

Gettens, R. J., & Stout, G. L. 1966. *Painting materials: a short encyclopaedia*. New York: Dover.

Giovanni, L., 1991. *Gli insetti e i danni del legno*. Firenze: Nardini editore.

González, E., Martínez, A. 1997. *Tratado del dorado, plateado y su policromía: tecnología, conservación y restauración.* Universidad Politécnica de Valencia, Spain.

Juanes, D. 2010. La tomografía axial computerizada. Estudio de escultura de madera *La ciencia y el Arte II. Ciencias experimentales y conservación del Patrimonio Histórico*. Madrid: Ministerio de Cultura. pp. 32-43.

Leistikow, K. U., Thüs, H., & Hough, R. B. 2002. *The wood book*. Köln [etc.]: Taschen.

Mayer, R. 1991. *The artist's handbook of materials and techniques*. 5th ed. London: Viking.

Pérez, C., Juanes, D., & del Egido, M. 2010. Las ciencias experimentales en los institutos de conservación *La ciencia y el Arte II. Ciencias experimentales y conservación del Patrimonio Histórico*. Madrid: Ministerio de Cultura. pp. 9-17

Perusini. G. 1989. *Il restauro dei dipinti e delle sculture lignee: storia, teorie e tecniche*. 2a ed. Udine: Dei Bianco.

Wolbers, R. 2005. *La pulitura di superfici dipinte: metodi acquosi*. Saonara: Il Prato.

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The technical examination of the Baroque terracotta architecture from a large-scale Nativity Scene

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Abstract

This paper will focus on the technical examination of one section, an arch, of the main architectural decoration of the baroque terracotta *Nativity Scene* that originally belonged to the Carnide Coenobium, in Lisbon. In 1913 the Museu National de Arte Antiga (MNAA), in Lisbon, acquired part of this group for their initial collection. The conservation project provided a first-time opportunity for a multidisciplinary group of art historians, conservators restorers and scientists to study and examine the artwork. While the materials used to compose the figures and crib are interesting, it is the architectural decoration that is more fascinating technologically. The technical means to construct the arch by the artist traditionally would be either by modelling or by using a mould. In this case, both techniques were used. The means to create the arch were identified through a meticulous observation of the object, a detailed technical photography using natural and raking light, and scientific identification of polychrome layers.

Keywords: terracotta, arch, Nativity scene, construction techniques, conservation, modelling, moulding.

Historical Background

The depiction of the Nativity has been popular in Portuguese art since the 16th century. Traditionally these scenes showed the holy figures surrounding the baby Jesus' crib often in front of a background setting. These were created to celebrate the birth of Christ at Christmas time. Initially quite small, the size of the scenes evolved and elaborate large-scale versions became prevalent. As the size grew, so did the representation. They revolved to represent not only the religious scene but also to show moments of everyday life or mundane scenes. In addition to the holy family and angels, shepherds, Magi, and animals, it became normal to see, for instance, peasants dancing or going about their daily business, or also worshiping the new born child. Additional figures became common-place often either telling a peripheral story or simply representing every-day life. Thus, figures such as a blind man playing the accordion, peasants holding baskets of eggs or fruit, chickens, rabbits or other animals were not unknown. These scenes became known as *Presépio* in Portuguese or *dioramas*, and were often created for monasteries or convents in the 17th and 18th centuries. Terracotta was often used to create the individual elements. The resulting figurines and architectural elements would have been polychromed, often to a high degree of finish, by skilled artisans.

The large-scale *Presépio,* belonging to the defunct Convent of Santa Teresa de Carnide, consisted of numerous groups of small figures and elements set against an architectural backdrop. It entered into the collection of the Museu National de Arte Antiga (MNAA) in Lisbon in October of 1913 (Figure 1). [Franco 2011] The acquisition was a direct result of the change in the political environment resulting from the deposition of the monarchy in 1910. The newly formed Republic imposed laws effecting the church and its role in society. Specifically the 'law of separation' forced all convents, monasteries and religious orders to close. The religious orders were disbanded and their properties confiscated. The church was banded from society, reduced to silence and persecuted. The accession to the MNAA collection saved this Nativity scene from vandalism and destruction. However, the whole scene was never put on display, nor studied scientifically or methodically, until the recent exhibition in 2011. This paper will discuss one

particular aspect of the large-scale *Presépio* in more detail. This will be one element of the background architecture, specifically the central arch.

Figure 1. Recreation of the Nativity scene in the recent exhibition at MNAA in 2011. © IMC-DGPC

Figure 2. Detail of two sections of the broken column and the mastic putty. © IMC-DGPC

Technical Issues

The original context and position of this *Presépio* has been lost, but as a devotional object it was intended to create a scenic narrative representation of the New Testament, celebrating the birth of Jesus. When conceived, the groups of polychromed terracotta figures and architectural elements would have been closed inside a cabinet, traditionally called *torrão*. The doors would have been opened at the start of the Advent cycle. The original cabinet for this Nativity scene has been lost. Its proportions and perspective can only be calculated by taking into account the relative size of the figures and their relationship to the architectural elements. The arch, discussed in this paper, is key to determining the original setting. This semi-circular arch, measuring 117 cm in height, provides the central backdrop for the iconography. It is represented as a ruined edifice, which supplies the setting for the orchestra of angels and the Nativity group in the foreground.

Structurally the arch is composed of five elements (Figure 2). The two pilasters are constructed from four blocks and the arch itself is made from one terracotta piece. The five elements were originally connected with a putty-like paste probably consisting of terracotta powdered stone bound in a resin such as mastic [1]. The individual figures of the angels were fixed to the arch with metal and wooden struts.

Contemporary sources mention the setting of the Nativity scene and indicate that the entire object was displayed in a very restricted space. It is probable that the cabinet measured no more than 200 cm in height and had a depth of ca. 60 cm. The architectural elements, including the arch, would have been fixed to the walls, floor and ceiling of the cabinet in some way. The figures would have been placed in this setting on different levels filling the remaining space. A proposed sceneography was reconstructed for the recent exhibition at the MNAA in 2011 (Figure 1).

The clay support of the arch has been identified as a mixture of hydrated aluminium silicates. The consistency is quite heterogeneous, as can be seen by the patterns and colours of the cylindrical veins visible in the broken faces of the blocks. It seems that the clay was not well blended (Figure

3). It displays a solid aspect, similar to a brick, without hollow parts. The colour of the clay is red ochre with several veins of in-between yellows and red orange or red ochre. Traditionally, the technical means to construct the arch would be either by modelling or by using a mould. In this case, both techniques were used by the artist. The artistic technique and process used to create the arch were identified through a meticulous observation of the object, a detailed technical photography using natural and raking light, and scientific identification of polychrome layers.

Figure 3. Detail showing the different veins of colour present in the clay blocks indicating that the clay mixture was not well blended. © IMC-DGPC

Modelling

As mentioned, both modelling and moulding techniques were used to create the form of the arch. The wet terracotta block was placed on a wooden board for ease of working practice. The traces of the wood's morphology are imprinted into the clay and are clearly visible in raking light (Figure 3). The reverse of the arch was not intended to be seen, and thus this surface is left unfinished. Tool marks related to working the wet clay are also visible as are fingerprints (Figure 4). These marks were evidently made by wooden sticks used to remove excess material. The working process of the block appears to be similar to that for wooden supports. When viewed from the reverse, incision marks delineating the planning of the work can be clearly identified

Once the surface rendering of the large block was completed, it was sectioned into five smaller pieces to aid handling and prevent cracking during the firing of the material. The tool used to cut the block into five sections can be identified by the mark left in the material. It was a metal wire cutter typically used in clay working, as described in the 1733 treatise '*Tratado de Artefactos Symmetriacos, e Geométricos* (…)' by Father Inácio da Piedade de Vasconcelos (1676-1752). [Vasconcellos 1733]

The surface of two decorative columns comprising the arch was also modelled. After firing, the sections were adhered together using the above described mastic putty. This material was found beneath the polychromy through the Nativity figures and larger elements, not only to join sections together but also to repair cracks that occurred during the firing process. The number of filled flaws in the terracotta suggest that, in this case, the problem did not arise solely from firing the raw material but lay in the mixture used to create the clay blocks. The mastic was also used to attach the four cut parts or *tacelos* to each other [2]. In fact this kind of material was at time generally used in Nativity scence for fixing elements to the base of the cabinet. It is applied warm and changes when drying from a yellow to a brownish colour. There are often pieces of burnt wood stuck in the mixture, presumably from the melting process. Over time this material

becomes brittle and looses its adhesive proprieties, resulting in failed joints. The *tacelos* sections of the column have separated because of this.

Figure 4. Ranking light detail of the back of the arch with incise marks of the wooden board. © IMC-DGPC

Figure 5. Detail of a finger print in the clay. © IMC-DGPC

Figure 6. Detail of the terracotta block cut using a wire. © IMC-DGPC

Mouldings

While the larger sections of the arch were made using the modelling technique described above, the finer details comprising the low relief decoration of the arch were made differently. A moulding technique was used on the applied arcade decorative frieze. The motifs created are classical in style, winding acanthus leafs decorate a vase similar to an urn, symmetrical and very regular in shape. Traces of the moulding technique are clearly visible in Figure 7. The geometric profile decorations of the arch have also been moulded. These are very damaged. The incise marks made to align the position on the arch are visible in the losses. (Figure 8) The sections were also fixed in place with the mastic putty.

Figure 7. The key-stone arch. The classical winding acanthus leafs and vase are moulded decoration elements adhered to the modelled arch. © IMC-DGPC

Figure 8. Incise lines are visible marking the position where the frieze moulded frieze decoration should be adhered. © IMC-DGPC

It can be concluded that these decorative motifs were made in sections. The wet clay was pressed into moulds and directly assembled on the modelled arch prior to firing. The applied polychromy covers the whole surface and the joints with the main structure of the arch. The decorative process was executed in two phases. First a preparation layer was applied. This is white in colour. On top of this, a yellowish varnish layer, thick in consistency, containing small glass particles was spread over the surface. The glass particles reflect the light and give the appearance of gold. It is possible that the resin component is shellac. This technique was widely used for the pedestals of sculptures or the bases of the cabinets for the Nativity *Presépio* scenes throughout the Baroque period in Portugal. The technique was researched more fully in the international technical study carried out between Portugal, Spain and Belgium completed in 2002, POLICROMIA. The researchers compared this system with technique of 'aventurine' [3]. [Serk e Sanyova 2004]

Conclusion

This paper results from a project made in collaboration with the MNAA, in Lisbon for the conservation and exhibition of the Nativity Scene from the defunct Convent of Santa Teresa de Carnide in Lisbon. This project allowed conservators to study the large-scale terracotta work and place it in context with the tradition of producing *Presépio* scenes in Portugal in the 17th century. This Nativity scene is constructed using different technological systems. Both modelling and moulding procedures are used to create the form of the arch. The architectural element of this *Presépio* consists of five sections. The sections were cut from the larger original block using a wire cutter prior to firing in the kiln. This conforms to the technique describe in contemporary sources. Dividing the larger block into smaller sections also facilitated handling and avoided problems during firing. The decorative surface was achieved by embedding glass particles in a varnish layer. This technique was commonly used to imitate gold throughout the 17th and 18th century in Portugal. The use of this technique as an economic measure, as it substituted the use of gold leaf.

In its origin setting, the scenography of the *Presépio* was subjected to a very restricted space inside a small cabinet with doors. It would have been on display for limited periods during the year marking the religious calendar. The architectural structure could be placed in the fore or background of the cabinet with the Nativity scene placed in the front or below the arch. The other groups of sculptures were placed on different levels, filling all the remaining space. In the recent exhibition in the MNAA a reconstruction of the original setting was proposed.

Endnotes

1. Putty is a generic term for a filling material. In this case, the filler is similar in texture to clay and is used to repair losses or cracks in the structure of the fired material.

2. *Tacelo* is the Portuguese technical name for the blocks of clay. The corresponding term used by Father Inácio da Piedade Vasconcelos was *part*.

3. *Aventurine* is a technical decoration technique in which glass and metal particles are embedded in a varnish. Its invention is credited to an Italian family of glassmakers in the mid 17th century. The technique was very popular in the Baroque period with polychromists who liked to imitate precious stones with aventurine-feldspar or sunstone.

References

Franco, A., Bastos, C. 2011, 'O 'Presépio de Carnide' da casa da recreação ao Museu Nacional de Arte Antiga'. In: Franco, A., (comissário), *Revelações O Presépio de Santa Teresa de Carnide*. Lisboa: SEC-IMC, pp. 11-31.

Serk, M.; Sanyova, J., 2004, 'La technique de décoration dite "à l'aventurine" redécouverte sur les oeuvres baroques'. In: Seruya A. (dir) Policromia: a escultura policromada religiosa dos séculos XVII e XVIII, estudo comparativo das

técnicas, alterações e conservação em Portugal, Espanha e Bélgica. Lisboa : Instituto Português de Conservação e Restauro, 2004.

Vasconcellos, Padre Ignacio da Piedade, 1733. *Artefactos Symmetriacos e Geométricos, advertidos, e descobertos pela industriosa perfeição das artes, esculturaria, architectonica, e da pintura.* Lisboa Occidental: Na Officina de Joseph António da Sylva, Impressa da Academia Real.

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Restoration or Tradition

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Abstract

This paper seeks to highlight the problem with which a conservator is faced when confronted with the reintegration of devotional images in rural environments where the stakeholders are unaware of the criteria for heritage intervention. A case study will be used to illustrate this predicament: the *Virgen del Rosario* is a carved wooden, polychromed and gilded sculpture that dates to the end of the 15th century. It has been used dressed in garments and accoutrements in processions causing damage to the polychrome layers. Conservation criteria suggest a change in use and appearance may not be compatible with the traditional image known to the congregation. Some parishioners wished to keep the statue as it is, while others understood that certain changes needed to be made in order that the sculpture would be preserved for future generations. The conservators aimed to find a middle ground between these two parties.

Keywords: polychromy, integration, rural community, replica, conservation criteria

Introduction

This paper, originally presented as a poster, seeks to highlight the problem with which a conservator is faced when confronted with the reintegration of devotional images in rural communities where the stakeholders are unaware of the criteria for heritage intervention. A case study will be used to illustrate this predicament: the *Virgen del Rosario* is a carved wooden, polychromed and gilded sculpture that dates to the end of the 15th century. The poor condition of the polychromy is due in part to dressing the sculpture in costumes (clothing, jewelry and a crown), which do not belong to the original conception, for processional purposes. Ironically the damage caused by the application of the costumes is now partially hidden by these. This paper addresses the importance of communication with parishioners when dealing with the restoration of devotional images. Often when complying with conservation criteria the resulting image changes from that that the community has become accustomed to. It is thus important to communicate throughout the conservation project the criteria used to make decisions for treatment.

The *Virgen del Rosario*

This polychromed wooden sculpture dating from the latter part of the 15th century belongs to a small rural church (Figures 1-3). It is used in processions as a devotional image but is kept for the rest of the year in a cabinet in the church. It is dressed in garments and adorned with a crown and jewellery. In addition to signs of deterioration resulting from natural ageing, these accoutrements have caused damage over time and usage to the polychrome layers. The wooden support has been damaged by wood boring insects and shows a number of cracks in the wood, possibly resulting from temperature and relative humidity fluctuations. Some ornamental elements are missing and there is damage to the original paint layers and gilding. Much of the original *sgraffito* decoration has been covered with overpaint layers in the 19th and 20th centuries. This in turn has been damaged by the close proximity of the garment rubbing against the surface

when the sculpture is moving during processions through the village on feast days. The microclimate created by the covering textiles while the sculpture is displayed in the church also promotes flaking and further deterioration of the surface.

The church wardens and parishioners wished to have the sculpture conserved so that they could continue to use it in their liturgy and more importantly on special festival occasions. The sculpture is an integral part of the summer festival celebrating the patron saint of the village and the community wished to continue to use the sculpture in this function (Figure 4). For this purpose the sculpture is dressed in clothing donated to the church which is non original to the conception of the sculpture (Figure 5). However, using the sculpture for this purpose propagates the damage. Thus, compromises from both parties was required – the parishioners needed to be made aware of the potential damages to the object inflicted by its current use and the conservation team needed to take their desires into consideration when designing the conservation project. Many discussions were held between the two groups (Figure 6).

Figures 1 – 3. Left: the sculpture prior to intervention. Right: the sculpture after intervention. Centre: the dressed figure displayed in a cabinet above the altar in the church after compleation of the conservation project.

Conservation project

The conservation project allowed conservators to convey to the congregation the importance of criteria for the intervention and preservation of cultural heritage objects. Any changes to the sculpture took the traditional image of the sculpture known by the local people into consideration. The congregation remained divided: some wished to continue to worship the sculpture in its traditional appearance; while others were more open to change and wished to find a solution which ensured the continued preservation of the sculpture. Those wishing to continue using the costume defended their position by emphasising the direct involvement of the donor, the economic value of the object, and the preservation of the inherited tradition. In contrast, those more open to change understand the (artistic, historical, and aesthetical) value of the carved sculpture and the risk involved in, not only, dressing the sculpture but also its involvement in the processions in terms of vibration.

The aim of the project was to find a middle ground: while the importance of complying to international standards for conservation was stressed, any intervention needed to be accepted by the congregation and were compatible with their traditions. Thus, the proposed treatment ensured this balance to be met: a replica would be created which could be dressed in the donated costume and accoutrements for the processional festivities and religious ceremonies. The original

sculpture would be restored and kept in the interior of the church and could thus be worshiped or used on specific occasions.

Figure 2. The sculpture processing through the village during a religious festival.

Figure 3. Damages caused to the sculpture by friction induced by the garments.

Figure 4. Conservators discussing options for treatment with parishioners.

Treatment of the sculpture

The sculpture was initially cleaned using soft brushes and a vacuum cleaner to suck the displaced dirt from the surface. The second phase of cleaning involve the removal of overpaint layers using solvents (Figure 7). Consolidation of the original flaking layers was carried out using a synthetic resin that could withstand the uncontrolled climatic conditions of the church. Losses in the polychrome layers were replenished using Stuc.bol®. Structural losses such as the cracks were filled with an epoxy resin (Figure 8). The losses were reintegrated using water colours. Finally a varnish layer was applied to seal and protect the surface.

A replica of the sculpture was created for use in processions. This was dressed in the traditional garments and embellished with ornaments for use in processions. The original is kept displayed in a small cabinet on the altar in the church.

Conclusion

It is essential that conservators, when confronted with this type of conflict, remain flexible and are able to adapt treatment protocols to fit the circumstances and the historical value of specific cultural heritage. This project showed that the merits of intervention undertaken using international standards for restoration and conservation could accommodate for the function of the object as a devotional image. The creation of a replica that could be used in processions

allowed the parishioners to accept that their object was fragile and would be best preserved if it were not subjected to this devotional tradition. Preserving the original sculpture in the church, dressed in its religious finery, allowed the parishioners to continue to use this important relic in their liturgical practice. Through compromise, the patrimonial value of this particular religious artefact has been preserved for future generations.

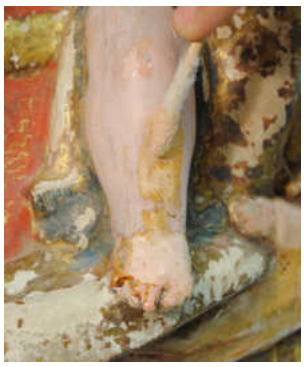

Figure 5. Removal of overpaint.

Figure 6. Structural damage to the support.

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Materials

Stuc.bol®: acrylic formulation patented by UPV, Valencia for the filling of losses in gilded surfaces.

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Our Lady of the Rosary: one peculiar 18th century construction technique of polychrome sculpture

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Abstract

Our Lady of the Rosary is a polychrome wooden sculpture that belongs to collection of the Museum of Santa Cruz, Vila Viçosa, Beja. No signs of authorship nor dating marks were noted. An inventory record exists describing an object that resembles the sculpture in questions. This can be used to assign the artwork to the workshop of Machado de Castro and date it to the third quarter of the 18th century. The sculpture has a peculiar construction method, formed by more than 70 blocks of wood. The wood sections are assembled with metal nails within the work. Four different wood types are used to make the support. Due to the differential shrinkage of the wood, joints have opened and cracks have occurred influencing the current state of conservation. It is very likely that this work was made from reused materials of the workshop that. In spite the technique used to create the support, it is a work that reflects perfectly the stylistic cannons of the Baroque period.

Keywords: Wood, assembly, sculpture, sculpture technology, Baroque.

Introduction

The sculpture of *Our Lady of the Rosary* from the Museum of Santa Cruz in Vila Viçosa, Beja, may belong to the third quarter of the 18th century, in the late Baroque period (Figure 1). It is a work assigned to the Machado de Castro's workshop, which is verifiable when compared to other sculptures from the master himself and his apprentices. It is a life-size work measuring 165 cm high, 75 cm wide and 50 cm deep. Its workshop-like character is well noticed in the construction technique, which is probably derived of reused materials.

Joaquim Machado de Castro (1731 – 1822) was a sculptor and sculpture theorist in Portugal that wrote an extremely important work: '*O Dicionário de Escultura'* [Castro, 1937] – and others like '*Descripção Analytica da Execução da Real Estatua Equestre do Senhor Rei Fidelissimo D. José I*', as well as '*Discurso sobre as utilidades do Desenho*'. He was born in Coimbra, and travelle to Lisbon to learn how to sculpt in a variety of materials – wood, marble, and clay. Afterwards he worked for many years (approximately fourteen) in Mafra where he becomes influenced by the Italian Masters that worked in Mafra's Basilica. It is after this period that he formed his known style.

Materials and techniques

Through a histological analysis of the different types of wood that constitute this work it was possible to determinate the presence of four different kinds of wood [1]: Cedar (*Cedrus sp.*), Mahogany (*Khaya sp.*), Maple (*Acer sp.*) and Birch (*Bétula sp*) (Figure 3). The first two wood species form the central and larger structural blocks, whilst the others form smaller anatomical elements, such as hands and feet. Maple was detected on a loose finger of the Virgin. Birch was detected on the Christ child's right hand. The different blocks were joined together using the simple assembly technique. An empty space was left in the centre of the construction to avoid excess weight and minimize the effects caused by the natural movements of the wood. [Baudry, 1984] Some metal nails were used to join the sections together and reinforce the glue. The material used in the

assembly was protein glue. The nails were detected by X-radiography (Figure 2). The authors believe that the result of the this unusual technique using a variety of wooden blocks glued together would obtain a unique support that could be carved by subtractive system. The subtractive system "*implies that the creator has to trim the material support until it becomes an artistic object (…)*". [Vilhena, 2004]

Figure 1. Our Lady of the Rosary (general view). © IMC Division of Photography and Radiography.

Figure 2. X-Radiography of Our Lady of the Rosary. Notice the empty space, metal nails and the division of various blocks. © IMC Division of Photography and Radiography.

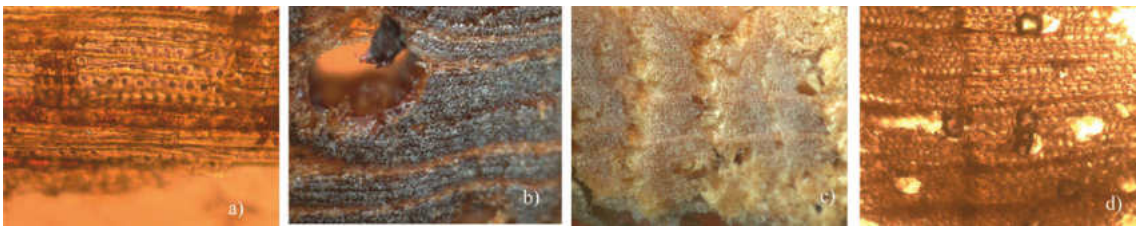

Figure 3 Wood Samples from left arm of the Virgin, right hand of the Virgin, Child's right hand and a finger of the Virgin, respectively. a) Cedar (*cedrus sp.*) radial view (220x); b) Mahogany (*Khaya sp.*) cross-section view (65x); Maple (*Acer sp.*) cross-section view (65x); and Birch (*Bétula sp.*) cross-section view (110x). © José de Figueiredo's Conservation and Restoration Laboratory.

The wood blocks are assembled with no regard to the wood grain direction or orientation. This has lead to a variety of damages presenting themselves over time effecting the current state of conservation of the entire composition. Wood is typically anisotropic. [Kollmann, 1968] The opposing orientation of the blocks of different wood types has endangered the stability of the sculpture. Joints have opened, and cracks, splits and checks have occurred. Some of the smaller anatomical elements, such as the right arm of the Virgin, have detached. The movement of the wood has also formed an overriding network of microscopic cracks in the polychromy, leading to losses and flaking paint.

Figure 4. Sketch of the wood assembles from four view points. © Helena Pereira

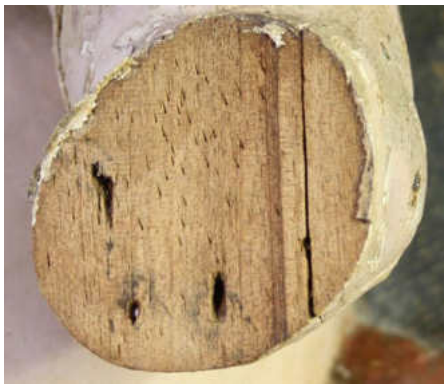

Figure 5. The "sting" treatment applied on Child's arm joinery. © Helena Pereira.

Figure 6. The block carbonised of the arm of the Virgin. © Helena Pereira.

The majority of the support is composed of two divergent wood sorts: hardwood (mahogany) and softwood (cedar). Both wood sorts have different responses to fluctuations in relative humidity (RH). The different reaction times will lead to different dimensional behaviour. [Hoadley, 1998].

The carving technique applied in this composition was executed with high level of mastery, fulfilling the aesthetic cannons from the Baroque period. First, the different woods were cut with saws and then the contact surfaces between blocks were sanded, thereby losing the saw marks which led the authors to believe that these surfaces were sanded afterwards. However, as this would result in an extremely smooth surface it does not seem plausible. Thus, in some cases, the artist might have applied a "sting" treatment probably with one of the chisel's ends in various sanded contact areas, so that the protein glue would penetrate into the interior of the wood, therefore improving the adhesion (Figure 5). Although this treatment might have worked very well, for instance in the adhesion of the foot of the child, the same did not occur in some larger elements such as the right arm of the Virgin. This is likely because of the different wood types that constitute one single anatomical element. The right arm of the Virgin, as well as being built by ten blocks, one of which in poor state. There is evidence that the wood has been burnt (carbonised) (Figure 6). This proves that this sculpture was carved with re-utilised wood. The tools used to carve the wood were the ones commonly used in that period, and that are also discussed by Master Machado de Castro in his "Dicionario da Escultura: "*Saws, (…) flat chisels (or striated), gouges, of different shapes and sizes; and Oak or Cork tree mallets are indispensable (…)*". [Castro, 1937]

The execution of the Virgin's face seems to have a more careful and has resulted in a elaborated aesthetic treatment. The face is sculpted from a single wood block which is mounted on blocks forming her head (Figure 7). This is not the case for the Christ Child. The Child's head is formed of six blocks. This does not meet with the precepts of the period, especially when considering the small bloc used to shape his chin (Figure 8a). The same occurs with the cherubs' faces that form the base of the sculpture, one has two of these smaller additions (Figure 8b). The eye sockets of both the Virgin and Child were hollowed-out prior to forming the head. Glass eyes have been inserted from the interior into the resulting hollows.

The whole the surface of the sculpture, after being assembled and carved, was scored (Figure 9). This was probably for two reasons: one, as it was meant to be polychromed, to allow polychrome layers to adhere to the entire surface. The other reason could be to mimic the final aspect of a stone sculpture, as it was common in that period throughout Europe. [Espinosa et al, 2002] This technique is visible in many works by Machado de Castro, for instance those that belong to the *Zimbório of the Ajuda's Palace* or those that can be found in the *Baldachin of São Vicente de Fora's Church*, both in Lisbon.

Figure 7. The Virgin's face. Note that it is formed by a single block in the form of a mask © Helena Pereira.

Figure 8. The blocks composing the Child's head (a-left) and cherub's face (b-right). © Helena Pereira.

The conservation problems present in this sculpture mainly derived from the technical execution. However, one problem is not present and this is a result of the selection of wood species used. There is no evidence of infestation by wood boring insects. The different types of wood chosen are resistant to these attacks. Cedar, is commonly known for not suffering attacks from wood-boring insects [Calvo, 1997], as is mahogany [Porter, 2001], and this reflects upon the sculpture.

However these woods are normally used for furniture construction and architectural structures and not to create a polychrome sculpture. This was the first time that the authors came across this usage kind of wood to produce a whole volume sculpture.

Figure 9. Detail of the scored surface treatment on the Virgin's arm. © Helena Pereira.

Conclusion

This project's main objective was the study of a construction system directly applied to form the whole volume of the sculpture. This usage of multiple wood sorts assembled is little known in the artistic production of wood sculpture from the late Baroque period. The life-size sculpture of *Our Lady of the Rosary*, revealed a technology of workshop-like character for the construction of the support. Composed by different assembled wooden blocks, probably resulting from a reuse of materials, the sculptor-artist knew how assemble the various blocks to create a whole. The detailed and thorough examination has identified the position and construction of the whole. This assemblage of these blocks has created problems with regard to the state of conservation of the work, not only in terms of joint separation due to the loss of adhesion of the animal glue, but also because of the late addition of non-original rusty metallic elements. There is a number of issues to approach in the future, for instance, what would be the real goal of the scoring treatment of the surface below the polychromy? Could it be for mimicking a stone sculpture in monochrome support? Or was the objective to allow a better adhesion of the polychrome to the support? In the absence of any documentation concerning the work, the answers can only be speculated.

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Endnotes

1. Mahogany and cedar species were identified during a study published in MURTA, Elsa; SANCHES, Diogo, "*Nossa Senhora do Rosário and Anjo Ceroferário, two different cases in conservation of sculpture, in polychrome wooden support, at the IMC's Department of Conservation*", (poster presentation). International conference on wood science for preservation of cultural heritage: mechanical and biological factors, promoted by committee of COST action IE0601, Braga, 2008, pp. 287-291.

References

Baudry, M., et al. 1984. *La Sculpture – Méthode et Vocabulaire*, 2nd edn. Paris: Imprimerie Nacionale, Inventaire Général des Monuments et Des Richesses Artistiques de la France, p. 160.

Borges, A.G.M. 2006. *Ficha de Inventário do Património Artístico Móvel da Arquidiocese de Évora, Nº VV.BA.2.023 esc.*, Beja, Fundação Eugénio de Almeida.

Calvo, Ana. 1997. *Conservación y restauración, Materiales, técnicas y procedimientos de la A a la Z*, Barcelona, Ediziones del serbal, p.53.

Castro, Joaquim Machado de. 1937. *Dicionário de Escultura*, Lisboa, Inéditos de História de Arte, Depositário Livraria Coelho, p. 17, available in http://purl.pt/778. (accessed 2012)

Espinosa, T., et al, 2002. 'História e Evolução da Policromia Barroca'. Actas do Congresso Internacional sobre *A Escultura Policromada Religiosa dos Séculos XVII e XVIII*, Lisboa 29, 30 e 31 Outubro 2002. pp. 37-54.

Hoadley, Bruce R., 1998 'Wood as a physical surface for paint application', Painted Wood: History and Conservation, Proceedings of the Williamsburg Symposium 11-14 November, 1994, The Getty Conservation Institute, Los Angeles pp. 2-16.

Kollmann, Franz, Côté, W.A.. 1968. *Principles of Wood Science and Technology – Solid Wood*, V. I, Berlin, Springer-Verlag.p. 297.

Macedo, Diogo de. 1935. *Machado de Castro*, V. I, Artis, pp. 149; 103; 149-150.

Porter, Brian. 2001. *Carpentry and Joinery*, 3rdedn. v.1, Great Britain, Butterworth Heinmann, p.53

Vilhena de Carvalho, M. J. 2004. 'Normas de inventário – escultura'. *Artes plásticas e artes decorativas*, Instituto Português de Museus (IPM) 1st edn. Lisbon p. 18.

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A case study on polychromed alabaster: The Virgin of the Castle of Cullera

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Abstract

Polychromed sculptures from the east coast of Spain have often been aesthetically adapted due to devotional use. Many sculptures have undergone changes in appearance due to overpaints applied directly to the original polychromy. The three main causes of these interventions are: changes in fashion and/or religious artistic standards; losses in polychrome layers due to a deficient adherence to the original support; and/or losses in polychrome layers due to abrasion or past cleaning treatments. This case study highlights the treatment of the Virgin of the Castle of Cullera, a 14th century alabaster stone sculpture with original but overpainted polychrome layers. The analysis of these layers showed that the technical and material qualities of the original paint layers was superior to those covering it. Deciding which layers to remove during restoration can be difficult. Closely examining the surface and combining analytical results with stratigraphic windows and cleaning tests can aid the conservator in the decision making process. This paper presents a case study of a typical religious sculpture and the difficulties encountered due to its repainted surface and function as a devotional image.

Keywords: Alabaster, polychrome, sculpture, stone, flow diagram, repaints, devotional sculpture

Introduction

The *Virgin of the Castle* or *Mare de Deu* of Cullera is a polychromed and gilded sculpture made of alabaster stone. It has been dated to the end of the 14th century and it is similar to some other sculptures representing the Virgin and Child found in the east coast of Spain. This region was known in those days as the *Kingdoms of Valencia and Aragon*. Today this area contains the provinces of Aragón, Cataluña and Valencia. [Giner Pereperez 1976] The gilt elements are additions applied between the 18th century and present day.

The stone sculpture has undergone many changes from its conception until the present day due to accidences and past interventions. As a result, its appearance has changed over the centuries in terms of both its support and polychromy.

The owners of the sculpture, the Parish of Saint John of Cullera, invited the conservators at the Department of Conservation and Restoration of Cultural Heritage (IVC+r) to treat the object in 2010. The aim of the treatment was to resolve the fragile state of conservation of the sculpture. Prior to treatment, the sculpture was examined and studied. Treatment was a collaborative project between the departments of Stone and Metal and Goldsmith. The analytical studies were carried out by conservation scientists in the Research Laboratory.

Construction techniques and materials

Although sources relating to this sculpture indicated that it was carved from marble, the recent analysis carried out proved that the support was alabaster stone. The main component of the mineral support is calcium sulphate. The support consists of one piece of stone carved using point chisels and toothed stone chisels. There are no perceivable joints and the final polishing of the surface has removed any visible tool marks. Alabaster is known as a material easy to carve and sculpt because of its softness, but the presence of veins in the stone often cause it to crack.

The sculpture was originally polychromed with paint and gold leaf. The image uses the natural colour of the stone as background to the golden stars, palm leaves and trims of the garments of both Virgin and Child. The reverse of the Virgin's cloak is painted blue, the robes of the figures appear brown, the faces of the figures are dark in flesh tones, the Child's hair is brown while the Virgin's is gilded. The Virgin's veil is also gilded. A careful study of the piece revealed that this was not the original appearance of the sculpture.

Figure 1. Condition prior to treatment of the *Virgin of the Castle* of Cullera. Alabaster 14th century sculpture of Virgin with Child and 18th century gilt elements.

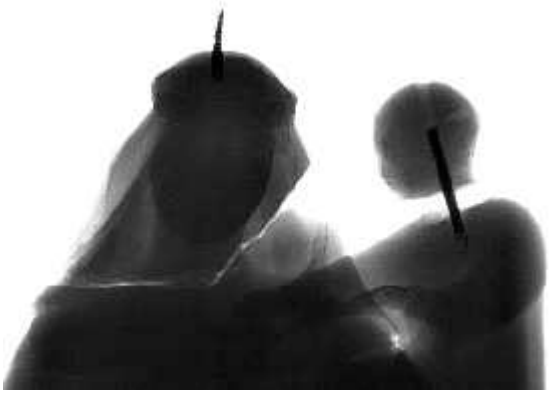


Figure 2. Reversed radiography of the top section of the sculpture. Cracks in the shoulder area of the Virgin, are visible. Losses in original material can be seen in the Child's neck. Previous restorations are evident.

Historical interventions and accidents

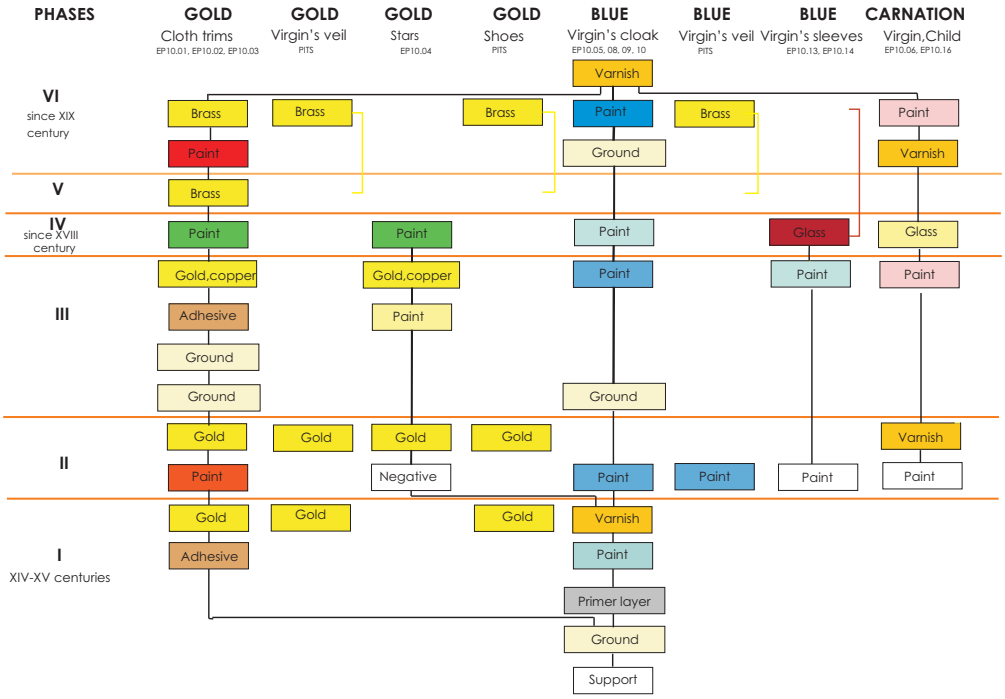
Examining the sculpture, it was clear that it had undergone many accidents and interventions since its conception to both the support and polychromy. These included fractures, losses in the support, re-proportioning of the volumes, repainting and re-gilding. Furthermore, the metal work was added in the 18th century, thereby changing the original stone construction. The Virgin's crown was damaged at this time as a screw was placed in her head in order to support the new metal crown. At this time, the figure of Christ was given an aureole; again a hole was drilled into the support to create a mount for the fixture of this new element. Further changes involved the re-conception of the base of the sculpture. This was adapted in shape to allow the figure to stand on the silver and brass pedestal. Lastly, five additional drill holes were inserted into the reverse of the sculpture to support her aureole (Figure 2).

These interventions to the stone support were accompanied by deliberate repaints. There are at least five more overpaint phases applied to the Virgin. The reason for these is not certain but likely to be the poor state of conservation of the paint layers or a change aesthetical taste. Table 1 shows a schematic overview of these layers based on the analytical results, which will be explained more fully later.

On the contrary, some other problems are probably due to non-deliberated accidents. There are four cracks that can easily be appreciated. Three of them produced a partial volume loss and had

been replaced (Virgin's head, Child's head and Child's right hand and bear cub), and only one has been stocked and shows no alabaster loss (Virgin's chest).

Table 1. Flow diagram showing the various overpaint layers present on the *Virgin of the Castle*.



Analytical studies

The sculpture was examined and analysed before the restoration process with the aim of obtaining information about its structure, materials and creation procedures. These analytical studies also provided information about the state of conservation of the sculpture and of previous interventions. [Gomez 1998]

The radiographic study was implemented according to standard guidelines. [Middleton and Lang 2005] The condition of the structure of the sculpture could be evaluated using the X-radiographs produced. In general, the support was in good condition except for a couple of cracks in the shoulder area of the Virgin which were filled in a previous intervention. The loss of original material in the neck area of the child was clearly visible. This area had been reconstructed in a previous treatment (Figure 2). The X-radiograph also showed the holes on the reverse of the Virgin, in the pedestal and the Child´s head. Different metallic elements such as the rod that holds the head of the Child were also identified.

The polychrome studies were made by microsampling. The microsamples were prepared in cross section and analysed by optical microscopy (OM) and scanning electron microscopy coupled with X-ray diffraction spectroscopy (SEM-EDX). [Instituto del Patrimonio Histórico Expañol 2008] The results of these studies provided information about the inorganic and organic nature of the different materials used in the work of art (binding media, fillers, pigments, dyes, metal leaf, varnishes, etc.), the making process, the state of conservation of the polychromy and the study of the past interventions partially hide the original appearance of the sculpture.

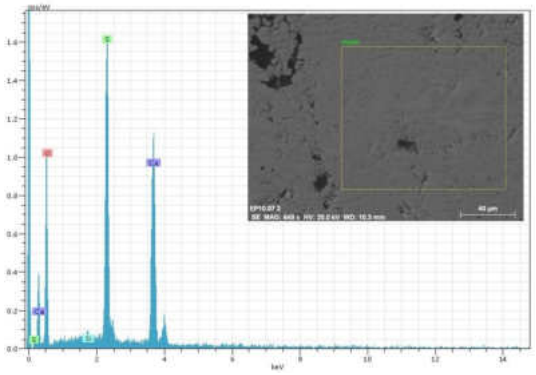


Figure 3. EDX spectrum of a microsample cross section. It shows the presence of calcium and sulphur.

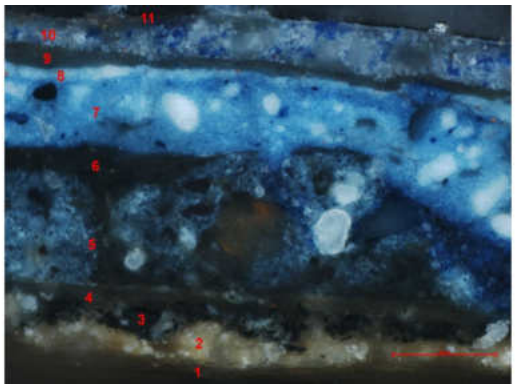


Figure 4. Cross section from the blue Virgin's cloak. (2) ground, (3) greyish preparation layer, (4) original blue polychromy. Overpaint layers are labelled from 7 to 11.

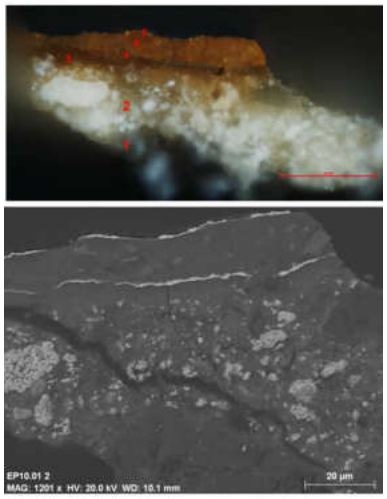


Figure 5. (Top) OM cross section of the sample from the Virgin's gilded dress. (Bottom) SEM image of the same sample. The pictures show the original gilding and early re-gilding.

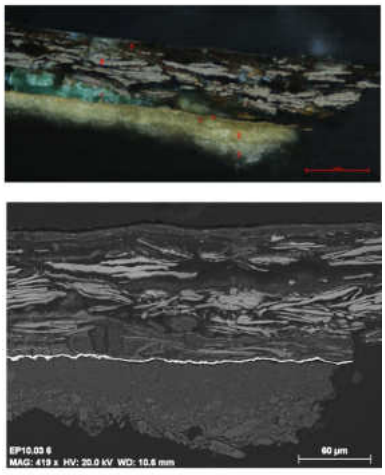


Figure 6. (Top) OM cross section of the sample from the Virgin's gilded dress. (Bottom) SEM image of the same sample. The pictures show a recent regilding made with brass on a green layer, probably Brunswick green.

Samples analysed from the support showed that the Virgin was sculpted from alabaster stone (calcium sulphate hydrated), as can be seen in the EDX spectrum of a microsample cross section (Figure 3). The alabaster stone support was prepared for painting by applying a white ground layer. This layer contained a mixture of gypsum and lead white pigment. The earliest identified polychrome layer, and thus possibly the original, is blue in colour. The pigment has been identified as lapis lazuli mixed with an organic blue dye, and lead white. This is applied on top of a greyish preparation layer, containing a mixture of lead white and an organic black pigment (Figure 4). The sample was removed from an area of the Virgin's blue cloak. The use of lapis lazuli indicates the quality of the sculpture and the importance it therefore must have had for the community.

In general, the entire sculpture was repainted a number of different times. This can be seen in the cross section samples removed from various sites. The original pallet of the artist can be identified by studying the lowest (original) paint layers in the samples. The pigments include: lead white, vermilion, earths and lakes. Figure 4 shows a cross section in which the overpaints applied to the blue cloak of the Virgin are visible. The cross section reveals a rather complex stratigraphic sequence. At least three overpaint layers, inter spaced with varnish layers have been identified.

The blue used for the latest overpaint layer is synthetic ultramarine, marketed since the mid-19th century. [Eastaugh et al. 2004, Gettens and Stout 1966]

The Virgin was gilded originally in some areas. The original gilding layer was identified under some of the overpaint areas, especially in the dress of the Virgin. The gilding was made by applying a bolus (ochre) layer on top of the ground layer. The gold leaf was adhered to this layer. There are a number of different re-gildings, the earliest of these used the same application techniques as the original method (Figure 5). The quality of the gilding of the more recent interventions is less, fake gold made using brass powder was employed (Figure 6).

Flow diagram

A hypothesis of the original stratigraphy was proposed based on the sample analysis and cleaning test windows. [Barros García 2007] Cleaning windows were graduated to show the different layers of polychromy. The results are expressed in a flow diagram (Table 1). The purpose of this diagram is to offer a visual sketch combining all information to facilitate the understanding of all the layers present in the sculpture.

The left column of the diagram indicates the phases or stages of different paint and gilding applications; the oldest at the bottom and the more recent on top. In this case six phases have been observed and numbered from I to VI. The detection of modern pigments allows dating for some of the phases.

The top row indicates three types of information: which colour or metal leaf is analysed as being present, from which part of the sculpture it belongs and if this information comes from sampling analysis or layer tests. The rectangles in each of the columns indicates a different layer, its colour and typology (support, ground, primer layer, adhesive, paint, gold, glass or varnish). The rectangles that are vertically connected with a black line indicate that the layers are on situated on top of one another. If there is no connection it means that superposition has not been confirmed and possibly there is another intermediate layer. Lateral lines in colour indicate that this layer could be placed in different phases, since there is not enough information confirming its temporary execution. Rectangles or layers on the same level mean that they have been applied during the same period of time.

Conclusions can be drawn from the flow diagram. These include: a) the golden trims have six phases where III to VI are of bad quality and technique; b) the blue cloak has five phases; c) the Virgin's golden and blue veil, the cloak's golden stars and the golden shoes have three phases each, the last one made of brass; d) the oldest completed phase is number II because Phase I is incomplete on the Virgin's veil, sleeve and carnations.

State of Conservation

In general the condition of the sculpture is good, though the appearance has been greatly altered. There is a dirt layer present over the whole surface of the alabaster sculpture. The main component of this layer is soot from burning candles and oil lamps, as well as solid particles. The dirt layer is less striking in the lower section of the sculpture. This is a result of the cleaning policy implemented to date. The cleaning of the upper section, including the heads of the Virgin and Child, were more hesitantly cleaned than the lower section.

A quite degraded varnish layer is situated below the dirt layer that covers both the polychromy and unpainted alabaster. This varnish has become brittle through ageing, and has yellowed and darkened due to the oxidation of its components.

In some areas, the adherence of the polychrome layers is problematic leading to paint and gilding loss. This problem can be noticed on the golden trims, shoes and flesh tones.

The alabaster support is stained in the surrounding areas into which the iron struts are inserted to provide additional support to certain structural sections. This includes the Virgin's back, Virgin's and Child's heads, and at the base of the sculpture.

Criteria for decision making and conservation treatment

It is essential, first of all, to understand and take into consideration that this sculpture remains a devotional Catholic image. Indeed it represents the patron saint of Cullera, a small village situated on the Mediterranean Coast near Valencia. This sculpture is thus not a museum piece nor belongs to a private collection. A different set of criteria for treatment were followed.

Therefore it is not a museum or private collection piece where other criteria could have been applied [Instituto del Patrimonio Histórico Expañol 2008] Conflict may arise often when dealing with the treatment of devotional images. There may be a difference in opinion between the ethical considerations of the conservator and the private owner's personal wishes. In these cases, an 'archaeological' approach is out of the question. An 'archaeological' approach would involve removing, layer by layer, the overpaint to reveal the original (damaged) polychromy. In this case, the sculpture represents a saint who is venerated. The worshipers do not wish to see a difference after restoration with the image they have been revering their entire lives. However, education plays an important role as this can increase the lay person's understanding of the processes and methodology by raising their awareness of the problems at state. Elucidation can develop through good communication with the church officials and the parishioners. In this case, the dialogue extensive and the various stakeholders were encouraged to visit the institute to observe the progress both during the study and restoration phase of the project.

One of the most difficult problems that the restorer had to deal with in this case was the cleaning level. In fact, this Virgin is known as "La Moreneta", the brown skin Lady. This presented a problem since the darkness of the skin was not due to its original colour but actually caused by the superficial dirt and varnish layers. A second problem concerned the repair of the structural losses to the support. These volumetric missing sections had been replaced in the past with reconstructed sections. These prior to treatment showed further damage. While the replaced sections could be considered forgeries, as it is not clear on what basis the earlier reconstructions were made, these required replacement in the current treatment. The areas that needed attention were the Child's neck, the bear cub held by the Child, and part of the Virgin's veil. A third problem revolved around the areas of polychromy and gilding that needed to be toned down and covered. Lastly, the 18th century gilding extended beyond the losses beneath, removing these would reveal areas of original surface. The question whether to remove or not these areas highlights the difference in views expressed by the conservator and the parishioner. While these distort the original appearance for the conservator, they are part of the current and consistent appearance of the Virgin for the parishioners.

In order to facilitate the analytical studies carried out all the metalwork elements were detached. These pieces were taken and treated in the IVC+R Metal and Goldsmith department. These were, as mentioned above, later additions. Whether to replace these elements or not was discussed with the church stakeholders. However, viewing the Virgin of the Castle without these additions was not viable and at the end of the negotiations it was decided to replace these elements.

Superficial dirt and varnish layers were removed by chemical cleaning performed with a chelating agent (triamonium citrate) and solvents (ethyl alcohol and acetone) respectively. The most noticeable visual change resulting from the cleaning performed was with the alabaster surface

which changed from a greyish appearance to a light cream-colour. At this stage, the change in appearance of the polychrome and gilding layers was not problematic as these surface layers were non original and would be removed in a later phase of treatment.

The three additional sections replacing losses in the support were dismantled; Virgin's head, Child's head and bear cub with Child's left hand. In each case the decision making came from different reasons. The Virgin's head was dismantled because a large part of the veil was fake, hiding the original hair carving and its polychrome. Moreover, there was an iron bolt inside that needed checking and possible replacement or treatment. In the case of the Child's head, his neck was forged, partially covering original alabaster, its gypsum was degraded and had an iron bolt as well. The Bear cub with the Child's left hand was modelled in one single piece covered most of the original's bear cub claws and needed its adhesion reinforced.

Further cleaning tests were carried out once the initial study of the surface and samples was complete. These graduated (stratigraphic) cleaning windows allowed the condition of the underlayers to be determined. These tests showed that the original surface was badly damaged, up to 60% of the total surface of Phase I in all colours and gilded areas. Also, all of the superficial gilded areas, made of brass, were oxidised in contrast with gilding relateded to Phases I and II, where its composition is pure gold resulting in a bright shiny golden surface. Decisions regarding the cleaning strategy and degree of removal of non-original layers were made only after all of the research was carried out and analysed.

The final decision was to remove Phases III to VI on the trims of the garments, the veil, shoes and cloak, and Phases IV to VI on the stars, sleeves and flesh tones. However, the cleaning of these last areas proved difficult: the overpaint relating to Phase III on the stars could not be removed without damaging the underlying Phase II gilding which had been decided to be kept. Furthermore, the Phase II colours of the flesh tones and sleeves proved to be almost as white as the first preparation layer. This overpaint removal process was carried out by a combination of chemical and mechanical cleaning techniques, depending on the requirements of each specific area - preparation, paint or gilding composition (Figure 7).

Figure 7. The removal of gilding layers from the Virgin's cloak.

Figure 8. Colour retouching on the reverse of the Virgin's veil.

The temporarily detached pieces were treated apart before replacing them back in the positions they had came from. The iron elements were cleaned, consolidated and protected. The possibility of substitution with a more stable material was rejected since the three iron elements were strongly embedded into the alabaster support. Attempting to detach these struts would endanger the original support or sections.

All sections of structural loss to the alabaster sculpture were modelled with a synthetic resin (Balsite®). These sections included the front veil and hair of the Virgin's, the reverse of the Virgin's veil and cloak, the Child's neck and two portions of the trim of the cloak. These reconstructed sections were initially covered with a stucco and retouched. The same stucco was used to fill losses in the polychromy and gilding. A varnish layer of a natural resin, dammar, was applied to the surface. The retouching was carried out in watercolours using a rigatino approach (Figure 8). Finally, polychrome and alabaster surfaces were protected with a synthetic resin (Matt Varnish Regal).

Conclusions

The conservation treatment of polychromed sculptures has two main focuses: reintegration of the support and polychromy layers. In order to select the right criteria for decision making, conceptual intangible aspects have to be considered as well as the common technical problems. Today, many religious sculptures remain as devotional images. It is still common to find devotional pieces from the 13th century inside churches, cathedrals and basilicas.

Conservators are often faced with a different set of challenges when these devotional sculptures require treatment. The main problem is that current criteria on conservation and restoration fields may come into confrontation with the church stakeholders' points of view. Parishioners are often reluctant to accept extreme modifications to the appearance of a sculpture they worship. Reconstructions and fully integrated images are often demanded. These considerations may be opposed to modern criteria for treatment, with regard to cleaning, reconstruction of missing sections, overpaint removal and degree of retouching finish.

On the other hand conservators have to understand that these kinds of sculptures are more than just a work of art, but also a venerated item for many people. Compromise and understanding is thus key in the negotiation process. Each sculpture should be considered as a separate case after a personalised study. Once an understanding has been reached through educating the parishioners, frequently cleaning strategies to remove latter repaints is accepted. However, replacement sections, even if fake, are often replaced or remodelled to retain the full volumetric structure of the sculpture. Furthermore, colour losses are reintegrated. There is no discussion that all treatments and materials have to be compatible, somehow reversible and innocuous to the original materials.

Polychrome losses, wears and changes in fashion have been resolved repainting the pieces over and over, totally or partially. In most cases, original and previous layers are preserved underneath the new polychrome ones, but in some others, parts or the totality of these historical layers were eliminated. Conservators also find that modern polychromes over an old sculpture have not the same technical and material quality. The older the repainting layer is the higher quality of its materials and techniques of application are. For example a 14th century repainting is much better than a 20th century one although both distort the original aspect of the image.

Where complicated cases of repainting appear, a good tool for understanding and studying the case is to elaborate a flow diagram based on analytical results from sampling. This diagram combined with stratigraphic layer cleaning windows will offer a certain security to decisions when a repaint removal is going to be carried out.

There is an enormous task of education and consciousness-raising that has to be developed about conservation and restoration criteria with the public in general and parishioners in particular.

Materials

Balsite®, CTS

Matt Regal Varnish, CTS

References

Barros García, J. M. 2007. 'Towards a Diagrammatic Representation of Non Original Layers on Painted Surfaces'. *Arché*. Publicación Del Insitituto Universitario De Restauración Del Patrimonio de la UPV. Number 2.

Eastaugh, N., Walsh, V., Chaplin, T., and Siddal, R. 2004. *The Pigment Compendium. A dictionary of historical pigments*. Elsevier Butterworth-Heinemann.

Gettens, R. J. and Stout, G. L. 1966. *Painting Materials: A short encyclopaedia*. New York. Dover.

Giner Pereperez, F. 1976. *La mare de Déu del Castell de Cullera*. Ayntamiento de Cullera, Valencia. España.

Gomez, M. L. 1998. *La restauración: examen cientifico aplicado a la conservacion de obras de arte*. Madrid. Cátedra. Instituto del Patrimonio Histórico Expañol.

Instituto del Patrimonio Histórico Expañol. 2008 *La ciencia y el arte: ciencias experimetales y conservación del patrimonio histórico*. Madrid. Ministerio de Cultura, Dirección General de Bellas Artes y Bienes Culturales Instituto del Patrimonio Histórico Expañol.

Report. 2008. *Analytical studies of Virgin of the Castel*. Instituto del Patrimonio Histórico Expañol. Unpublished. http://www.mcu.es/patrimonio/MC/IPHE/Intervenciones/BienesMuebles/BienesMuebles.html (27/02/2012)

Middleton, A. and Lang, J. 2005. *Radiography of cultural material*. Oxford (2nd ed). Elsevier.

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How was it made? *Virgin and Child*, a perfect example of the typologies that characterise Malines sculpture

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Abstract

The so called "Malines" sculptures produced around the 15th century in the Flemish region were characterized as being small size figures, meant for private worship. The *Virgins,* represented with joyful and doll-like facial expressions, a long forehead, and dressed as monarchs with very narrow waists, were most appreciated throughout Europe. Flemish regional workshops were closely related in their development. The success of the Antwerp altarpiece workshops influenced the emergence of the Mechelen workshop and the production of its small sculptures. Guild regulations were very strict and each workshop marked their work as a way of guaranteeing its quality and therefore its place of origin. Only these exclusive brand marks can distinguish the different production workshops apart. With this paper the authors propose to identify, by means of visual resemblance, several key aspects of the workshops' manufacturing methods for the sculpture of the *Virgin and Child*, belonging to the Museu Alberto Sampaio, in Guimarães, Portugal, on which no brand marks were found.

Keywords: Wooden sculpture, workshop, guild, manufacturing methods, Luso-Flemish trade.

Historical background

Flanders played an important role in the socio-historical, cultural and commercial interchange in Europe at the turn of the 15th to the 16th centuries. Flanders was one of the counties under the rule of the powerful House of Burgundy. This Duchy of Burgundy also incorporated the County of Hainaut (which included the city of Brussels), the Duchy of Brabant (which included the city of Antwerp), the Duchy of Limburg, and the Duchy of Luxembourg, as well as the County of Namur and the Archdioese of the city of Mechelen. Also in the 16th century, the port of Antwerp succeeded Bruges as the main trading centre, bringing prosperity and expansion to their surroundings.

There are several documents that prove the abundant shipping of Flemish art to Portugal. The Luso-Flemish relations and tax registers dating from the middle of the 16th century reveal the nature of those imports and can be used to map their distribution. [Vermeylen 2005] In the late 15th century, and especially in the first half of the 16th century, small religious images were most appreciated. The small images were imported mostly from the Flemish territories, rather than from other sources such as Germany and Italy.

Portuguese merchants began to settle in Bruges at an early date. Maritime trade, the transportation of agricultural products and buying manufactured articles consolidated the relationship between the two countries. Marriages between the royal houses of Portugal and Burgundy strengthened the relationship. The 12th century marriages of Princess Matilda of Portugal to Count of Flanders Philip of Alsace, and later his nephew Ferdinand of Portugal with Countess Joan of Constantinople, heiress of Flanders and Hainaut, were especially influential. [Curvelo et al. 2002] However, the success of Flemish art in Portugal was due mainly to the 15th century marriage of the Portuguese princess Isabella of Portugal (1397-1471) to Philip the Good (1396-1467), Duke of Burgundy. Although, Isabella became well aquainted with the luxurious

Flemish court, she never forgot her roots and made every effort to maintain and further strengthen the good relations that existed between the two countries. Whenever the occasion afforded, Isabella, *daughter of the King of Portugal* as she always entitled herself, engaged artists and craftsmen that were at her disposal, sending pieces of notorious quality to Portugal. When compared to local Portugues artistic production of this period, the Flemish pieces were unprecedented. These imported artworks certainly played a major role in shaping the taste of the time in Portugal. In addition, Isabella continued to promote the Portuguese *feitorias* [1] in Flanders. Moreover, she played a crucial role, undoubtedly with Flemish help, in the settlement of the Azores. In this context, it is also important to highlight her role as Lady of Mechelen. She was offered the city of Mechelen, Termonde and Audenarde as a wedding gift from the Duke. The discerning eyes of Isabella were an essential vehicle for spreading objects of Flemish taste. [Grilo 2005] In this period, as Portugal was completely dependent of Burghundy (Flanders), it was perfectly natural that the Portuguese monarchy became tempted to copy the splendid court of Burgundy in all its luxury fashion and wealth. Copies of Flemish imports became commonplace.

Brabant production centres for art were concentrated in three cities considered by many as the most important of Flemish region on the turn of the 15th to the 16th century: Mechelen, Antwerp and Brussels. Other regional cities produced quality work but did not have the same prestige. Among the Brabant cities, Mechelen was especially renown for producing, by commission, polychromed and gilded sculptures, mostly of small size. The *Maline* exemplars, that arrived to Portugal by that time, were characterised not only by their small size but mainly by the graceful positions of the body, allied with the typical medieval character of the Flemish doll like expression, optimistic and loaded with virtuosity, decorated with taste and finesse, bridging a mixture of exoticism and elegance [2]. [Tavares e Távora 1976, 33]

The emergence of this unique art was a counter-reaction to the art from Southern Europe that tended to a certain Mannerist style. The school of art that materialised in the Brabant region influenced the whole country after a short period of time. The most famous polychrome retable altarpieces, containing small sculptures set in architectural surroundings were created in this context. These retables, as well as individual figures, were exported throughout Europe and many of them, due to a historical and social conjecture explained above, arrived in Portugal in the late 15th and 16th centuries.

Formal aspects of the Mechelen workshops

The images that emerged from the Mechelen workshops are of two main groups: the polychromed individual sculptures carved in the round with a naturalistic appearance (usually of a slightly larger scale); and smaller high relief figures that were intended to be set against a backdrop, thus have flat undecorated backs. These were also more often than not polychromed. The material used for both types was predominantly wood. The most common wood species were oak, walnut, linden, and occasionally beech, poplar, birch and fruit trees.

The *Virgin and Child*, of this study, can be characterised as part of the second group of sculptures. The workmanship is typical of serial production, whose main objective would be marketing. The majority of sculptures of *Malines Virgins* in this second case are similar in size and iconography. The bibliography consulted agreed on the same characterisation of the female figures: the protruding belly, the naturalistic treatment of the small and well marked breasts, and the "S" line of the body, with a slight protrusion of the hip and the right knee. The figures appear in a pose that is very natural and graceful, linked by the beauty and elegance of dress and optimistic expression with their almond-shaped slanting eyes and the right small nose and smiling mouth, framed by an oval face with a small jaw and wavy hair. [Tavares e Távora 1976, Serck-Dewaide 1998, Barreiro and Murta 2005] Polychromy was always of good quality. Although the sculptures

could be made without a base (pedestal), it was common however to include a platform, roughly 2 cm thick, on which the feet were placed, simulating the ground.

The artists ensured the material quality of their work in order to prove their mastership of the craft. This quality control was endorsed and protected by Guild regulations. Thus it was mandatory to apply, before a sale or exportation, a mark on the support, the sculpture figure and the polychromy. The Malines workshops began in the early 16th century to systematically mark the reverse of the sculptures. The mark used was a shield with three pales. [Serck-Dewaide 1998] The mark was made either by punching directly an iron engraved with the symbol on the wood with a mallet or by branding the wood with a hot metal iron. Normally these marks can be seen in the lower third of the reverse of the flattened images, or on the bases. Other cities and production centres devised their own brands or marks.

The image of the Virgin and Child, that was extremely popular in the late 15th and early 16th centuries, gave way to other iconographies. Images of martyred virgin saints became increasingly popular in the first quarter of the 16th century. This is perhaps a reflection on the accompanying hagiology of the time which promoted various cult devotion. The most favoured images were the triple representation of Saint Anne, Virgin and Child (Santana Triple). [Saraiva 2011]

Figure 1. Virgem de Malines. Museu Alberto Sampaio, Guimarães. © Departmento de Conservação e Restauro.

Figure 2. Bottom of the base, which shows the characteristic marks of the implement used to fix the wooden block in the woodworking bench © Carina Saraiva

Case study

The case study involves the confirmation of the attribution of the *Virgem de Malines*, belonging to the Museum of Alberto Sampaio in Guimarães (invº E-57) to Flemish production centres, in particular those practicing in Mechelen [3]. The sculpture characteristics of the Flemish city of Mechelen; however, the authors wished to study the artwork closer to provide stronger links to this production centre. It shows an advanced state of degradation due to biological infestation. The brand marks typical of Mechelen are not present, but it is difficult to say for certain that they were never present, as the loss of support at the reverse due to insect infestation is high. Documentation in the museum is scarce and there is no record of the accession to the collection. [Bastos et al. 2005] This sculpture is small in size, measuring 35 cm high and 5 cm deep. It is carved as if it were a high relief with a flat reverse section. The wooden support is clearly visible

in loses to the polychromy. Tool marks in the wood are visible. The underside of the base shows typical marks of the woodworking bench (Figure 2). Blocks of wood were typically carved horizontally on a woodcarving bench. The implement used to fix the block in the bench frame (a so called bench dog) often left marks in the underside of the base and top of the sculpture that were later not worked away. These shapes left in the wood indicate the form of the tool. Round and triangular forms are typical. Only the front is polychromed, while the reverse is left undecorated. Tool marks used to shape the wood are visible on the reverse. These consist of longitudinal marks that have been created by a gouge (Figure 3).

Figure 3, Reverse. Flat, undecorated, with longitudinal marks of gouge. © Departamento de Conservação e Restauro.

Figure 4. Detail of the X-radiograph showing the carved block of walnut tree. © Division of Photography and Radiography.

Figure 5. Two sizes of gouges were used to carve the curly hair. © Departamento de Conservação e Restauro.

The X-radiograph, taken from front of the sculpture, gave great deal of information. It shows that the sculpture is carved from a single block from a walnut tree (Figure 4) [4]. There were no additional blocks added for the protruding elements, such as hands, or accoutrements. The remains of three metal fastenings are visible in the X-radiograph as three white dots at the top of the Virgin's head. These presumably relate to the fixtures for the halo. Some areas that appear white on the X-radiograph correspond to areas of fill to repair damages. These consist of now aged wax-resin fillers. Other areas that appear white relate to the use of lead white pigment in the original paint layers

The artisan used two distinct gouges to carve the locks of curly hair. The sizes of the gouges differed. The tool marks can be seen in the two locks of hair on the reverse of the head (Figure 5), and on the four locks on top of the shoulders that sweep down covering both forearms, as well as those locks at the front of the sculpture that cover the neckline.

The figure of the Virgin is depicted wearing a Flemish turban, consisting of a strip of cloth or ribbon, shaped into a helix coil. A string of beads is placed in the turban and these dangle beneath the hairline on the forehead and neck of the figure creating a sense of illusionistic reality. The face of the Virgin is broad and oval shaped. The almond shaped eyes are shown with a downward gaze. The collar around the bosom is well defined without tool marks, indicating that the surface here was highly finished by sanding prior to the application of the polchromy (Figure 6). The Virgin is dressed in a long tunic with a girdle fastened at her waist, emphasising the figure. The robe falls in folds to the feet. The figure is placed on a platform consisting of a thin

section of carved wood, measuring 1.3 cm deep. The platform is carved to simulate the ground. Grass is imitated using a small gouge by carving hollow parallel hatched lines. This form is characteristic of 15th century Brussels workshops, rather than Mechelen (Figure 7).

The figure of the Christ child is presented in front of the Virgin with his torso at an angel. His figure is supported by both hands of the Virgin. However, his features are no longer present due to the severe damage by biological attack in this area. His figure now lacks his head and both hands. It is clear however that he was holding an attribute (Figure 8).

Figure 6. The collar around the bosum has a high degree of finish. © Departamento de Conservação e Restauro.

Figure 7. Floor surface made with a small gouge. Carved using hollow parallel crossed lines © Departamento de Conservação e Restauro.

Figure 8. The figure of the Child is severely damaged by biological attack. It lacks the head and both hands. © Carina Saraiva

The sculpture was studied carefully using an integrated interdisciplinary approach. Treatment carried out was minimal. This included the consolidation of polychrome layers; anoxic disinfestation in a modified atmospheric chamber to counter ongoing insect attack; and the localised strengthening of the damaged wood by introducing a consolidant. The statue was cleaned of dirt and exit holes left by insects were filled with a filler consisting of cellulose fibres and retouched. The disturbing areas of white preparation, visible along the edges of lacunae, were toned down [5].

To conclude, while this sculpture has all of the characteristic typologies of Mechelen production it is not possible to confirm the attribution to this city as no brand marks were found on the sculpture. However, while certain features appear similar to Brussels production, the overall appearance of the sculpture matches those presented by other Maline figures of the Virgin and Child in Portuguese collections.

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Endnotes

1. "Feitorias" can be translated into English as "trading post".

2. "Maline" commonly refers to the name given in Portugal to small size Flemish sculptures imported from the artistic production centre of Mechelen, taken from the French word for the city.

3. More information can be found on the *Matriznet* website; available at http://www.matriznet.imc-ip.pt/ipm/MWBINT/MWBINT00.asp. (accessed June 2014).

4. The wood was identified by Lília Alfarra Esteves (LCR-IJF IMC) ***Juglans regia*** L., characterised by the diffuse porosity, the type of parenchyma and spinal cord.

5. The study and practical work consisted on the probation period and Master Dissertation for the IPT-EST of student Carina Saraiva, in the Sculpture division of the DCR-DGPC in Portugal, during the 2011/12 academic year.

References

Barreiro, A. and Murta, E. 2005. 'A Escultura Flamenga Importada em Portugal. Alguns casos de conservação e restauro'. In Garcia, B. J. G. and Grilo, F. (ed.) *Ao Modo da Flandres – Disponibilidade, Inovação e Mercado da Arte (1415-1580).* Proceedings of the International Congress. Lisbon: Reitoria da Universidade de Lisboa, pp. 247-255.

Bastos, C. et al. 2005. Museu de Alberto Sampaio: roteiro. Lisboa: IPM.

Curvelo, A.; Pinto Matos, M. A.; Vilhena de Carvalho, M. J. 2002. *Da Flandres e do Oriente : escultura importada: colecção Miguel Pinto*, Lisboa, IPM, Casa Museu Dr. Anastácio Gonçalves.

Grilo, M. J., 2005. 'A acção mecenática de D. Isabel de Portugal, Duquesa de Borgonha (1397-1471) – Uma princesa entre Portugal, a Flandres e a Itália'. In: Garcia, B. J. G. and Grilo, F. (ed.) *Ao Modo da Flandres – Disponibilidade, Inovação e Mercado da Arte (1415-1580).* Proceedings of the International Congress. Lisboa: Reitoria da Universidade de Lisbon, pp. 75-90.

Saraiva, C. 2011. 'Conservação e Restauro em Escultura Policromada Virgem de Malines'. Master dissertation. Conservation and Restoration Department, Instituto Politécnico de Tomar.

Serck-Dewaide, M. 1998. 'Support and Polychromy of Altarpieces from Brussels, Mechlin, and Antwerp. Study, Comparison, and Restoration'. In: Dorge, V. and Howlet, C. (ed.) Proceedings of the symposium *Painted wood: History and Conservation*. Los Angeles: Getty Conservation Institute, pp. 82-99.

Tavares e Távora, B. F. 1976. *Imagens de Malines*, Lisboa: Colecções/ Museu Nacional de Arte Antiga.

Vermeylen, F. 2005. 'Paintings for Portugal. The export of Flemish Art from Antwerp to Lisbon during the sixteenth century'. In: *Ao Modo da Flandres – Disponibilidade, Inovação e Mercado da Arte (1415-1580).* Proceedings of the International Congress at the Reitoria da Universidade de Lisboa, Lisbon, pp. 67-72.

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