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

Edited by Kate Seymour
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.
Volume I

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

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Papers
Traces of tools and workbench clamps found on the sculptures of Jan van Steffeswert (ca. 1460 - ca. 1530)
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Abstract

Studying the characteristic traces of the working method left on wooden objects can shed light on the practice of late medieval sculptors. It is crucial that reconstructions of working methods are based on a meticulous study of a group of sculptures attributed to one master craftsman or a studio workshop. However, the results obtained do not guarantee that a clear picture of the working methods emerges. In some cases, it remains difficult to link traces or marks left by tools and/or the workbench to specific carving techniques or methods. In-depth studies of Lower Rhine sculptors, such as Hans Multscher and Niklaus Weckmann, have provided much clarity into German working practice. The material-technical research undertaken of the work produced by Jan van Steffeswert provides a similar insight to Southern Netherlandish carvers. This research, carried out prior to a 2000/2001 retrospective exhibition, was undertaken on twelve signed works that are to date known to be by this artist. The tool marks found on these twelve works could be linked to other tool marks on unsigned works that are thought to be from the same workshop, aiding questions of attribution. Research was inhibited as many of the works were either heavily overpainted, had been stripped of original paint layers or changed by earlier repairs or treatments. The study of the van Steffeswert oeuvre showed he used at least two types of workbench. Traces of the system used to fix the wood block in the workbench could be used to reconstruct both types. Holes at the top and bottom of the block in which wooden pins were inserted so as to suspend the block in the bench were noted, as were the marks left by forked metal clamps (bench dogs) used to fasten the block in position. While examples of the former workbench have been preserved, none exist to day of the latter, though similar benches can be seen in prints and drawings that date from the beginning of the 16th century. Reconstructing these has allowed researchers to envision the techniques and methods used in the Jan van Steffeswert late medieval workshop.

Keywords: 16th century, Jan van Steffeswert, sculpture, workbench, clamp, pin, bench-dog

Introduction

Until recently in The Netherlands, research carried out on late medieval sculptures has been the domain of the art historian, lacking collaboration with conservators and technical art historians. Until the late 1990s, a systematic study of a particular group of sculptures or oeuvre, such as those of Jan van Steffeswert (ca. 1460 - ca. 1530), combined with a material-technical investigation had not been carried out. In Germany, on the contrary, collaborative efforts between art historians and conservators over the last few decades have produced a large volume of new information. A long lasting cooperative project concentrating on work of the Ulmese sculptor, Niklaus Weckmann (active ca. 1482-1526), resulted in an exhibition in 1993 at the Württembergisches Landesmuseum in Stuttgart [Lichte 1993b]. The title ‘Meisterwerke Massenhaft’ (Masterworks of a Craftsman) indicates that the studio practice of this sculptor was the focus of this exhibition. In 1997 the same museum organised a further similar exhibition about another known Ulmese sculptor, Hans Multscher (ca. 1400-1467) [Reinhardt and Roth 1997]. Furthermore, masterworks emanating from the Lower Rhine region were the focus of a third exhibition, entitled ‘Gegen den Strom’, shown at the Suermondt-Ludwig Museum in Aachen in 1996/97 [Rommé 1996/1997]. In these cases, art historical research in combination with material-technical analysis provided additional understanding of the studio practice of the Lower Rhine sculptors. The aim of the Dutch collaborative study was to shine a similar light on sculptors and master-carvers from the Southern Netherlands, in particular the Maastricht sculptor Jan van Steffeswert.

Reconstructions: Lower Rhine Workbenches

Reconstructions of the working methods practised in the late medieval period by sculptors and their workshops have been attempted in all of the above mentioned research projects. Experts have attempted to use information gained during comparative material-technical research to uncover specific information
about the individual working methods of a particular workshop. The meticulous study of a group of sculptures attributed to one master craftsman and his studio workshop is crucial to producing an accurate reconstruction. However, results obtained from such a study do not guarantee that a clear picture of the working methods emerges. In some cases, it remains difficult to link traces or marks left by the workbench and/or tools to specific carving techniques or methods.

Figure 1. Georg Pencz, print depicting the Children of Mercury, Folge der Planeten c. 1505. A ‘floating’ workbench is visible in the lower left corner.

Figure 2. Reconstruction of the Weckmann type ‘floating’ workbench. © SRAL.

Regrettably, no conclusive results were drawn after an in-depth study of the production of Hans Multscher. [Reinhardt and Roth 1997] A reconstruction of his working methods could not be decisively determined from a study of tool marks left during the construction process on sculptures attributed to his workshop. However, the marks of tools left on the sculptures from the workshop of Niklaus Weckmann, combined with depictions of contemporary working practice, could be used to make a reconstruction of the type of workbench utilised during the carving of his sculptures (Figure 1). [Lichte 1993, Rief 1998] The workbench used by Weckmann was simple in construction. It consisted of a flat thick lower board and two uprights in which pegs, attached to the top and bottom of the wooden block, were used to fix the wood horizontally for carving (Figure 2). One of the uprights could be adjusted by placing it in predetermined slots in the lower board to accommodate the length of the woodblock. End wedges would be used to fix the angle at which the block was carved. Such a workbench would be simple to create and adapt for small and large scale works. Was this the same style of workbench used by Jan van Steffeswert?

The search for Jan van Steffeswert’s workbench

The material-technical research undertaken of the work produced by Jan van Steffeswert gave new insight into the methods used within his workshop. The study was carried out prior to the 2000/2001 exhibition, shown at the BonnefantenMuseum, Maastricht dedicated to this artist. [te Poel 2000] A year-long technical, material and art historical study was carried out in-situ in churches, museums and private collections, as well as on sculptures brought to the conservation studios of the Stichting Restauratie Atelier Limburg (SRAL) in Maastricht [1].

This research initially focused on twelve signed works by this artist (see Table 1: Appendix I) [2]. The tool marks found on these twelve works were linked to similar tool marks on unsigned works, included in the exhibition, thought to be from the same workshop. Around 70 works were studied in total. The results of this meticulous study further aided researchers in the stylistic attribution of works to the hand of Jan van Steffeswert. Registering marks left by carving tools or the wood-working process was not possible on all sculptures in the exhibition because, unfortunately, many of the works were either heavily overpainted, had been stripped of original paint layers or changed by earlier repairs or treatments.

Specifically signatures were examined, as were the tops and bottoms of the sculptures. Traces of implements or tools used while carving took place were systematically recorded. Marks were measured using a variety of instruments, such as dial and outside diameter callipers. The resulting information gave insight into Jan van Steffeswert’s working practice and the workshop tools he used. How the master
A. Truyen and K. Seymour. 2014. *Traces of tools and workbench clamps found on the sculptures of Jan van Steffeswert (ca. 1460 - ca. 1530).*

Craftsman carved the sculptures in his workshop became clearer. Interpreting the marks registered and associating these with specific tools was at times difficult. While the traces in the wood left by gouges and chisels were easy to identify, determining what caused the often multitude of indentations on the bases of the sculpture proved more difficult.

Drilled recessed holes were found on a number of Jan van Steffeswert's sculptures, as on those created by several other middle age sculptors (Figure 3). The reason for these holes becomes clear when contemporary illustrations of the working process are studied. These holes provided the seat for the pegs (either metal or wood) used to hold the wooden block horizontal between the two uprights of the carving workbench. It was clear, therefore, that in some cases Jan van Steffeswert used a similar system as Weckmann to fix the wood block in a carving bench. But was this the end of the story?

Besides the round peg-holes, another sort of mark was noted on many of the sculptures, specifically on the bases as the tops had been worked to receive the polychromy layers for hair or hats. Often a multitude of short indentations in the wood were catalogued (Figure 4). These marks were shallow, measuring from 1 to 2 mm deep. A careful documentation of these, grouped the marks into pairs. When two such marks could be associated with each other they were parallel. What tool could have left these? It could not have been a forklike pin or peg used to hold the block in position as the indentation was too shallow for the tool to have sufficient grip to hold the block in position during carving on a workbench similar to that used by Weckmann. Finding the source of these marks became the focus of this research project.

[Figure 3: a) (left): St. Chrispin (or Chrispianus), Sint-Martinuskerk in Gronsveld; b) (right): Base showing two drill holes for attachment pins. © SRAL]

Again contemporary drawings of woodcarvers at work gave researchers more insight (Figure 5). Once researchers realised that another sort of bench could have been used, interpreting the marks almost became self-explanatory. However, some further investigation was necessary as the means in which the wood block was fixed to this second workbench type were difficult to determine in the prints. It was therefore difficult to establish how the bench really functioned. A drawing of a workbench from 1505 clarified the situation (Figure 6). [Landis 1987, Rief 1998]

This second bench type differed from that explained above. This bench consisted of a trestle table with four splayed legs. The height of the table surface would be around waist height. The wooden block would rest on the table surface during the carving process. But how was the block fixed in position? Some prints show that it was tied down, but this would not give sufficient stability for the rough carving process (Figure 5). The 1505 illustration holds the clue. Here the technical drawing shows that holes were drilled into the table surface at regular intervals (Figure 6). These so called *dog-holes* would hold a metal hook (a *bench-dog*). A rectangular recess in the bench top is created on one side of the bench. This would form part of the *enclosed tail vice*. The end *bench-dog* could be moved by using a *bench screw*. The centre *bench-dog* would be inserted in a relevant *dog-hole*, depending on the size of the wooden block being carved. The wooden block was placed horizontal on top of the table surface and held in place by the opposing *bench-dogs*. Placing the *bench-dog* in a hole further along the table surface could vary the working space and thus a longer block could be accommodated. This bench type also permitted small and large scale blocks of...
wood to be carved. Here when the block required rotation, it would be released, repositioned and re-clamped. The marks left by the clamp during the repositioning would often be situated close together.

Studying the marks on the bases of Jan van Steffeswert's sculptures more closely, confirmed this practice. While the marks on the sculptures vary in size. Repeated patterns of double notches could be identified, often within a small area (Figure 4). The distance between the two notches of the pair was regular, indicating that the same tool made the impression. This tool was repeatedly pressed against the wood at slightly different angles, which suggested that the wooden block was being rotated regularly and re-clamped. Could these dents then be the trace of a clamp used to fix the block in position while carving progressed? And what sort of clamp would leave such an impression? Did other clamps make the other impressions? This would indicate that the carver exchanged clamps during the working process.

A reconstruction of this workbench type provided some answers to these questions (Figure 7). It is highly likely that a fork-like clamp was used. The teeth of the pronged clamp shallowly indented the wood, providing grip while the carver asserted pressure carving the wood using chisels or gouges (Figure 8). The construction of this bench type was simple and could be achieved in a relative quick way. The trestle top could be made out of two or three thick boards, which contained holes for the legs. The dog-holes and vice recess would also be easy to create. It is possible that a carver or his pupils made a workbench solely for a specific task. Once the task was completed the bench could be dismantled.

This plausible reconstruction of the workbench used by this late medieval sculptor enabled a greater understanding of master's working practice. It is not impossible that during the carving process a number of different workbenches were used. It some cases, it was clear that Jan van Steffeswert used a ‘floating’ workbench, similar to that used by Weckmann, and in other cases he used a flat trestle bench. It seems that van Steffeswert was not particular to one bench sort or the other, and in rare documented cases used both for the same statue.

Traces of other tools

The meticulous study of a large body of work by this master, revealed more about the working practice of the sculptor. The carving process employed by Jan van Steffeswert is not atypical. When carving the wooden blocks, in general he worked with the wood grain, following the growth direction of the tree. However, the trunks of trees grown locally in unmanaged forests were often not straight. A good carver would not waist this precious source material and would incorporate the change in growth direction as part of the form of the sculpture. Jan van Steffeswert was particularly good at this. His masterly working of the wood can be seen in the statue of St. Barbara from the St. Lambertus Church in Neeroeteren for which he selected a wood block that included the main trunk and a side branch. The slightly curved tower is formed by the side branch, while the figure of the saint is carved from the main trunk.
After creating the rough shape of the sculpture, the block was fixed in a horizontal position on a workbench to move on to finer work. Again here Jan van Steffeswert followed typical 16th century practice. It is probably that he first drew the rough shape on the wooden block to indicate the desired form. Excess wood would be carefully removed using a chisel or a gouge. The drawing would be closely followed. As the work progressed, the chisels and gouges became finer and finer. Drills were used to form complex shapes, such as locks of hair and beard, as well as areas difficult to reach.

Traces deriving from the carving process were noted on the examined sculptures. These traces were the key to the rediscovery of van Steffeswert’s studio practice. Slowly but surely, the techniques, tools and materials used by this Maastricht carver became apparent during the research project. Not only were gouge, chisel and drill marks identified on a number of sculptures, but it also became clear that van Steffeswert used a lathe to shape the wood. Circular marks are visible in the dish holding the head of St. John the Baptist in the *Johanneschotel* from Liege. The remains of a wooden peg, fixing the dish to the lathe, are visible in the right cheek of St. John. Further traces of the use of a lathe can be found on the inside of St. Anne’s turban from a sculpture group belonging to the BonnefantenMuseum representing the *Virgin and Child with St. Anne* dating from 1500.

![Image](image1.jpg)

**Figure 5. Master of the Housebook Woodcut showing Mercury and his Children Zwischen 1470-1505 (Private Collection). A trestle workbench is depicted in the lower centre of the image.**

![Image](image2.jpg)

**Figure 6. Loeffelholz technical drawing Nuremburg 1505. (Deutsche Stattsbibliothek, Berlin) The dog-holes, bench-dogs and vice are clearly drawn.**

Contemporary illustrations show woodworkers using a lathe but at this time these were not standard equipment in a sculptor’s studio. Jan van Steffeswert may have used a lathe belonging to the workshop of a spindle turner in the Spilstraat (*Spindle Street*) in Maastricht. The spindle turners were also members of the carpenter’s guild.

Jan van Steffeswert was economical in selecting wood for his sculptures. However, if the main block of wood did not accommodate the desired form, extra sections of wood were attached to the sides of the main block using dowels. There are a number of sculptures by Jan van Steffeswert where additions have been placed on both sides of the main block. Van Steffeswert often produced beautiful and delicately carved female saints, paying special attention to their hair and faces. Details, such as wrinkles, were not forgotten. Decorative elements in the drapery and attributes were also carved with attention for detail. These were mostly carved directly into the main wood block. However, if the elements were too small, these were carved separately and later attached to the main section using wooden pegs or directly with glue. The statue of *Mary Magdalene* from the Church of St. Matthew, Maastricht provides a good example of this working process. Nearly all of the wooden flowers show integration in the finishing process of carving. Therefore these attached elements must have been in position before carving the statue commenced.
Jan van Steffeswert's Signature and Mastermark

The artistic legacy of Jan van Steffeswert remains impressive even after five hundred years. Unusually for a carver in this period, van Steffeswert signed many of his sculptures. Fifteen signed works can be traced back to van Steffeswert’s hand, and over 60 additional pieces have been attributed to his workshop [6]. His style was well copied, not only by those working in his studio but also by local followers. Thus, it seems that Jan van Steffeswert was an accomplished carver and his influence had a far reach across the Meuse region. Contemporary sources record his presence in Maastricht as early as 1490, when he joined the carpenter’s guild, and until his death after 1531.

His studio was registered in the Mariastraat from 1507, near the timber market situated on the riverfront. It is known that he employed a number of assistants and schooled apprentices. Nothing can be said with any certainty about the size of Jan van Steffeswert’s workshop. Archival research revealed that he trained pupils, but there is little information about their exact number. However, given the large number of sculptures produced and their large size - some of the crucifixes are larger than life size - it is likely that his studio consisted of a certain amount of pupils and/or assistants.

Jan van Steffeswert’s style is distinctive and his impressive oeuvre suggests that his works were popular and his studio busy. He was apparently so conscious of his individual qualities that he placed his signature prominently on the front of his finished works. It is through this practice that he has emerged from anonymity and thus so much is known about this artist today. This late medieval carver signed his works in more ways than one: besides IAN VAN STEFFESWERT he also used IAN van Weerd, IAN BIELDESNIIDER (Van Weerd) or simply IAN. His signature was mostly accompanied by a maker’s mark (mastermark) and date. The signatures examined showed that the letters, numbers and maker’s mark have been carved into the wood with a depth of 1 to 2 mm. The signature and mastermark are also painted with a thin layer of original paint without the ground layer.

Conclusion

The interdisciplinary research project carried out on the sculptures of Jan van Steffeswert and his workshop ten years ago, in combination with more recent discoveries, has led to surprising new insights regarding the life and work of a carver from the Southern Netherlands. It is a rarity in the mostly anonymous world of medieval sculpture, that an individual artist, only by using his signature, emerges within his cultural setting. The work and life of Jan van Steffeswert opens a window showing an element of Maastricht society at the beginning of the 16th century. It is fortuitous that Jan van Steffeswert signed a large portion of his works and that the traces left by used tools and clamps give the opportunity to compare and connect sculptures within his oeuvre. These traces of the carving process allow us to form a picture of the working practice within his studio.

The technical information acquired from studying other late medieval sculptors was often not enough to understand exactly the working practise within their individual studios. The direct comparison between a group of sculptures stylistic attributed to one carver or workshop is essential to be able to reconstruct a
studio practice and the equipment used, such as workbenches. But, the question is can you make an attribution to a particular carver or workshop based on the traces and marks left on the sculpture by a workbench?

Marks left during the carving process were found during the examination of sculptures from Lower Rhine workshops and from the carver Hans Multscher from Ulm. However, the marks were too diverse to provide accurate information for the reconstruction of the workbenches used by these master carvers. A reconstruction of a workbench possible was only in the case of Niklaus Weckmann.

The research on the sculptures of Jan van Steffeswert was initially based on stylistic attribution. This was a group of sculptures with similar features. Comparing the clamp marks allowed researchers to confirm the stylistic attribution. The similarity between the clamp marks proves that these statues came from the workshop of Jan van Steffeswert. It is the combination of a wide data-set and a methodological research that provided sufficient information to confirm this corroboration. It is imperative that the starting point for any research be a group of allied sculptures attributed to a master carver or workshop. Without this it would be near impossible to confirm attribution solely based on workbench clamp marks left on sculptures. The registration of the marks needs to be accurate and consistent, and directly carried out on the sculpture itself rather than on photographs. Registration may prove difficult initially, thus return viewings are required. Even so it may be difficult to draw the right conclusions!

Endnotes
1. Art historical research was carried out by Peter te Poel, (former) curator at the BonnefantenMuseum, and material-technical research by Arnold Truyen, Head of Sculpture Conservation at SRAL.
2. Over 70 sculptures were studied in the Jan van Steffeswert research project. The twelve signed sculptures that form the core of this study are listed in Table 1, Appendix I. Details of other sculptures mentioned in this paper are also given.

References
Poel, P. te. (ed) 2000. Op de drempel van een nieuwe tijd De maastrichtse beeldsnijder Jan van Steffeswert voor 1470 na 1525 Bonnefantenmuseum Maastricht
## Appendix I

### Table 1. Details of the main sculptures studied for the 2000/2001 Jan van Steffeswert exhibition at the Bonnefanten Museum, Maastricht

<table>
<thead>
<tr>
<th>Sculpture</th>
<th>Place</th>
<th>Size (h x w x d)</th>
<th>Wood Type</th>
<th>Signed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marianum</td>
<td>Aachen Cathedral, Aachen</td>
<td>168.5 x 69.0 x 32.8 cm</td>
<td>Oak wood</td>
<td>Signed IAN BIELDESNIIDER and dated 1524</td>
</tr>
<tr>
<td>Virgin Mary and Child</td>
<td>St. Mary’s College, Oscott, Birmingham</td>
<td>38.8 x 19.5 x 11.7 cm</td>
<td>Boxwood</td>
<td>Signed IAN VAN WEERD</td>
</tr>
<tr>
<td>Saint Catherine</td>
<td>British Museum (inv. WB260)</td>
<td>92.5 x 32.5 x 25.0 cm</td>
<td>Walnut</td>
<td></td>
</tr>
<tr>
<td>Female Saint</td>
<td>Museum of Western and Oriental Art, Kiev</td>
<td>82.3 x 31.7 x 25.5 cm</td>
<td>Walnut</td>
<td></td>
</tr>
<tr>
<td>Female Saint</td>
<td>Metropolitan Museum of Art, New York</td>
<td>82.5 x 21.5 x 25.7 cm</td>
<td>Oak wood</td>
<td></td>
</tr>
<tr>
<td>St. Odile (?)</td>
<td>Royal Museums for Art and History in Brussels (inv. 8680)</td>
<td>94.5 x 32.5 x 33.1 cm</td>
<td>Walnut</td>
<td>IAN VA(N) WEERD, mastermark and dated 1509</td>
</tr>
<tr>
<td>Saint Crispin and its pendant Crispinianus</td>
<td>Sint-Petruskerk, Maastricht and Sint-Martinuskerk in Gronsveld</td>
<td>Walnut</td>
<td>IAN and mastermark</td>
<td></td>
</tr>
<tr>
<td>Sitting Bishop</td>
<td>BonnefantenMuseum (inv. 138)</td>
<td>86.1 x 43.3 x 27.3 cm</td>
<td>Walnut</td>
<td>IAN and mastermark</td>
</tr>
<tr>
<td>Virgin and Child with St. Anne (Anna-te-Drien)</td>
<td>BonnefantenMuseum (inv. 3958)</td>
<td>44.2 x 27.8 x 18.8 cm</td>
<td>Walnut</td>
<td>A 1500</td>
</tr>
<tr>
<td>Female saint</td>
<td>BonnefantenMuseum (inv. 752 BM)</td>
<td>84.3 x 37.2 x 26.2 cm</td>
<td>Oak wood</td>
<td>IAN mark 1501</td>
</tr>
<tr>
<td>St. Hubertus</td>
<td>Domein Bokrijk Belgium</td>
<td>88.5 x 60.3 x 60.8 cm</td>
<td>Lime wood</td>
<td>IAN mastermark 1510</td>
</tr>
<tr>
<td>Virgin Mary and Child</td>
<td>Bonnefantenmuseum</td>
<td>30.0 x 15.0 x 13.8 cm</td>
<td>Walnut</td>
<td>IAN 151(1)</td>
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<td>Virgin Mary and Child</td>
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<td>IAN VAN STEFFESWERT mastermark and 1513</td>
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<tr>
<td>St. Joseph with Child</td>
<td>St. Nicolaaschurch Heythuysen</td>
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### Additional Sculptures

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<td>85.8 x 36.5 x 21.6 cm</td>
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<tr>
<td>Mary Magdalene</td>
<td>Church of St. Matthew, Maastricht</td>
<td>140.4 x 51.3 x 34.0 cm</td>
<td>Oak wood</td>
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<tr>
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<td>BonnefantenMuseum</td>
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<tr>
<td>Johannotchotel</td>
<td>Liege Musée de la Vie Wallonne</td>
<td>46.5 x 17.2 cm</td>
<td>Walnut (?)</td>
<td>IAN BIELDESNIieder VAN WEERD mastermark and 1508</td>
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<tr>
<td>St. Amelberga</td>
<td>St. Amelbergachurch Susteren</td>
<td>51.5 x 45.5 x 22.0 cm</td>
<td>Walnut</td>
<td>IAN(AN) V(AN) (STEF)?E(NS)W(ERTH)?</td>
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</tbody>
</table>

Please use the following when citing this paper:

The artisan carver's materials and practices: studying 13th and 14th century Mosan sculptures

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Abstract

The paper presents technical information regarding carving practices retrieved from a large corpus of 13th and 14th century wooden sculptures from the Meuse region. Prior to the 13th century artisan carvers used wood from various species. This changed to an almost exclusive use of locally sourced oak at the start of the 13th century. A century later artisan carvers were using fast growing oak over wood of a slow and regular growth. Why these changes took place will be discussed. The second part of the paper focuses on the construction of the wooden sculptures. Studying the corpus, it is clear that the position of the heart of the trunk and the marks relating to tools, such as drill holes, follow no regular rules. Further, extremities and draperies are often constructed from additional pieces of wood, contrary to the regulations set out in the Livre des Métiers d'Etienne Boileau. Surprisingly, sculptures considered as masterpieces also show these exceptions to the rules. Moreover, the manner in which the reverse of the sculpture was hollowed-out may improve understanding of the original presentation and setting of the sculptures in churches. Another interesting point investigated is the evolution towards a smaller cavity in the reverse of sculptures as the artisan carvers began to carve in the round. Finally, questions of attribution to Mosan production and more specifically to anonymous workshops are considered.

Keywords: Technical study; wooden sculptures; 13th and 14th century; Meuse valley; oak wood; carving process; attribution; drill holes; joinery; hollowed-out reverse; tool marks.

Introduction

A large corpus of 13th and 14th century wooden sculptures from the Meuse region are still in existence today. The sculptures mentioned in this paper are listed in Table 1 (Appendix I). This list is not exhaustive but represents the best-known examples. Although these are well documented by art historians, attribution to a particular artist is lacking for these sculptures. Further, not one single sculpture can be dated precisely by either an inscription or matched to archival documents. Nevertheless, on the basis of a stylistic study, a relative chronology has been established, and groups of sculptures have been attributed to anonymous workshops. Alias names have been proposed by Robert Didier such as ‘Maître des Chréts Huy-Wasseige’, ‘Maître des Madones Souriantes de Liège’, or ‘Maître de la Vierge de La Gleize’. [Didier 1973, 1993a, 1993b] In recent years, dendrochronological analysis has been carried out on 10 Mosan sculptures, yielding results that match the relative chronology proposed by art historians. This paper presents some technical observations regarding the material and construction of 85 wooden sculptures. These were collected during investigations performed at the Royal Institute for Cultural Heritage (KIK-IRPA) for a PhD thesis presented by the author at the University of Liège in 2008. [Mercier 2008]

The 13th century was a period of great transformation in the figurative development of Gothic art. This period saw hieratic and frontal Sedes Sapientiae rise and become smiling and standing Virgins. It is therefore interesting to note whether the choice of material and construction of these sculptures evolves as the resulting sculptures become figures in the round. Technical information can complement and complete stylistic analysis; thus, the determination of materials or practices to either the Mosan production in general or to anonymous workshops is pertinent. This research focuses on this aspect [1].

The material: tree species, origin of the oak, and quality of the oak

Identification of the wood used by the carvers

During the Romanesque period, artisan carvers in the Mosan area used a large variety of local species of wood such as lime wood, alder, willow and aspen. While carpenters in the Meuse valley used oak systematically and in large amounts in the 12th century [Houbrechts 2002, Houbrechts 2008], it is only in
the 13th century that oak became the predominant species of wood used by carvers. Indeed, of 85 sculptures studied, 68 are carved out of oak, and only 17 out of other species. But analysing this data can lead to further conclusions. Firstly, following the Romanesque tradition, some high quality sculptures, dating around 1200-1230, are carved in other species such as lime wood [2], aspen [3] and apple wood [4]. Secondly, from the second quarter of the 13th century onwards, sculptures of high quality were all carved in oak [5]. Lastly, in the second half of the 13th century, other species of wood were sometimes used but only for sculptures of lesser quality [6].

This transition of usage by artisan carvers from many species of wood to oak in the first half of the 13th century is also documented in Scandinavian countries, as well as in the Rhineland. [Tängeberg 1986, Neyses 1989, Kollandsrud 2002] Why did artisan carvers begin to use a harder wood for carving? Why did this change happen at this time, when carvers were starting to create sculptures with more depth and with more complex draperies? Might this transition be related to an evolution in the quality of the iron used to make carver’s tools? Or did the carvers suddenly become concerned with the durability of their works and hence preferred a wood species that is less prone to insect attack? Could this change be due to an increased availability of oak? Could looking at the geographical origin of oak wood in this period help answer these questions?

The origin of the wood

Dendrochronological analysis, carried out by Pascale Fraiture at KIK-IRPA, yielded important information about the geographical origin of oak. The wood used to carve the three sculptures in the St. John the Evangelist Church in Liège is of regional origin, most probably from Liège [7]. [Fraiture 2000] The use of oak may be linked to the organisation of the wood trade. The first wood merchants in Liège, the marniers, are attested in the 13th century but this does not mean that the trade was not organised before then. [Hoffsummer 1995] The exportation of oak from the Meuse valley to Flanders in the 13th century is further confirmed by dendrochronology studies carried out on carved wooden artefacts. [Houbrechts 2008]

The quality of the wood

Oak used during the 13th century was of a slow and regular growth: it is uniform in structure, and without knots and irregularities, consisting of small and regular year-rings. In this respect, the small Christ in Majesty from Rausa, a masterpiece of Mosan sculpture, is an exception. Here the lesser quality of the wood, which contains nine large knots, is striking and has led to the formation of deep cracks in the wood block. Some of the wooden splints inserted into these cracks are original. These are carved and covered with the oldest polychromy. This suggests that the block had already cracked before or during execution and that the carver was aware of shrinkage problems. The large and wide vertical crack in the right side of Christ’s face, which formed later, may suggest that the wood was not completely dry when the figure was carved. It would seem that carving in fresh wood was quite unusual in this period. Archival sources document that Jourdain de Liège, both a goldsmith and a wood carver, asked for old (annosum) and compact (c Macrocarpa) wood. [Kupper et al. 2000]

Christ in Majesty from Rausa was attributed to the same workshop referred to as the workshop of the ‘Maître des Christs d’Hay-Wassegue’. [Didier 1973] It is interesting to note that the Crucifix from Hay, belonging to the same group, also presents cracks and knots [8]. The question arises as to why such an important Master would have chosen such a poor quality of wood. However, these unusual practices may possibly be considered as characteristic to this workshop.

Contrary to 13th century sculptures, which are made of good oak, many of the early 14th century sculptures studied were carved from bad quality oak. Many of these sculptures show cracks and deformations in the wooden support that developed over time. The masterpieces of high quality, attributed or linked to the so-called ‘Maître de la Vierge de La Gleize’, belong to this group of sculptures [9]. [Didier 1993a] It is possible that carvers could no longer find good local oak easily in this period of civil war and famine in the Meuse valley. This transition of using lesser quality fast growing oak is also observed in the field of carpentry in the north of Belgium and, in some cases, in the Mosan area. Further study of forest management in the medieval period might reveal more information in this respect. It is also important that climatic conditions are taken into account. Fast growing oak is far more responsive to changes in relative humidity. Damages relating to this characteristic of the wood can be identified, but the construction process itself may also be the cause of cracks and deformations in many 14th century Mosan sculptures.
Carving wooden sculptures: the construction process

Position of the sculpture in the trunk:

Usually, the heart of the trunk is located more or less with the central axis of the sculpture. Often the heart is positioned slightly towards the reverse, so that this portion of the trunk is removed when the sculpture is hollowed-out. This practise reduced the weight of the sculpture but more importantly reduced the tendency of the wooden support to crack or fracture. However, this precaution is not always practiced, and in a few examples dating from the first half of the 13th century, the heart is located towards the front side of the sculpture, leading to the formation of deep cracks and subsequently a loss of material[10]. This is also the case with two sculptures dating from end of the 13th century attributed to the so-called ‘Maître des Madones Souriantes de Liège’ or to his studio workshop[11]. [Didier 1993b]

Drill holes

Many sculptures show traces of the drill holes in the head and/or bottom of the sculpture[12]. These holes result from pins or screws that served to fix the block of wood in the carving bench during the carving process. In the Sedes Sapientiae of St. John the Evangelist Church, Liège the hole in the Virgin’s head has a diameter of 4 cm and is filled with a piece of wood. The hole was drilled to reach the cavity in the back of the sculpture. As the figure of the Christ child was carved separately, a hole exists in his head as well as in his right foot. No traces of a common alternate clamping system using forked hooks (bench dogs) to fix the wood block in the workbench have been noted on any of the sculptures studied, not even on the smaller ones. Sometimes there is no hole at all[13]. In some cases, the carver would fill the hole with a plug of similar wood paring off the top of the plug flush with the surrounding wood. This practise can be identified in the Christ in Majesty from Rausa and in two sculptures from Herve[14].

In some cases relics have been found in the cavity, sealed in place before the polychromy was added. Relics have been documented in the Virgin from Hove in Norway and in the Virgin from Ittre in Belgium. [Liepe2014, Lefftz 2005] Tomographic examination of this latter sculpture identified the presence of a small object of different density inside the head cavity; this drill hole is closed off with a piece of wood[15]. [Lefftz 2005]

Gouge and Chisel Marks

The soft modelling of sculptures from the Meuse valley show no traces of the tools used to carve the forms. The surface is usually meticulously carved and has a smooth finish. However, this quality of carving cannot be used as an exclusive criteria for identifying Mosan production as tool marks can be identified on some early 13th century sculptures from this region. Traces left by a curved gouge and chisels are indeed visible in a number of works, including the Sedes Sapientiae, the St. John from the Church in Hollogne-sur-Geer, both now in collection of the Catherijneconvent Museum, as well as the Sedes from St. Paul’s Cathedral in Liège[16]. It is clear that the tool marks left on these sculptures form part of the decorative image and were not meant to be completely obscured by polychromy. The deep gouges in the wood convey a certain rhythm to the draperies, forms comparable to works by Mosan goldsmiths such as Hugo d’Oignies.

When the reverse of sculptures is hollowed-out, the opening of the cavity is roughed out with the help of a gouge with curved edges, with a chisel or with both. The traces are usually around 2.5 cm long. The tool traces run parallel and never cross. Usually, the cavity is very carefully executed leaving a thin shell of wood. In the case of the St. John from Huy, the tomographic examination made it possible to observe that the wooden shell is locally no more than 0.5 cm thick (Figure 1)[17]. [Mercier 2006-2007] Such a practice would explain the holes found on several sculptures, when carvers accidentally penetrated the thin shell with their tools.

The joinery

In the first decades of the 13th century, the wooden block still influences the shape of the sculptures. Mostly they were entirely carved from a single piece of wood[18]. The Livre des Métiers d’Etienn Boileau was published around 1268 in Paris. This text gives instructions stipulating that no carver should make a figure that is not carved from a single piece of wood, except for crowns and crucifixes. [Lespinasse and Bonnardot 1879] Apart from crucifixes, which are traditionally composed of three parts[19], Mosan sculptures do not exactly follow the guild regulations found in Paris. Indeed, in the 13th century, sculptures
were progressively less dependent of the shape and size of the wooden block. Many consist of additional sections, usually attached to the main body with wooden pegs. In the case of sitting figures, right forearms or right hands were usually made of separate pieces.

What is more amazing to observe is the construction of draperies. Here, additional of pieces of wood are also attached to the central block even in sculptures of high quality. In the Crucifix from Serinchamps, dated around 1220, a large piece of drapery that hung down on the right side of the loincloth is missing [20]. This missing section was originally attached with three wooden pegs (diameter: 2 cm). In the Sedes Sapientiae from St Paul’s Cathedral, Liège the sleeves of the mantel were attached to each part of the main block using wooden pegs (1.5 cm in diameter) [21]. The Virgin’s left arm and the missing side parts of the throne were attached in the same way (Figure 2). The presence of the original polychromy on the pegs is a proof of the authenticity of the construction. In the Virgin and St. John from a Calvary in the St. John the Evangelist Church, Liège, the hands of the Virgin and parts of the draperies of both sculptures are made of additional pieces of wood secured with wooden pegs [22]. This kind of assemblage of pieces of draperies is also observed on sculptures from the second half of the 13th century and in particular in the group of the ‘Maître des Madones Souriantes de Liège’ [23] (Figure 3). In the case of St. Mark from Herve, dated around 1300-1330, the right hand, as well as the phylactery, is made of an additional section [24]. The presence of the original polychromy here is also a proof of authenticity. Separate pieces of draperies may also have been fixed to the sculpture.

Figure 1. Details of a cross section of the St. John from Musée Communal (tomographic scan): after the hollowing-out of the reverse, the sculpture is no more than 0.5 cm thick in places. ©KIK-IRPA

Figure 2. Virgin from St. Paul’s Cathedral in Liège, ca. 1230. Detail of the additional pieces of wood used to construct the mantel attached to the main block using wooden pegs. ©KIK-IRPA

The practice of adding additional wood pieces to the main block in sculptures of high quality seems to indicate that guild regulations were above all meant to avoid fraud and to protect the customers. Such prohibition reveals practices that were actually current. This is suggested in the Livre des Métiers itself: ‘And this has been established by the master of the guild because one of our members had made figures that were made of many pieces.’ [Blindheim 1952]

The hollowed-out reverse

Typically, Mosan sculptures from the 13th century were hollowed-out from the reverse to avoid shrinkage and cracking in the wooden block. In some sculptures dated from the start of the century, material was removed from two or three areas, including the head section (Figure 4) [25] [Mercier 2006-2007]. Usually these compartments connected with each other internally. The aim of this particular shape of the cavity may be to make the sculptures more stable and solid in order to compensate for the loss of material. This technique is illustrated by several examples in the Romanesque period in Germany, France and Italy [26]. Only a single cavity was made from 1230, and the heads of the Mosan sculpture was left untouched [27].
A wooden board was sometimes attached to the reverse closing off the cavity. The presence of such a wooden board may indicate whether the sculpture was intended to be seen in the round. This may suggest the sculpture’s original placement in the church. When these boards are still preserved, they are often secured with wooden pegs [28] (Figure 5). The St. John and Virgin form a Calvary in the St. John the Evangelist Church, Liège was probably mounted on top of the rood beam in the choir and thus would have been seen in the round. Indeed, these sculptures are carved in the round with boards entirely carved to reproduce the drapery and painted. On St. John figures from other Calvary series, there is no indication that the cavity was ever closed. The edges of the cavity are irregular and neither peg holes nor nail holes are visible [29]. Does this indicate that the sculptures were placed on mural consoles? Another possibility is that they were placed on the rood screen dividing the chancel from the main body of the church, which traditionally included a representation of the Calvary. The majority of the Sedes Sapientiae show no traces of a board or attachment points for a board indicating that none was intended. This suggests that the sculptures were originally placed on an altar, in a niche or inside a tabernacle and not seen in the round. Examples of such tabernacles can be found in Scandinavian countries [30].

The form of the cavity changed as artisan carvers began to conceive sculptures that were intended to be seen in the round. In the second half of the 13th century, the cavity became increasingly more rectangular and narrow in form. The cavity is almost always closed by a wooden board, which is carved and covered with polychromy, as can be seen in Figure 5 [31]. The size of the cavity became smaller as the century progressed and carving in the round developed. By the beginning of the 14th century, the cavity was small and wooden board fully decorated [32]. The two sculptures of the Evangelists St. Luke and St. Mark from Herve have boards that were glued in place rather than being secured with wooden pegs. The joint between the board and the main wooden block is flat and smooth, further it has been covered with strips of canvas before being polychromed (Figure 6). Sculptures that were conceived in the round, from around 1300, had often very little material removed from the reverse. The cavity of the sculpture of St. Bishop from Couvent des Croisiers [33] is very small and located at the centre (Figure 7). The conservation history of this sculpture revealed that cracks appeared as early as the end of the 14th century and were repaired. Stratigraphic investigation of the polychromy dates the earliest intervention to this period. [Mercier 2009] This treatment involved further hollowing-out of the reverse and the resulting cavity was covered with canvas and painted.

By the first half of the 14th century, the reverse of sculptures was no longer systematically hollowed-out. One example is the Virgin, Faimes in the Musée Grand Curtius collection in Liège (Figure 8) [34]. Further examples can be attributed to the workshop of the Maître de la Vierge de La Gleize or to his studio [35]. The advantage of leaving the heart-wood meant that carvers could carve the entire sculpture from one single block of wood. However, as the wooden sculpture aged, the formation of deep cracks and splits could not be prevented.
Conclusion

It seems that studying the evolution of the construction process of 13th and 14th century wooden sculptures from the Mosan region can be used to reveal more interesting data than solely observing the traces left by tools. Studying these works has shown that some practices clearly evolved while for others there seems to be no clear method. Artisan carvers throughout the two centuries did not always follow strict regulations in selecting the quality of wood used to create these sculptures. Nor did they always use a single block to create the figure or position the image so to avoid using heart-wood. These characteristics can be found in sculptures that are considered masterpieces in Mosan production. However, the manner in which the reverse of the sculptures was hollowed-out and the size of the resulting cavity shows a clear development as carvers began to conceive their sculptures in the round.

The systematic study of such a large group of sculptures has also allowed common characteristics from particular anonymous workshops to come to light. Works attributed to the ‘Maître des Christs Huy-Wasseiges’ appear to be carved from oak of lesser quality that was still partially green. Works that are associated with the ‘Maître des Madones Souriantes de Liège’ are carved from a better quality oak and the draperies are typically...
constructed of additional sections. In these sculptures the heart of the trunk is characteristically positioned off-centre and the carving has a smooth finish. Further investigations of other sculptures linked to this group stylistically, such as the Virgin from Alden-Biesen and Hommersum, would add to the accumulated knowledge of this workshop. A third group of sculptures, attributed to the ‘Maître de la Vierge de La Gleize’, can also be linked due to their material and physical characteristics. These sculptures are usually carved from low quality oak and are not hollowed-out at the reverse. The attribution of further sculptures to this group will prove difficult, as these characteristics are common to the general evolution of Mosan production.

This study of 13th and 14th century sculptures from the Mosan region is only the beginning. While investigation of these works has resulting in interesting hypotheses more questions remain unanswered. The study has shown there was a clear transition by artisan carvers from using wood sourced from various tree species in the Romanesque period to using high quality oak almost exclusively in the 13th century to using lower quality oak by the start of the 14th century. Why this came about requires further interdisciplinary research.

Endnotes

1. All sculptures consulted in this research are listed in Table 1 (Appendix I). The KIK-IRPA reference number refers to entries online KIK-IRPA photo library http://www.kikirpa.be (accessed 5/08/13). If no KIK-IRPA number is given then the sculpture is not included in the photo library.

2. Crucifix, St. Denis’ Church, Forest.

3. St. Elis in Majesty, Havenne: collection MPAAN.

4. St. Evève, St. James Church, Schurhoven: collection MRAH.

5. Sedes Sapientiae and group of Virgin and St. John, St. John the Evangelist Church, Liège; Crucifix so-called Beau Dieu d’Hay: collection Musée Communal; Christ in Majesty, Rausa: collection Musée Grand Curtius.

6. Sedes Sapientiae, Eprave: collection Cercle Culturel et Historique, Rochefort; St. Laurent, Havenne: collection MPAAN.

7. Sedes Sapientiae, Virgin and St. John, St. John the Evangelist Church, Liège. Other examples of the use of local oak: St. John: collection Musée Communal; Virgin, Geer: collection Musée Grand Curtius.


9. Virgin, Assumption of the Virgin Church, La Gleize; St. John, Fexhe-le-haut-Clocher and St. Pope: both collection Musée Grand Curtius.


11. Virgin: collection MRAH; Virgin, Béguinage Church, Sint-Truiden.

12. Sedes Sapientiae, Carmelite Church, Vilvoorde has drill holes in both the head and at the bottom of the sculpture.

13. Sedes Sapientiae: collection MRAH; Sedes Sapientiae, St. Leonardus Church, Zoutleeuw.


15. Sedes Sapientiae, St. Remi Church, Ittre.


18. St. John: collection Musée Communal; St. Gertrude, Sint Gertrudis Church, Kuringen; St. Lucy, Bernister: collection Musée Grand Curtius.

19. The main part of the figure comprising of the head and the body are carved from one block. The arms are carved separately. These are fastened to matching holes in the torso using a mortise and tenons construction. This joint construction is commonly used during the 13th and 14th centuries in the north of Europe. Other construction systems are observed in Norway during the same period. [Blindheim 2004].

20. Crucifix, St. Trinity Church, Serinchamps.

22. Virgin and St. John, St. John the Evangelist Church, Liège
23. Virgin: collection MRAH; and Virgin: collection Pirenne.
25. St. John: collection Musée Communal, Huy; St. Lucy, Bernister: collection Musée Grand Curtius; Sedes Sapientiae, Oignies: collection MET; Crucifix, St. Denis’ Church, Forest.
26. St. George Crucifix, dating circa 1070: collection Schnütgenmuseum (inv. A 9); an Italian Volto Santo and a Virgin, Burgund: both collection The Metropolitan Museum, New York (inv. 47.100.54 and inv. 47.101.15).
27. Crucifix, Oreye: collection Musée Grand Curtius; Sedes Sapientiae: collection MRAH.
28. Virgin and St. John, St. John the Evangelist Church, Liège; Virgin, Marche-les-Dames: collection MPAAN; St. John Agnifer, Sambre: collection MPAAN.
30. Virgin, Hove; and Virgin, Dale [Blindheim 2004]
31. Virgin, Marche-les-Dames: collection MPAAN; Virgin, Béguinage Church, Sint-Truiden; St. John Agnifer, Sambre: collection MPAAN.
33. St. Bishop, Croisiers Convent: collection MPAAN.
34. Virgin, Faimes; Virgin, Geer; Virgin, St. John-Baptist’s Church, Liège: all collection Musée Grand Curtius; Virga Jesse, Chapel of Our lady, Hasselt.
35. Virgin, Assumption of the Virgin Church, La Gleize; St. John, Fexhe-le-haut-Clocher and St. Pope: both collection Musée Grand Curtius.

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Please use the following when citing this paper:

## Appendix I

### Table 1: Overview of Mosan Sculptures studied and described in the paper.

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<th>Museum / Collection</th>
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<th>KIK-IRPA Photo Library Reference Number</th>
<th>Characteristic</th>
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<td></td>
<td><em>St. Laurent</em>, Havenne, end of the 13th century, h. 83 cm</td>
<td>KIK-IRPA 10128334</td>
<td>Unspecified wood. Not oak. Lower quality carving</td>
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<tr>
<td></td>
<td><em>Virgin</em>. Geer. Dating around 1330. h. 76 cm</td>
<td>KIK-IRPA 10127886</td>
<td>Oak wood. Local origin. No cavity. Drill hole bottom.</td>
</tr>
<tr>
<td>Object</td>
<td>Location</td>
<td>Date</td>
<td>Height</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>St. John</td>
<td>Fexhe-le-haut-Clocher</td>
<td>1330</td>
<td>86.5 cm</td>
</tr>
<tr>
<td>Virgin</td>
<td>Faimes</td>
<td>1330</td>
<td>116.5 cm</td>
</tr>
<tr>
<td>Virgin</td>
<td>St. John the Baptist’s Church</td>
<td>Liège</td>
<td>1325</td>
</tr>
<tr>
<td>Virgin</td>
<td>Eprave</td>
<td>1250</td>
<td>61 cm</td>
</tr>
<tr>
<td>St. John</td>
<td>Church of Hollogne-sur-Geer</td>
<td>(inv. ABM bh490)</td>
<td>1230</td>
</tr>
<tr>
<td>Location/Temple</td>
<td>Statue/Scene</td>
<td>Date/Height/Timber/Construction/Tool Marks/Heartwood Position</td>
<td>Notes/Additional Details</td>
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<tr>
<td>---------------------------------</td>
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<tr>
<td>Metropolitan Museum (MET). New York</td>
<td>Hollowed-out. Including head.</td>
<td>1220. h. 123 cm</td>
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<td>Churches</td>
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<tr>
<td>St. Denis Church. Forest</td>
<td>Lime wood. Body hollowed-out. Two cavities closed with board.</td>
<td>1160 or 1200. h. 195 cm</td>
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<tr>
<td>Assumption of the Virgin Church. La Gleize</td>
<td>Oak wood. Low quality. High quality carving. Cracks and knots present. No cavity. Workshop of Maître de la Vierge de La Gleize.</td>
<td>1230. h. 103 cm</td>
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<tr>
<td>Carmélite Church. Vilvoorde</td>
<td>Walnut wood. Drill hole top and bottom</td>
<td>1230. h. 58.5 cm</td>
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<tr>
<td>St. Remi Church. Ittre</td>
<td>Oak wood. Body hollowed-out. Single cavity. Drill hole top containing a relic ?</td>
<td>1230-1250. h. 75 cm</td>
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<td>St. Leonardus Church. Zoutleeuw</td>
<td>Oak wood. Good quality. Body hollowed out. Single cavity. No drill hole</td>
<td>1240-1250. h. 84.5 cm</td>
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<td>Chapel of Our Lady</td>
<td>Virgin known as ‘Virga Jesse’</td>
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The technical study of Romanesque and Gothic Sedes Sapientae from the Pyrenees-Orientales (France): a methodological approach.

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Abstract

Over the last few years, the researchers and conservators at the Centre de Conservation-Restauration du Patrimoine (CCRP) in Perpignan, France have studied and treated a number of sculptures from the Pyrenees-Orientales region, representing the Virgin and Child. This initiative is part of a wider research programme, which concluded with an exhibition in September 2011 in Perpignan. This programme considers the cultural and religious aspects as well as historical and technical information. This paper focuses on research carried out as part of a PhD thesis, which formed part of this programme. It concerns principally Romanesque and Gothic Virgins produced between the 12th and the 14th centuries. Past publications dwell on aspects of popular belief, denomination and also devotion. Most authors attribute the Sedes type to the ‘Romanesque tradition’, in which the Virgin is represented sitting on a chair with the Child on her lap. However, some of these Virgins, considered Romanesque, do feature some Gothic characteristics, principally in the folds of the draperies. Many unanswered questions remain regarding the chronology of these sculptures, both in relative and absolute terms. Furthermore, many technical aspects still require investigation. Will further results of the stylistic analysis and technical examination allow for more accurate chronology and allow the Sedes to be dated between the 12th and the 14th centuries? This paper aims to address such issues.

Keywords: Romanesque and Gothic Virgins; Romanesque tradition; technology; style.

Heuristic Approach

Until now, the study of Romanesque Virgins has focused on iconographical descriptions, devotional aspects and myths surrounding the discovery of the sculptures. While the investigation of technical and stylistic characteristics has been mostly overlooked, a few researchers have published technological studies in the 20th century. The typological distinction between the decorative processes used for Romanesque Virgins from Auvergne was established by Louis Brehier in 1943. His work classified these Virgins into three groups: wooden and gilded Virgins, polychromed wooden sculptures and those painted on canvas and marouflaged onto a carved wooden support. [Brehier 1943] Similar classifications are missing for Virgins from the Languedoc-Roussillon region. Brehier’s approach, although archaic, is forward thinking in terms of material consideration. He concludes: ‘First and foremost they are works of piety and, despite being sometimes rather crude in their rustic way, these little monuments do have their charm and their value lies principally in the sincerity and naivety of the art they represent’ [Brehier 1943]. However, the seminal work in this field remains Ilene Forsyth’s ‘The Throne of Wisdom’, published in 1972. [Forsyth 1972] This marks a crucial step in the technical study of these enthroned Virgins.

Historicism played a central role in the writings of 19th and 20th century authors. Nationalism and national identity were dominant hidden themes present in much of the publications from this period. Authors asserted the “national” Catalan identity by referring to a period that was particularly auspicious for Catalonia: the Romanesque age. Serving primarily as a springboard for political projects at the start of the 20th century, this nostalgia for the past lead to renewed interest in Romanesque heritage, primarily monuments, and therefore numerous publications. However, none grant more than a few pages to devotional figurines, and those that do refer to these figures in the context of sculptures adorning monuments. This nationalistic trend should not be forgotten when reviewing such texts.

Moreover, paradoxically the majority of authors considered the Pyrenees as a border, forgetting that French and Spanish Catalonia formed a single territory that was independent of the Kingdoms of France and Spain throughout the Romanesque period. It was not until 1659 and the Treaty of the Pyrenees that Roussillon became French. Sculptures from this region are more often than not grouped according to later geographical regions. This has two consequences for statues representing the Virgin and Child. Firstly, a large number of these sculptures are still today called ‘Romanesque Virgins’ or ‘Virgins in the
Romanesque tradition’ when they actually demonstrate the material and stylistic features of later Gothic art. Secondly, the Languedoc-Roussillon Virgins tend to be associated typologically with French art when they should actually belong to Spanish Catalan art.

Methodological problems in investigating Romanesque sculptures persist, especially with regard to the technical-material characteristics; a fact emphasised by Jean-René Gaborit at the conference ‘Regards sur l’objet roman’. Gaborit notes that ‘considerable literature [is available on the subject] [focused on iconography, designations, provenance, dating] in which the good and bad exist side by side’. [Gaborit 2005] Gaborit goes on to set out a valuable provisional examination form, which ensures that interesting areas for research are not overlooked. This form has been essential for the current research.

When “tradition” means “stylistic evolution” … Romanesque or Gothic Virgin?

The notion of the “Romanesque tradition” is persistent. The classification of sculptures to this group using an early iconic model has been consistent and is clearly apparent when considering the available texts historiographically. In the conclusion of his 1984 work ‘Les Vierges romanes tardives du Roussillon dans l'histoire et dans l'art’, Mathias Delcor writes of 14th century statuary: ‘We are a long way from the French models and, though the dress and folds of the clothing point to the 14th century, the fixed gaze of the Madonna and her rigidity, or in a word the hieratism of the sculpture as a whole continues the old Romanesque local model. Clearly the very nature of these statues, which occupied a place in the cult of ancient Romanesque models that the faithful obviously held so dear, contributed to the survival of this Romanesque art in Roussillon right into the 14th century’. [Delcor 1984] This opinion continued to be expressed by subsequent authors.

Current opinion questions this idea of the “Romanesque tradition”. Why should works made in the 14th century be classed as belonging to the “Romanesque tradition” simply because they depict a seated Virgin with Child? Although there is iconographical continuity, a superficial stylistic analysis shows that these works show characteristics belonging to the later Gothic style. The figures tend to be more realistic, particularly in the drapery which is formed by complex fold patterns. These stylistic innovations, typical of the Gothic style, gradually spread into Catalan territory. Allocating sculptures to the earlier “Romanesque tradition” perhaps persisted in order to convey a greater historical importance to these works, justifying the high level of devotion that they receive. The current research has reviewed the corpus and has suggested new historical allocations.

Presentation of the corpus:

A. Material-technical investigation and analysis

The corpus of works investigated in this research project consisted of 96 sculptures representing the enthroned Virgin and Child from the Pyrenees-Orientales Region. Material-technical research was carried out on twelve sculptures at the Centre de Conservation-Restauration du Patrimoine (CCRP) in Perpignan,
France. Conservation treatment of a number of sculptures was also carried out simultaneously. Features of each of the sculptures are recorded in check-list form. This initiative is part of a wider research programme, which concluded with an exhibition in September 2011 in Perpignan. This research programme considers the cultural and religious aspects as well as historical and technical information.

Overview of material-technical analysis

The wood species used to create the sculptures were identified (B - Laboratory of Tervueren Museum; F - Dtalents Ingénierie at Limoges and F - Art'cane at Vannes) Tomography was used to identify structural aspects (F - University Hospital of Perpignan). The polychromy was studied and the identification both of pigments (FTIR) and medium were carried out (staining tests on cross-section) (F - University of Avignon).

![Image 2: Left to right: the Virgin of Serdinya, Chapel of Marinyans (round 1342, h. 95 cm), the Virgin of Bouleternère (last quarter 13th century, h. 60 cm), the Virgin of Vinça (1250 – 1270, h. 90 cm) and the Virgin of Sahorre (14th century, h. 60 cm). © Hauwermeiren](image)

Support

Nine species of wood were identified in the 96 Virgins studied: poplar, pine, willow, walnut, chestnut, yew, alder, birch and limewood. Wood identification was carried out using samples removed from the base of the sculpture. Confirmation was at times possible using tomographic scans of the sculptures. Figure 3 shows these scans for four sculptures in which poplar, willow, pine and walnut wood was identified.

Typically the main figures are either carved from a single piece of wood or are constructed by joining two sections of wood. Smaller details, such as attributes and hands, are frequently carved separately and joined to the central block. Often the heartwood is included and the reverse of the sculptures is rarely hollowed-out. This led to cracks developing within the support in many Virgins. When the sculptures consist of multiple sections, the wood species used to form various sections can vary. Examples are present were the Virgin and Child figures are carved from different wood species, such as the Virgin of Mosset and the Virgin of Planès (Figure 1, far right). Questions arise when examining these sculptures. Can it be concluded that one figure or the other dates from a later period? Is one figure a replacement? However, even if the wood species is the same for both figures, one figure may be a later addition. Often the heartwood is present in both sections if the two figures are carved from different wood blocks, such as in the Virgin of Odeillo (Figure 1, second left). Smaller additions such as the globe held by the Virgin, when present, are also often carved from the heartwood.

Joinery joints or hand-forged nails are often used to connect the various sections together. Throughout the corpus three types of joints are found: mortise and tenon joints, mortise and tenon joints strengthened by a dowel, and joints made only from a dowel. Other joints may be attached using nails. Unfortunately, many elements held with simple joints, such as the hands, are often lost or replaced. At the current stage in the study it is not possible to use the type of joint as a chronological criterion. Linen or hemp cloth is consistently used to plug gaps at the joints or cover potentially weak points. Regrettably, analysis and treatment reports rarely refer to the nature of fibres or type of canvas. Future documentation of the cloth strips present would perhaps aid the understanding of the material history of the work or allow certain sculptures to be grouped together.
Although most of the sculptures studied are carved from wooden blocks containing the heartwood, it is not possible at present to carry out dendrochronology for a number of reasons. Firstly, reference data for this region is lacking. Secondly, many of the sculptures consist of wooden blocks with fewer yearly growth rings than the minimum required to provide a precise relative chronology (at least 50, better 80 growth rings). Further, many of the wood species identified, such as poplar, consist of mixed growth patterns or contain sapwood [1].

Preparation and Ground layers

The preparation layer for all of the Virgins studied consisted of calcium sulphate (gypsum, CaSO\textsubscript{4}) mixed with a proteinaceous binding agent of animal glue. As expected, this material usage is consistent with the practice in the region in Southern Europe from which the sculptures are sourced. The different application techniques and materials found within the preparation layers are exemplified by the following:

*Virgin of Laroque des Albères*, 14\textsuperscript{th} century (Figure 4, left): Here a sample was removed from the gilded mantel, where silver or tin metal leaf is used. Yellow tinted varnish completes the gilding effect. The preparation consists of three layers. The first contains gypsum (CaSO\textsubscript{4}) mixed in a proteinaceous medium. The second a layer of gypsum (CaSO\textsubscript{4}) mixed in a lipid/proteinaceous medium and lastly, a third layer consisting of an oil medium. It is likely that this layer is the imprimatura applied in a uniform colour directly below the polychromy. *Virgin of Font-Romeu Odeillo*, second half of the 12\textsuperscript{th} – first half 13\textsuperscript{th} century (Figure 1, second right) and *Virgin of Prunet and Belpuig*, 14\textsuperscript{th} century (Figure 4, right): Here samples were removed from the flesh tones. The preparation consists of two layers both containing gypsum (CaSO\textsubscript{4}) and animal glue. The analysis of the ground layer in a further sample removed from the Virgin’s dress revealed a mixture of gypsum (CaSO\textsubscript{4}) and quartz (SiO\textsubscript{2}), and mixtures of clay. The element strontium was also detected. The binding medium was proteinaceous, probably animal glue.

*Virgin of Err*, second half 12\textsuperscript{th} – first half 13\textsuperscript{th} century: Here a sample was removed from the mantle and the flesh tones. Again in both samples the preparation consists of two layers. In the sample removed from the mantle the initial layer is composed of gypsum (CaSO\textsubscript{4}), followed by a second layer of gypsum (CaSO\textsubscript{4}) mixed with calcite (CaCO\textsubscript{3}). In the sample removed from the flesh tones, the first layer is composed of gypsum (CaSO\textsubscript{4}). However the second layer is tinted red. A red iron oxide, hematite (Fe\textsubscript{2}O\textsubscript{3}), added to gypsum (CaSO\textsubscript{4}) was detected.
Unusually, the preparation layers analysed in other sculptures, including Virgin of Bouleternère (Figure 2, second left), Virgin of Perpignan Palais des Rois de Majorque, and Virgin of Catllar show only trace amounts of gypsum (CaSO₄). A further anomaly within the corpus is the Prades Virgin. Here the first preparation layer is made from gypsum (CaSO₄), while a second layer consists of a pattern made in an imprimatura/paint containing lead white pigment (2PbCO₃.Pb(OH)₂).

Polychrony

Pigment analysis of the flesh tones was carried out on six of the twelve sculptures studied. The analysis showed that the flesh tones are all composed differently. The flesh tones are mainly light in colour with a few pink highlights. The presence of pigments such as lead white, cinnabar and red lead does not help to date a sculpture with any precision. [2] Vermilion, however, made from a synthesis of mercury and sulphur (synthetic cinnabar), became more common from the 14th century. The presence of the natural mineral, thus suggests an earlier date.

Pigments used to create the draperies were analysed but not systematically for all of the Virgins studied. The various pigments found were as commonly used in the 12th and 13th centuries, as in the 14th and 15th centuries: these included azurite, natural ultramarine (lapis lazuli), indigo, minium (red lead), cinnabar, madder lake, malachite, and copper resinate. [3] It should be noted that in the 14th century there was a further general trend towards using ‘silvering’ (the use of silver or tin leaf) covered in a yellow varnish to imitate gold embroidered cloth. This silvering is often used in conjunction with edging in black, red and green, used either alone or in various combinations. Given the relatively widespread use of these pigments, it is thus not currently possible to date the works more accurately using pigment analysis. Thus stylistic characteristics need to be used in order to date a sculpture to a more specific time period. Furthermore, it is difficult to draw any further conclusions on the use or distribution of the various pigments without a more systematic methodological approach. Samples should be removed from the same sections of polychromy.

Figure 4. On the left: the Virgin of Laroque des Albères (14th century). On the right: the Virgin of Prunet and Belpuig (14th century). © Hauwermeiren

B. The stylistic analysis

The stylistic analysis of this highly diverse group of works raised many more questions than were answered. Using stylistic characteristics to cluster various sculptures to particular dates proved difficult when regional considerations were taken into account. In particular, the Eastern Pyrenees region is remote and contact with large centres, such as Toulouse and Paris would have been limited. Thus, should sculptures originating from this area be dated earlier because innovative practices arrived here later? However, there were regional centres production, including Cuxa or Ripoll, Saint-Martin du Canigou, and the Seu d’Ugell. How extensive their influence on the general production of Sedes is not clear. The spread of ideas and innovations between regions and centres of production also remains to be clarified. A certain workshop clearly created a particular style and used certain practices. Workshops on the periphery of the region would copy this style or technique. Inevitably the copies would contain inconsistencies when compared to the original style. Further transitions and adaptations would occur in transperiphery workshops, as the style is adapted. Thus, interpretations of original styles or methods became adapted to their own. The notion of centre-periphery-transperiphery was raised by Worth in 2004 and needs to be considered carefully when allocating particular styles to certain workshops. [Wirth 2004] Further
reflections in this line of thought need to include the concept of ‘leader’ works that were created in the main and larger centres of production. Were these venerated and then copied in periphery or transperiphery workshops? Pilgrimage was very important in the Romanesque and later Gothic periods. The Pyrenees-Orientales region lies on the pilgrimage routes towards Camostella and Saint Jacques. Artists and craftsmen moved along these works were work could be found decorating the churches and chapels along the waypoints. The movements of ideas and innovations in style would also logically follow as artisans moved between centres of production. Parallels to the production of Virgins resulting from centres in Spanish Catalonia should not be forgotten.

**Conclusion**

In conclusion, this research programme initiated by researchers and conservators at the Centre de Conservation-Restauration du Patrimoine (CCRP) in Perpignan, France encompassed a comprehensive stylistic study of a large corpus comprising ninety-six seated, enthroned Virgin and Childs from the Pyrenees-Orientales region representing the Virgin and Child. Within this project, the materials and construction techniques of twelve sculptures were investigated, resulting in an increased understanding of the historical and production of these sculptures.

The research carried out by the author has lead to the attribution of a further three sculptures to this group of Virgins mentioned above, although the allocation of a date cannot yet be considered. These three sculptures, *Virgin of Thuir*, *Virgin of Baillestavy* and *Virgin of Espira de Conflent* can now be added to the production of Virgins in the Easter Pyrenees region (Figure 5). However, the style of these three works shows some clearly differences from the other Virgins discussed within this paper. In fact, stylistic analysis undoubtedly shows influence of Virgins deriving from Northern Europe, for example the *Virgin of Espira de Conflent* can be linked to Virgins of this same period in Sweden (Viklau) and has similarities with the *Virgin of Gorsem* in Belgium as well as the *Virgin of Thuir*.

Therein lies one of the problems of analysing and studying a corpus of works that seems varied. The task therefore must be twofold: a technical analysis using a system that is suitable for recurring features and a stylistic analysis following a precise methodology, such as studying the fold formation, or the anatomical structure.

**Endnotes**

1. The rings were counted on sculptures carved from poplar. Given that this species does not display homogenous growth (depending on sun and climate conditions), the wood can sometimes develop two growth rings rather than one per season. Thus it is not possible to make any conclusions as to the minimum age of the trunk.

2. Pigments: lead white (basic lead carbonate, $2\text{PbCO}_3\cdot\text{Pb(OH)}_2$), cinnabar (red mercury (II) sulphide, $\text{HgS}$) and red lead (lead (II,IV) oxide, $\text{Pb}_3\text{O}_4$, or $2\text{PbO}\cdot\text{PbO}_2$).

3. Pigments: azurite (copper carbonate hydroxide mineral, $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$), natural ultramarine or lapis lazuli (lazurite or feldspathoid silicate mineral, $(\text{Na,Ca})_8(\text{AlSiO}_4)_{12}((\text{S,SO}_4,\text{Cl})_1\cdot2)$, indigo (organic dyestuff, genus *Indigofera*), minium (red lead, lead (II,IV) oxide, $\text{Pb}_3\text{O}_4$, or $2\text{PbO}\cdot\text{PbO}_2$), cinnabar (red mercury (II) sulphide, $\text{HgS}$), madder lake...
(organic dyestuff, genus *Rubia tinctorum* or *Rubia cordifolia*), malachite (copper carbonate hydroxide mineral, Cu₂CO₃(OH)₂), and copper resinate (verdigris, basic copper acetate, Cu(C₁₉H₂₉COO)₂).

### References

Brehier L. 1943. *Vierges romanes d’Auvergne*. Le Point, revue artistique et littéraire, XXV.


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Going forensic. Art historical research of Northern late Gothic and Renaissance wooden sculptures based on the in-depth analysis of materials and traces left by the carving process.

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Abstract

Current methodology in studying wooden sculptures is to use an interdisciplinary team of collaborating conservators, curators, art historians and scientists to collect and analyse data. This effective co-operation replaced in the later 20th century an earlier approach implemented by art historians based on connoisseurship. Important new insights and an increase in technical knowledge of both materials and construction techniques is a direct result of this new methodology, replacing persistent ‘romantic’ misinterpretations. One such misconception inferred that the wood grain (and wood species) dictated the artisan carvers’ propensity to carve certain shapes or forms. The suggestion was that northern German artisans created more ‘cubic’ sculptures compared to those formed by their southern compatriots who used softer limewood. Furthermore, the virtuosity of the artist was evaluated according to the quality of wood or to the number of parts attached onto the main wooden block. These premises have been replaced with a better understanding of construction processes, which in turn has led to a clearer picture of artistic practice. To ensure knowledge continues to develop and expand, the collection of fundamental data through detailed investigation is an absolute necessity. In many cases, an exact identification of the wood species can give clues to the region where the sculptures were made. Traces of the carving tools (including saw-dents along the cutting edges), the degree and the shape (wedge-shaped, rectangular, semicircle) of the sculptures’ hollowed-out reverse, holes and marks caused by mandrels, iron forked clamps, and other devices as part of the carving bench have to be accurately measured and documented exactly. A synopsis of the sculptural process can lead to the identification of works by a single master or particular workshop, or at least identify the centres of production or ‘kunstlandschaften’. In order to make the data accessible for all experts involved, these measurements should be published in comprehensive catalogues/corpora similar to those series concerning early Netherlandish, early German or Italian paintings.

Keywords: Carving process; Tool marks; Carving bench; northern German sculptures; Hollowed-out; kunstlandschaften; Gothic and Renaissance sculpture

Introduction

The characteristics and artistic hallmarks of wooden sculptures dating from the Gothic and Renaissance periods are often investigated by studying these objects using the natural sciences and forensic examination methodologies. Clues discovered can serve to develop an artistic-craftsman ‘profile’ and thus to identify an artist, a workshop, a city, a region or a specific artistic centre or ‘kunstlandschaften’. In order to recognise these clues it is essential that collected data, photographs and graphs are comprehensibly published in detail and widely disseminated, in a similar manner to the series of catalogues relating to early German or Netherlandish paintings. This methodology based on physical evidence has replaced the dominant trend of connoisseurship previously practiced by art historians. In this paper the author aims to initiate the collection of data by highlighting both findings revealed and problems confronted by conservators, curators, scientists and art historians studying sculptures from within the late Gothic and Renaissance periods, and in particular from northern Germany.

Wood Species

A first major clue, that may provide crucial geographical information, can be obtained by analysing the wood species used by the sculptor. This can sometimes help connect a specific sculpture with an artistic centre; though in general, conclusions drawn may be overestimated if other technical aspects are not taken into account. For instance, lime wood (Tiliaeae europaea) was used throughout a wide geographical region spanning from Northern Germany to South Tyrol, from the Mosan region (Maastricht, Master Jan van Steffeswert) to Poland. Thus, concluding that a sculpture originates from a certain artistic centre based solely on the identification of lime wood as the wood species would be erroneous. However, in some
cases the identification of the wood species may, by a process of elimination, provide clarity to where a sculpture was or was not made, as is demonstrated by the following examples.

The figure of a seated Christ on a Rock was presumed to be carved in a Cologne workshop in the mid 15th century, according to the 2001 catalogue raisonné. [1] In fact, the wood species has subsequently been identified as stone pine (Pinus cembra). This southern European tree grows only in the Alps and in the Carpathian Mountains and has been extensively by artisans in the Tyrol region and in Southern Bavaria. Thus, it is most unlikely that this sculpture originates from the region surrounding Cologne, unless the wood was imported which is again an unlikely scenario.

Another example in which the identification of the wood species led to a re-attribution is the Enthroned Madonna and Child from the Leibieg-Haus Museum in Frankfurt. [2] In 2000 the former director of the museum, Dr. Herbert Beck, purchased this sculpture in Brussels. The artwork was dated on stylistic grounds at that time to the period 1440-1450 and was thought to originate from this city or region. Since then the wood species has been identified as lime wood. This new diagnosis precludes the presumption that the sculpture originates from Flanders. Guild regulations of 1454 prohibited Brussels’ carvers from using lime wood. Instead rules dictated that carvers must choose either walnut or high quality oak. Hence, the origin of this figural group was re-attributed in 2008 to the region of Upper Rhine (Strasburg) and dated from c. 1470.

A third example highlighting this issue is the seated St. Anne with the Virgin and Child belonging to the Rheinisches Landesmuseum in Bonn. [3] The sculpture is constructed from lime wood and should have been made in Brussels in the late 15th century.

Carving Tools

Another difficulty researchers are confronted with is the terminology of carving tools in German-speaking countries. It is, in short, this is non-existent and requires classification. A technical thesaurus is desperately needed. However, finding a consensus will prove difficult due to the scarcity and inconsistency of first hand information. Contemporary descriptions or definitions of terms relating to specific tools are rare in documents from the Middle Ages unto the 19th century. Few have come to light, and those that do, leave much to the imagination. Two such texts are referred to below.

One carving bench and a grindstone are specified in the inventory of Castle Hohbarr near Zabern/Saverne, Alsace of 1528. [Ungerer 1911, 45] These objects are recorded as being in ‘the steward’s room with a bay-window’. However, though mentioning the existence of a wood-working bench, this source does not stipulate what form this bench takes nor which objects were carved upon it. Thus it cannot be concluded whether the bench was used for carving sculptures or things of every-day use, such as clogs or roof shingles.

In 1518 David Frischherz von Schlettstadt stood trial for the murder of the painter journeyman Rudolf von Mastrik (from Maastricht). Documents relating to this trial shed light on the kinds of tools used by a carpentry journeyman. [Rott 1936, 104-105] Von Schlettstadt is recorded in 1517 and 1518 as a journeyman working in a Basel carver’s workshop. During the trial, the Basel law-court confiscated von Schlettstadt’s belongings, amongst which a box containing ‘art’: 21 pieces of ‘verstech zien’. This refers to
chisels/gouges used with a mallet for the initial processing of wooden blocks. These tools would be used for roughly shaping the block and hollowing-out the reverse. The inventory also mentions 11 pieces of ‘schnälysen’, which refers to chisels/gouges used for finishing the carving process. This more refined work would be carried out solely by using hand pressure, rather than mallets. While this document provides the researcher with the names of tools, without contemporary imagery, it is impossible to determine the appearance of these tools.

Paradoxically, further complications arise when contemporary imagery is found. These book illuminations, carvings, paintings and prints require some subjective interpretation before a consensus can be derived and as yet the names of tools still need to be matched with the according image.

Occasionally, actual contemporary tools do surface. Often these are discovered during archaeological excavations or have been maintained within collections. Examples can be found in the Chamber of Art and Curiosities (Kunst- und Wunderkammern) in Castle Ambras near Innsbruck and in the ‘Grünes Gewölbe’ in Dresden. A careful survey of these existing Gothic and Renaissance tools and a matching nomenclature is desired and would benefit the field greatly. Further discoveries have been made during the conservation of artworks. Conservators discovered a mallet and playing cards within the cavity of the horse while treating the St. George on Horseback belonging to the Storekyrkan Collection in Stockholm (Figure 1, left). [4] This find provides a unique glimpse into the life and working practice of the artisans who made this religious sculpture, which was commissioned in 1489. As far as the author is aware, this is the only mallet from the 15th century that is preserved. This find has moreover led to a re-attribution of this sculptural piece. The sculpture was originally ascribed to the famous Lübeck artist Bernt Notke but was reassigned to a carver of Netherlandish origin in 2009 by Mr Peter Tangeberg. However, the found mallet resembles more those used by (northern) German or Swedish wood-workers than Flemish or Netherlandish equivalents (Figure 1, right). It is likely that the sculpture was made in northern Germany/Sweden or by an artisan from this area.

However, the creation of a technical thesaurus for tools is not so straightforward as simply matching imagery or reality to a name of a tool. To further complicate matters the nomenclature of (German) tools used has changed over the centuries. The term ‘Flachseisen’ refers to a kind of straight chisel with a forward-curved edge (like a fingernail) in the first half of the 19th century, but to a gouge with a softly curved sweep at the end of that century. Thus, the terminology enigma continues to elude deciphering.

The wooden block: a single unit or composite?

Misconceptions regarding the carver’s choice of raw material, the wooden block, persist. Even today, many art historians endure the conception that the best quality sculptures are formed from a single wooden block obtained directly from a tree. This hypothesis is incorrect. Many high quality pieces comprise of multiple planks or boards joined together to form a solid block, which is subsequently carved.

One such example is St. Anne, carved in Antwerp, which consists of six wainscot oak-wood boards attached to form a single unity. [5] The internal construction can be determined by carefully studying the bottom of the sculpture (Figure 2). Wainscot-cut boards (known as ‘Wagenschott-Gutholz’ in German) were
the best and most expensive quality of oak available in Europe at that time. These boards were shipped from the Baltic region (i.e. Poland, Lithuania and the Teutonic Order territories) in enormous quantities to the Netherlands, Scotland, England, Northern Germany, Northern France, Spain and Portugal. Consequently, it should by no means be considered a flaw to use these boards to create blocks for carving. Furthermore, additional wooden elements were often added to the main block during the working process. These would consist of forms outside the dimensions of the main block, such as hands, arms, attributes, or even drapery elements. These additions should not be considered in a negative manner and may, in fact, show the virtuosity of a master sculptor. In the case of St. Anne, mentioned above, the added sections include part of the right shoulder, the right part of the waistcloth, the left part of the buttocks, part of the left heel, and two toes of the right foot.

**The wooden block: hollowed-out or not?**

Numerous artisan carvers reduced the internal wooden mass of the sculpture by hollowing-out the internal structure of the wood from the reverse. This reduced not only the weight of the sculpture but also the tendency of the wood to shrink on aging, thus avoiding the formation of cracks within the internal support.

A particular form of hollowing-out developed in Ulm in the 1460s. Local artisans not only removed wood from the main section of the sculpture but also from head region. The reverse of the head is separately hollowed by drilling a small hole, termed ‘woodpecker’s hole’ (‘Spechtlöcher’ in German), and scraping out the excess wood from the interior. A St. George sculpture carved in limewood (tilia sp.) from the workshop of Niklaus Weckmann (1450-1526) is a good example of this technique (Figure 3). [6] Linking this working process to a specific region is a recent discovery, which was made as a result of the detailed research work carried out during the preparation for a major exhibition showcasing this late Gothic sculptor from Ulm held at the Württembergisches Landesmuseum, Stuttgart in 1993. Conservators carrying out the investigation published an image of one observed case of such a woodpecker hole. This exciting new find lead to other conservators and curators reassessing sculptures from the same period and region in other collections. This new data was initially erroneously interpreted as the work of one particular master or journeyman trained in a particular workshop. Reassessing the data, it is now clear that this technique was standard practice within the Swabia, Franconia and Bavaria regions. This technical characteristic has now been identified on works from at least 18 masters. This case emphasises the importance of the dissemination of knowledge throughout the field, which leads to a further understanding of a particular artistic technique and construction process.

**A question of interpretation: carving benches, mandrels, clamps or pins?**

It has long been debated whether late Gothic sculptures were intended to be polychromed or not. A close observation of the base and top of the sculpture may shed more light on this matter. This issue has been

![Figure 3. The ‘Spechtlöcher’ hole in the head of the figure of St. George (left) is clearly visible on the reverse (right).](image-url)
discussed fully by Eike Oellermann. Wooden blocks were held in position during the carving process by metal (or wooden) pins or mandrels inserted into the central wooden block (Figure 4, left). Oellermann plausibly argues that if only one single empty hole resulting from the spindle is present, this could be a reliable indication that the sculpture was never intended to be polychromed. This is because the painter, if intending to decorated the wooden support following on from the carving process, would generally insert a wooden dowel into this hole. This dowel would form a handle, providing grip to rotate and turn the carved wooden support while the sculpture is in the process of being gilded and painted. In some cases, a second hole is drilled adjacent to that used to fix the block in the carving bench (Figure 4, right). This second attachment would provide additional stability during the finishing process, preventing the rotation of the block as pressure is applied during carving. Dowels used in this manner were sawn off flush with the top of the sculpture and often are covered with finishing layers. Thus, the presence of a single hole, combined with a dowel used as a wooden plug, would not fit with the scenario that the sculpture was never intended to be polychromed.

Figure 4. Two South Tyrolean carving benches (carvers’ workshop in St. Ulrich/Grödental). Left: Iron pins were commonly used to fix wooden blocks in the carving bench. Corresponding holes have been found in sculptures. [7] Right: Wooden dowels were inserted into secondary holes used to fix the sculpture in the bench. [8]

Figure 5. X-radiography detail of the head [9] showing the threaded remains of a 16th century screw. Photo courtesy of Elisabeth Taube and Beate Fücker.

Figure 6. Detail of the base [10] showing the hollowed-out section and numerous holes, dents and grooves originating from the carving process.

Those investigating sculptures need to remain open minded as no information can be taken for granted. Unusual and atypical situations often arise which may lead to the reversal of commonly held opinions or understandings. The discovery of a fragmentary metal screw within the head of a 16th century sculpture at the Germanisches Nationalmuseum in Nuremberg by Elisabeth Taube and Beate Fücker is one such case (Figure 5). [9] Previous to this breakthrough finding, the author had believed that the earliest metal screws used to hold wooden blocks in a carving bench dated from, at the earliest, the late 19th century. However, subsequent to the discovery in Nuremberg, traces of threaded indentations must be reassessed and hypotheses reworked. Photographs taken in the 1990s of works originating from the Grödnertal, Gherdëina (in the South Tyrol) have now been re-evaluated by the author. A reconsideration of the indentations in the channel created when a clamping device was inserted, suggests the regular use of metal threaded screws in the pre-industrial period. Presumably these screws would have been hand cut and filed.

A close examination of the base section of many sculptures often reveals numerous dents, holes and grooves, which must originate from the carving process (Figure 6). Interpreting the cause of these damages presents innumerable problems. These tool traces will for the most part derive from pronged or forked instruments used as a counterpart to the above-mentioned mandrel, pin or screw to fix the wooden block in the carving bench. Patterns, groups or pairs of indentations need to be identified as these can be matched to specific tools used within a single workshop. However, to complicate matters, single
holes completely unrelated to other indentations, are also often present. The author has learnt that these may stem from the use of a further clamping implement used to block the rotation of the wooden block during the physical exertions imposed by the sculptor during the carving process.

Tool marks: attribution to workshops or not?

As indicated above, the preparation of sculptural pieces for exhibition often provides the field with new findings. But conclusions should be drawn with caution! An interesting previously undocumented trace of the working process came to light during the preparation for the 2009 exhibition of the Ulm sculptor, Daniel Mauch (1477-1540). The curator Mrs Popp observed circular shaped grooves in the head of a number of sculptures from the Mauch workshop. The discovery of similar singular circular impressions on a pair of kneeling angels, loaned by the Stuttgart auctioneer Nagel for the exhibition, erroneously lead to the attribution of these figures to a master trained in the Mauch-workshop (Figure 7). Further study determined that the angels had been made at least 40 years earlier. In fact they do not have anything to do with Mauch. Interpretations should thus not be made in haste!

![Figure 7. Circular holes exist in the heads of the pair of kneeling angels.](image1)

![Figure 8. Details showing tool marks on four sculptures from the Suermondt-Ludwig-Museum.](image2)

The Suermondt-Ludwig-Museum, Aachen received in 1899 a legacy of four sculptures: a Madonna, St. Jerome, St. Odilia and St. Magdalena. While these sculptures arrived in the museum as a group, they were never considered as such until recently. The Madonna remained relegated to obscurity and was never investigated. St. Jerome, on the other hand, had been until the 1990s erroneously attributed to the Nuremberg region of the Tyrol and Bohemia. St. Odilia was thought to have been carved in a workshop within the Lower Franconia or Swabia region. Finally, St. Magdalena was considered, most astonishingly, to
originate from the Lower Rhine area. All four sculptures were examined in [date] extensively for traces of the carving process by Christiane Campioni during her thesis research as part of her training at the Hochschule Dresden. She has permitted the author to present some of her findings in this paper. Study revealed that all four sculptures were constructed from the same species of wood: limewood (*Tiliaeae europaea*) (Figure 8, left). Furthermore, similar circular impressions of identical diameter were observed in the base of each of the sculptures (Figure 8, upper centre) and wooden dowels, wrapped in linen, sawn-off flush with the surface, are present in each of the heads (Figure 8, lower centre). More conclusively, the reverse of each of the sculptures has been hollowed-out in a homogeneous manner using the same carving tool, a gouge (Figure 8, right). The cutting edge of this tool is flawed due to remnants of silicate within the metal rod, which gave the tool a distinctive and unique profile. This flaw results in jags continually appearing in the cutting edge as the blade becomes blunt with use. In this case the jags present as three raised parallel lines, the traces of which are clearly visible impressed into the wood of all four sculptures. Conclusively, there is now no doubt that the four figures were produced at least by the same workshop if not by the same sculptor.

Endnotes

1. *Christ on a Rock* (in German: Christus in der Rast; in Dutch: Christus op de koude steen), Cologne workshop, mid 15th century, Museum Schruetgen, Cologne.
3. *St. Anne with the Virgin and Child*, Brabant (Brussels?), late 15th century, Rheinisches Landesmuseum, Bonn.
4. St. George on Horseback, Bernt Notke or Netherlands artist, consecrated in 1489, Storekyrkan, Stockholm.
5. *St. Anne with the Virgin and Child*, Antwerp school (marked with city emblem of two hands), c. 1510-1520, private collection.
10. *St. John the Baptist*, Michael Pacher, c. 1471-1481, St. Wolfgang am Abersee, Austria.
13. *Madonna and Child*, St. Jerome, St. Odilia and St. Magdalena, Jörg Stein (active in Ulm), c. 1470, Suermondt-Ludwig-Museum Aachen (formerly located in Nuremberg, the Tyrol and Bohemia).

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Wood Crucifixes in Late 15th century Florence – Innovations in Construction Techniques. First Results from a Research in Progress.

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Abstract

The construction techniques of late 15th century wooden crucifixes has been investigated at the Opificio delle Pietre Dure (OPD) in Florence by the author throughout the last few years. The research carried out included a direct survey, based on graphic mapping, photography and X-radiography, of a number of sculptures. To illustrate the preliminary results of this research, the constructions of four out of a group of six examined crucifixes are described in detail and in the conclusions the examination of all the six crucifixes is interpreted. All the examined sculptures are based on different types of assembled block constructions and to understand these it was crucial to combine the observation of traces on the surface with the reading of X-radiographs. The intention of the article is to illustrate both, typical construction techniques of late 15th century crucifixes in Florence and the methodology that was used to discover these.

Keywords: Crucifix, Wood, Construction, Florence, 15th century, X-radiography

Introduction

Wood as a construction material for sculptures presented a serious, technical challenge to carvers, especially if they had to create life size figures. Tree trunks are limited in size and in shape and it could be a challenge to find a suitable trunk from which to carve a whole statue. More importantly, when tree trunks dry, they crack because shrinkage is faster and stronger near the surface of the trunk than internally.

In central medieval Italy, sculptors used tree trunks to carve life-size figures in two different ways. Sometimes they kept the sculpted figure solid, for which they needed a dried trunk. In these cases, they would usually have to deal with radial cracks caused by shrinkage and to find ways to repair them. [1] [Bagnoli 1987, 35; Stiberc 2005, 307] But it can take decades for a tree trunk to dry out evenly. Usual timber commerce practice was for tree trunks to be cut into planks to avoid cracking and to accelerate the drying process. Presumably, whole dried tree trunks were rarely available and it is not surprising therefore that fresh wood or even partially-dried trunks were more frequently used, requiring sculptures to be hollowed out after being roughly shaped. In this case, the wooden shell presented a structure comparable to a “curved plank” and therefore did not crack or split in suitable dry conditions. Therefore, it is all the more surprising that Florentine life-size wooden sculptures from the early Renaissance were generally made from whole trunks and were not hollowed-out. In particular, crucifixes, the largest group of preserved Florentine wooden sculptures from this period, consist of single blocks of wood.

It is possible that the iconography of the nude figure contributed in making the hollowing-out approach unattractive to artists like Donatello, Filippo Brunelleschi, Michelozzo or Luca della Robbia. Moreover, these artists did not rely on a specific workshop tradition when making wooden sculptures. They were increasingly interested in three-dimensional representation that included the figure in the round.

Studying the crucifixes that were carved by the following generation of Florentine sculptors (between 1480 and 1530), the tendency towards detailed anatomical reproduction of the naked body becomes even more evident. Around this time demand for wooden crucifixes must have been intense, due to the strong influence of the Dominican Girolamo Savonarola, for whom true faith could be achieved only through the contemplation of the crucified Christ. Several workshops specialising in the production of wooden crucifixes were active in Florence at this time. [Negrelli 2001] [2] Among the most prolific were those of Benedetto da Maiano, of Giuliano and Antonio da Sangallo and of Baccio da Montelupo, and as far as I could discover, examining crucifixes of the Sangallo and Baccio da Montelupo, these artists introduced a range of new techniques based on the construction of a block assembled from separate pieces of wood. What exactly drove these technical innovations is not known. Were these innovations motivated by pure technical considerations? or were they the result of changes in the supply and availability of wood? From a
technical point of view, these assembled block constructions represent a radical new solution for the problems that stem from the drying and cracking of the tree trunk. It was certainly easier to get hold of dry planks - or even bigger sections of wood - than of an entire dry trunk, and joining them together to form a block made it possible to reach any volume of wood that might be needed.

The research project

Our research project focused on a group of sculptures by the aforementioned artists active in the decades around 1500. At the date of the presentation of this paper [2010], I had examined the construction techniques of ten sculptures by the Sangallos, by Baccio da Montelupo and several related sculptures with no confirmed attribution, while the study of Benedetto da Maiano crucifixes was in planning. [Stiberc, 2013] [3] The examination of four of these sculptures is presented in this article and results are compared with further two sculptures. [4] All the sculptures examined to date are based on assembled block construction and the aim of the project was to find out in detail which principles of construction the sculptors were using, and how these block constructions were assembled technically. For all the examined sculptures, X-radiographic analysis was carried out in situ, the sculptures were measured and details relevant to the construction were documented with photographs and graphics. When possible X-radiographs were made frontally and laterally and where feasible covered the entire sculpture. For several reasons, mostly for lack of space, this was not always possible to do so, and compromises were unavoidably made. Furthermore, traditional 30 x 40 cm plates were mostly used, since it is not possible to place a single piece of large film between the figure and the cross. [5] Film plates were assembled in light-proof bags inserted between the cross and the figure of Christ, and then exposed simultaneously. Once developed, the plates were photographed and a single digital image was then created on computer using an image processing program. [Aldrovandi 1999; Aldrovandi and Ciappi 2000]

The actual process of examination was based on a combination of reading these X-radiograph images and observations of construction traces and joints between assemble planks present on the surface of the sculpture. Lastly for each sculpture we considered the following standard questions:

Joints: are the joints limited to a particular section of the sculpture, or do they transverse the entire structure? Do specific joints relate to the assembled block construction, or do they belong to one or more of the additions to the central block?

Structure: is the sculpture solid, or are there any hollow sections in the structure? How many component pieces are there for each section? What size are the component pieces? Are there correlations in measurements among the different sculptures examined? Are there any attachment systems, such as dowels or nails, and if so what function do they serve?

The following crucifixes present typical results within the range of the assembled block constructions which were examined.

Four crucifixes: characteristics construction elements:

1. Giuliano da Sangallo’s Crucifix in SS. Annunziata, Florence (Figure 1)

It is known from documents that, between 1481 and 1483, Giuliano da Sangallo was paid for a crucifix for the main altar of the Florentine Church of SS. Annunziata. [Lisner 1970, 86] This crucifix is now in the second chapel on the right in the same church. Giuliano and his younger brother Antonio are mainly known as architects, but they also ran an important workshop where they carved wooden crucifixes. The figure of the Christ in SS. Annunziata is 168 cm in height and in width. The chest is 32 cm wide and 28 cm deep. This section consists of two elements of 10 and 18 cm in depth. The original loincloth for the crucifix is lost, but it undoubtedly was made of a sized and gessoed linen cloth, as can still be found preserved on many other Florentine Renaissance crucifixes, including those by Antonio da Sangallo in the Artist’s chapel in the Cloisters of SS. Annunziata in San Domenico in Fiesole and in the Church of S. Agostino in Montepulciano.

In the lateral view of the sculpture, it is possible to observe the signs of some joints that indicate which are the main components and to understand the principles of construction. One joint is visible on both
sides of the chest and further down its continuation can be observed on the buttocks and subsequently across the legs (Figure 2). Parallel to this joint line there are further marks across the knees, belonging to a second joint that, in the upper half of the figure, just skims over the chest. It is evident that the sculpture was created from a block that had been constructed from three main parallel planks before carving began. Furthermore, on both sides of the chest one can observe what the carving has retained of two more components attached on each side of the main block.

A joint in the neck and five large nails visible in the X-radiograph show that the head is made from a further piece, nailed to the main wooden block (Figure 3). If the head had been carved from the main block, one half would have been contained in the central piece and the other half in the front section (together with the knees). Although that approach would have been consistent with the layout of the main block, the sculptor preferred to join a separate piece to the main block from which to carve the head. In this way he ensured that a joint did not divide the head, and that Christ’s face was free of any possible resulting disfigurement. A less likely hypothesis, in my opinion, would be that the head was carved separately and then attached to the body.

There is a particular detail in the X-radiograph image that is not easy to interpret. A dark mark crosses the middle of the figure’s chest in a vertical direction. The dark tone may indicate a less radio-opaque material or rather, in this case, less of the same material. The mark runs from the height of the figure’s left buttock up to underneath the neck, becoming increasingly narrower and more irregular. There are two ways to interpret this. One interpretation would be that there is one additional joint and that the main element of the figure’s bust would actually be composed by two sections considering that one of these contains a live edge near the joint, which in the X-radiograph appears as a dark shadow. The other possibility is that this is a radial shrinkage crack on the rear surface of the central piece, which is now invisible from outside as it is covered by the rear section of the block. This rear section, containing the back and buttocks, has been completely carved away in the concave area in between these anatomical parts, unveiling the open crack in the central section. This open section of the crack, between the edges of the back and the buttocks, needed to be filled prior to the application of polychromy, and it is this that is visible in the X-radiograph as a brighter interruption to the dark vertical mark.

So to conclude, it can be assumed that the sculptor has used three or four main sections of dried wood, joining them together to form one block. Either the central element is composed by two sections presenting live edges which were hidden inside the structure or the central element is one only piece which was cracked on one side and was therefore used as the central section, turning its cracked side to the reverse where it could be covered by the rear section. Two further pieces were added to the sides in the upper area of the chest where the arms are placed. Finally, the sculptor avoided carving the head of the figure from the composite main block, adding an extra section from which he carved the head.
2. Antonio da Sangallo’s Crucifix in San Domenico, Fiesole (Figure 4)

The Monastery of San Domenico is situated in Fiesole in the hills near Florence. A Crucifix by Antonio da Sangallo, Giuliano’s younger brother, can be found in the church. There is no document that allows for an exact dating, but it certainly belongs to a later period of Antonio’s work. Margrit Lisner proposed a date towards the end of the second decade of the 16th century. [Lisner 1969; Petrucci 1996; Martini 2003].

The crucifix is 177 cm high and 176 cm wide. The chest section is 28 cm deep, like that of the other Sangallo crucifix mentioned above. Observing the most evident vertical joints on both sides, the construction technique seems basically similar to the crucifix of the SS. Annunziata. A vertical joint divides the chest into a 19 cm thick front section and a 9 cm thick rear section in a ratio close to 2:1 quite similar to the other Sangallo crucifixes.

However, substantial differences to the SS. Annunziata crucifixes are revealed by the frontal X-radiograph image (Figure 5). There is a vertical mark across the middle of the chest, which in my opinion is a joint between the two sections that comprise the front of the sculpture. An absolutely straight edge, clearly planed and not naturally occurring can be seen over the whole length of the mark visible on the X-radiograph. Therefore, I would exclude the possibility that it could be a radial crack on the inner surface of one of the sections, which comprise the chest, as in Giuliano’s SS. Annunziata crucifix (see Figure 2). The darker zone along the mark could be explained by a loose fitting of the joint due to a live edge on the inner side of the sculpture.

There are further joints running perfectly parallel to the central one: two on the left and right area of the chest, which are also visible on the rear surface of the sculpture. This means that the rear portion of the sculpture is composed of three main sections: a larger one in the middle and two smaller ones at the sides. Two more vertical joints are visible in the X-radiograph in the loincloth area towards the knot: a long one starting from the horizontal joint line that starts at the top and runs down through the rest of the sculpture (the X-radiograph does not include the legs) and a short one, belonging to a smaller section next to the knot, that might be a correction by the artist.

It appears that the construction is based on a block composed of two frontal and three rear sections, one of them in turn composed of upper and lower segments (Figure 6), and that these are joined together in steps to avoid aligning the joints and to preserve the stability of the structure.
3. Baccio da Montelupo’s Crucifix in S. Marco, Florence

A contemporary of the Sangallo brothers, the sculptor Baccio da Montelupo carved an “endless number” of life size wood crucifixes, according to Georgio Vasari. [Vasari 1568] In 1496, he sculpted a crucifix for the church of S. Marco that is now preserved in the museum of the monastery nearby. [Spinelli 1996, 90; Lisner 1970, 82-83] The figure measures, from feet to head, 158 cm high and is 160 cm wide. The depth of the chest is 25 cm, which is clearly constructed of two sections measuring 10 and 15 cm in depth.

The crucifix is clearly based on an assembled block construction, yet the X-radiograph reveals a further surprise. The joints can be easily identified on the sculpture’s surface: on both sides of the chest there are the usual joints between the main, front and rear sections. On the front surface a joint line runs vertically from the chest to the left foot. There is no doubt that the figure was carved from a block that had been assembled before the carving began, and surprisingly, the X-radiograph revealed that it had also been hollowed out inside (Figure 7). The X-radiograph not only shows the hollow cavity but also confirms the use of an assembled wooden block. In addition to the joint that is visible on the front surface, the X-radiograph reveals another in the right half of the figure. This joint is presumably not at the front, but in the rear of the structure.

To conclude, four sections are combined to form a solid block. These consist of one large and one small section to the front, and one small and one large section at the reverse (Figure 8). They appear to have been assembled, then subsequently taken apart, hollowed out and finally permanently joined together. But did this happen before or after the figure was carved? I would imagine that it is safer to hollow out the carved figure rather than a block on to which the figure has only been outlined.

It appears that in this sculpture two different principles of crack prevention are combined to create a particularly safe solution: the hollowing-out and the assembled block structure. Perhaps the sculptor was not sufficiently confident that the wood he was using was dry enough to prevent cracking from occurring.

4. Antonfrancesco Bugiardini’s Crucifix in S. Frediano, Florence

The crucifix on the main altar of the Florentine church of S. Frediano in Cestello is traditionally attributed to Baccio da Montelupo and that is the reason why I included it in this part of this research. It has been discovered recently that Antonfrancesco Bugiardini, a long-forgotten sculptor of crucifixes, was paid in 1514 to carve this crucifix. [Lucidi 2010] Stratigraphic study of this sculpture revealed that the original flesh tones were removed and the sculpture repainted with an imitation bronze paint by 1857.

In spite of its completely altered character, the high quality of the crucifix is clearly evident. Moreover, this sculpture shows that high levels of artistic training were by no means limited to the leading contemporary Florentine workshops. A careful study of the X-radiographs, revealed the well-considered construction processes used to create the block from which the figure was carved. In the lateral X-radiograph image, the main joint between the front and rear sections as well as a joint in the head section can be easily...
identified. In the frontal X-radiograph, two dark vertical marks are clearly visible (Figure 9). The smaller of the two can be seen on the right beneath the iron hook (visible as an intense white spot in the centre of the X-radiograph). The larger and longer vertical mark begins further down in the chest section. Clearly these marks are not joints but shrinkage cracks on the inner surface of one or both of the two main sections. These shrinkage cracks had occurred prior to the block assemblage.

This case shows that sculptors in Florence at this time were also using dry but somewhat defective pieces of wood to create a relatively simple block, which in this sculpture is made of two main sections.

Summary and Conclusion

The constructions of six Florentine wooden crucifixes (1481 - 1530), which were examined during this research project, are discussed. Two are creations by Giuliano and Antonio da Sangallo, architects and sculptors with a background in woodworking. One is by Baccio da Montelupo, a prolific sculptor of wooden crucifixes and one is by Antonfrancesco Bugiardini, a sculptor who specialised in carving crucifixes. Conclusions have been drawn using further comparisons with Antonio da Sangallo’s Crucifix in the Cappella degli Artisti in the Cloisters of SS. Annunziata and Baccio da Montelupo’s crucifix in SS. Flora e Lucilla in Arezzo.

The construction technique of all the examined sculptures is based on joining together two or three thick planks or sections to form a main block of appropriate dimensions (depth) for carving a figure in the round. In some cases, the individual sections are in turn composed of more than one piece. In each crucifix examined, an additional wooden section was added to the main block to form the head, and this was usually secured with at least one large nail. It appears that all the sections were joined together to form an assembled block before carving began. Baccio da Montelupo combined the technique of forming a composite block with hollowing-out in his two crucifixes. It remains unclear if this process occurred prior to carving. It is plausible that they were hollowed-out after the sculpture had been roughly shaped. The composite block could be separated into two main sections, that are used to form the chest, and subsequently re-joining them together permanently once the figure was carved.

In most of the sculptures examined, the main vertical sections seem to be simply glued together. However, in two cases, the Crucifixes of San Domenico and S. Frediano, large nails reinforce the main joints. Wooden dowels were used for similar purposes for the San Domenico and the S. Marco Crucifixes. In contrast, the sections from which the heads are carved are always attached to the main block with nails.
This practice can be explained by the intrinsic difficulties of such a joint. The use of a nail can ensure strong pressure while the glue dries.

Comparing the dimensions of the main block also provided insight. The three Sangallo Crucifixes consist of similar sized blocks; respectively the height and lengths of the three figures are 168 x 168 cm, 168 x 165 cm, and 177 x 176 cm. The ratio between the height and width are also similar. Moreover, the depth of the block assembled also matches. Measuring the chest section of each of the sculptures gives a surprising similar result. The three sculptures each have a measurement of 28 cm at this point, although the sections used to form the block differ. All three sculptures are constructed using two main sections: two consists of planks measuring 10 and 18 cm and one 9 and 19 cm respectively, giving a ratio of approximately 1:2. The corresponding sections for the two Baccio da Montelupo Crucifixes found in the Churches of S. Marco and SS. Flore e Lucilla, are slightly narrower. The sculptor here has used a ratio of 2:3 when choosing the thickness of the two sections forming the depth of the figure. The S. Marco sculpture is created from two sections measuring 10 and 15 cm, while the SS. Flora e Lucilla figure is created from two sections measuring 8.5 and 14.5 cm respectively.

In some of the X-radiographs, it is clear that radial cracks had developed during the drying of the wood. Cracked wood sections were assembled with the damage orientated internally so as not to be visible or present on the finished surface. These cracks were not filled or treated prior to assembling the block. The presence of cracks confirm indirectly that dried wood was used for the component sections. After all, a radial shrinkage crack was also a guarantee that the wood was well dried. That damaged and live edged pieces of wood were actually used at all shows how economical the sculptors were when selecting timber. This method allowed these artisans to use defective pieces of wood without risk. It also reveals that the artists trusted the physical stability of their assembled blocks and the construction processes used to create these. And indeed after 500 years not one of these sculptures shows any further cracks or open joints.

End notes:

1. Examples of sculptures in which the shrinkage cracks have been filled prior to the application of polychromy are the annunciation group in S. Chiara della Marca in Castelfiorentino, from about 1380/90, attributed to Mariano d’Agno Romanelli and the crucifix attributed to Michelozzo found in the Florentine church of S. Niccolò.

2. Savonarola pointed out that the crucifix should not be of gold or silver but be realistically painted and stained with blood (“insanguinato”).

3. The study of crucifixes by Benedetto da Maiano is included in a recent publication focusing on the comparison between the techniques of the Maiano, the Sangallo and the Baccio da Montelupo workshops. [Stiberc 2013] For that paper part of the material presented in this paper was used. It was established that for the examined crucifixes by Benedetto a traditional technique was also used which involved a whole trunk subsequently hollowed-out.


5. Large format X-radiographic film is typically used at OPD. This permits the exposure of a single image which requires no stitching. However, logistics dictated that single sheets measuring 30 x 40 cm were used for this project.

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I would like to thank Laura Speranza, Director of the polychrome wood sculpture conservation department and Marco Giatti, Soprintendente of OPD for supporting this research project; Alfredo Aldrovandi, Director of the non destructive analysis and photography department at OPD, and Ottavio Giappi for their support implementing X-radiography of the sculptures; and Micol Gabey for completing most of the graphics. I am also grateful to Magnolia Scudieri, Director of the Museo di S. Marco; padre Gabriele Alessandri, prior of SS. Annunziata; and padre Vincenzo Caprara, prior of S. Domenico di Fiesole for their helpfulness. Last but not least, I would like to thank my friend Luana Mackawa for her corrections and Kate Seymour for her careful editing.
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Please use the following when citing this paper:

Wooden sculptures by the lay brother Cipriano da Cruz (1645/1650-1716): a study of the carving tool marks to determine authorship.

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Abstract

The Benedictine lay brother Cipriano da Cruz (1645/1650-1716) produced a prolific number of wooden artworks between 1665 and 1716. Seventeen life-sized statues carved in the round and hollowed-out on the reverse are discussed in this paper. The way in which the statues were clothed, the shape and depth of the cavity formed in the reverse of the tree trunks, the type of tool marks left on the wood and the joint techniques used to reach the volume demanded by each sculpture were systematically studied to develop criteria which can help determine authorship. The characteristics identified, which are highly coherent and constitute new data, can contribute towards the identification of missing, unaccounted statues and underwrite the attribution of other works, likely conceived by scholars but produced by Cipriano da Cruz, the “image maker”.

Keywords: Carving; Construction Techniques; Polychrome Sculpture; Tool Marks; Cipriano da Cruz.

Introduction

‘As there is no reason for noteworthy fellow to be ‘buried’ into oblivion, I will account for one whose name was Frei Cipriano da Cruz, who passed away in this Tibães monastery’. [Ascensão 1745, fl. 631] With these words, in the chronicle he wrote in 1745, Friar Marcelliano da Ascensão revealed the existence of this individual. Cipriano da Cruz was born in Braga and called Manoel Souza in his ‘worldly life’. He became a lay brother and a sculptor by trade. According to Ascensão, he was well spoken of. Numerous works of his already bore witness to his talent as an ‘accomplished image maker’ by the time he changed his name and became a member of the Benedictine São Martinho Monastery in Tibães, which he entered in 1676 as a lay brother. He remained in his community’s service until his death on the 11th of February in 1716.

Ascensão sought to remind his community of the outstanding works Cipriano da Cruz had done in his day. Even incomplete, the list he provided included: ‘in Coimbra, the images displayed in the church of the College, and the statue of Wisdom at the entrance of the university; in Tibães, the outdoor statues of the façade of the church, the indoor ones depicting the Holy Family, the Assumption of the Virgin, St. Lutgarda, St. Amaro, more St. Gregory and St. Bernard from the main altarpiece and the Visitations in the sacristy, and finally our Patron St. Benedict and St. Scholastic displayed in the stairs in-between the cloisters’. Marcelliano da Ascenção added: ‘For other monasteries, he [Cipriano da Cruz] produced also images’ without mentioning any specifically. [Ascensão 1745, fl. 631v]

In 1968, the art historian Robert Smith sought in his turn to rescue Frei Cipriano da Cruz from oblivion after discovering Marcelliano da Ascensão’s chronicle. [Smith 1968] On the basis of this manuscript and other sources, Smith identified a large number of works, in particular those produced for the São Martinho Monastery in Tibães and the church of Saint Benedict’s College in Coimbra. In these indoor spaces most of the artworks were conceived as pairs to underline the symmetrical mirror-like position of the figures. Smith mentions matching ensembles of a great aesthetic and religious unity. [Smith 1968, Le Gac 2000, Le Gac and Alcoforado 2003, Le Gac 2010] Furthermore, Smith managed to locate the majority of the sculptures, in particular those having been dismantled and moved to other sanctuaries or integrated into the Museu Nacional Machado de Castro collections, in Coimbra (Appendix I: Table 1).

Taking into account the latest research carried out on Manoel Souza/Cipriano da Cruz’ activity, his oeuvre amounts to 45 independent figures, and 7 carved groups, as well as 17 low-reliefs. [Rodrigues 1982, Le Gac 2003a, Le Gac and Alcoforado 2003, Le Gac 2009, Le Gac 2010, Le Gac 2011a, Le Gac 2011b] At least ten of his works listed in the archives have still not been located. Despite the missing pieces, it is possible to affirm that Cipriano da Cruz mastered the three major techniques of sculpture: wood carving,
clay modelling and stone carving. [Le Gac 2003b] These works, with a few exceptions, were life-sized, today considered as monumental pieces by their high placement within the altarpieces and chapels for which they were intended.

Figure 1. St. Catherine (Saint Michael’s Chapel, University of Coimbra): a) reverse; b) gouge marks in the hollowed cavity. © Archives MNMC / A. Le Gac

Figure 2. Annual rings clearly visible in the statues of a) St. Anselm and b) St. Bernard from Coimbra. © Archives MNMC / A. Le Gac

Objectives

None of the identified statues said to have been produced by Cipriano da Cruz bear his signature; an expected situation in a religious context, given this the lay brother’s role consisted in supplying his community and other monasteries’ needs with figures of devotion, without expecting anything in return except salvation.

Although the Cipriano da Cruz’ formal repertoire was compiled in order to facilitate the identification of missing artworks, it proved difficult to establish definitively his style. [Le Gac 2003a, 55-58] Indeed, the diversity of drapery forms observed on several contemporary statues provides evidence that their design results from multiple sources. [Le Gac 2011b] It is likely that scholars (we would say ‘artists’) conceived these designs. These scholars served a spiritual ideal and dedicated themselves to creating designs for education and propaganda purposes. Craftsmen or artisans, such as Cipriano da Cruz, would have produced artworks based on their designs. Da Cruz as a craftsman would be bound by strict rules of his trade. Expert in artisan techniques, the Benedictine lay brother had probably no option but to merely reproduce figures based on drawings and/or three-dimensional reduced scale models, without having a say in the aesthetic aspects. Therefore, the shapes and style that evolved were not of his creation but of either the commissioner’s or the original scholar’s.

Focusing exclusively on the wooden statues, the present research aims to show how the marks left by the sculptor in the raw material, visible in the hidden and polychrome-free areas of the figures, can constitute evidences of their true authorship.

Methodology

The present research relied on tool marks found on the polychrome-free reverse of one statue representing St. Catherine (Figure 1). This sculpture is obviously by Cipriano da Cruz (see below), ergo any tool marks found can be used to understand the manner in which the sculptor handled ‘the chisel and mallet’.

In contrast, the statue depicting St. Benedict, intended for Saint Benedict’s College in Coimbra, shows enough convincing signs of having been produced by another carver. It seemed helpful to examine this sculpture closely to investigate issues of authorship. It seemed also appropriate to confront tangible evidences with the content of the sources found so far to assess the variations resulting from both ‘readings’.
Comparative investigations were possible within the current study for a group of eighteen sculptures usually inaccessible. These artworks were included in an exhibition which permitted close examination of aspects usually not visible. The reverse of the sculptures could be observed in detail and a number of correlating characteristics recorded:

- the wood specie(s) used: identification of wood type, hardness and grain would indicate different carving practices;
- the way in which drapery was defined;
- the shape and depth of the cavity created in reverse by partly hollowing-out the trunk;
- the nature of the tool used for creating the cavity and the type of mark it left on the wood;
- the joint techniques employed to manage the large size of the sculptures.

Results and Discussion

Historical sources

Six existing sources mention Manoel Souza/Cipriano da Cruz’ activity. Studying the data given therein may result in confusion. The documents are quoted here in order of importance:

1. Receipt of 7.200 reais, dated the 28th of July 1691, corresponding to the last payment and completion of a wooden statue depicting St. Catherine Cipriano da Cruz carved for Saint Michael’s Chapel of the University of Coimbra (for the sum of 12.000 reais).

This document is the only one found so far bearing the own monk’s handwriting and signature. [Rodrigues 1982]

2. Payment of 40.000 reais ‘to [Manoel] Souza for the carving of 17 wooden high-reliefs meant for the church upper choir’, recorded in 1667 in a Tibães Monastery account book. [Livro de Obras 1661-1694; Le Gac 2011, 8]

3. Payment of 1.000 reais referring to a purchase of clay in 1676, on the 8th of August, ‘for a statue of St. Benedict to be done by Cipriano da Cruz’. [Livro de Obras 1661-1694; Le Gac 2011, 8]

4. Deed dated the 26th of July 1684, signed by the masters sculptors Domingos Nunes and António Gomes, in which both pledged to carve the main altarpiece of the church of Saint Benedict’s College in Coimbra. [Brandão 1984, 572-578] A clause specifies that ‘Supriano da Cruz (sic) will assist in carving the statues for this altar’ but without clarifying the number of figures to be done or the exact magnitude of this task.

5. Deed dated the 24th of June 1690, signed by the master painter Manoel Ferreira, in which this master pledges to gild the above mentioned main altarpiece in Coimbra. [Brandão 1984, 712-715] This contract mentions that eleven figures will be coated. However, twelve destination positions are clearly described.
The numbers do not correlate, especially if one takes into consideration the statue of *St. Benedict* – omitted in this source – which should have been placed in the central niche of the architecture.

6. A brief description of the church of Saint Benedict’s College in Coimbra, written in 1758 by Father Luís Cardoso. This author mentions thirteen sculptures found within the same sanctuary as the previous source: six from the main altarpiece, including *St. Benedict* statue (Table 1, 6-11); one from a side chapel of the transept; six from the lateral chapels of the nave (Table 1, 12-17). He noted that ‘all these statues were skilfully done by a lay brother’. [Smith 1968, 20] This designation fits Cipriano da Cruz because he was already numbered among the co-workers in the aforementioned contract for the main altarpiece manufacture.

Verification of the artworks can be made by cross-checking the fragmentary information contained in the referred sources with the list of artworks compiled by Ascensão as they somehow complement each other. At least two of the documents attest that the statues held in Saint Benedict’s College in Coimbra are by the same carver. But determining the exact number of sculptures commissioned or found within this space is more difficult to pinpoint. This raises a significant issue of why the polychromy of *St. Benedict* was not considered in 1690 if Cipriano da Cruz had already carved this statue. This aspect will be discussed below.

**Wood specie(s) and specific requirements**

The sculptures are all life-sized, 170 cm high or more. Two are of slightly smaller dimensions: *St. Bernard* (Tibães and Coimbra) and that of *St. Rupert* (Coimbra). These were designed for specific positions and viewpoints. Their size was dictated by the perspective effect desired by the iconography.

Table 1 shows that the selected sculptures are all carved in chestnut wood (*Castanea sativa*). It was one of the most common woods employed in Portugal in the 17th and 18th centuries. [Serck-Dewaide 2004, 122-123] Although chestnut as a hardwood is more difficult to shape, it was highly valued for its resistance to decay, and thus was often used to create indoor statues of durable quality. Its density and open grain was well suited for medium and life-sized figures, without interfering with ‘reading’ fine details. Since the type of wood is the same for all sculptures studied, this parameter was not considered the root cause of any observed difference regarding tool marks documented.

Chestnut trees were selected with trunks corresponding to the size of the intended figure, including the head. Tree ring analysis carried out on *St. Anselm* and *St. Bernard* from Coimbra indicated that the trees were at least 45 and 32 years old respectively at the time of felling (Figures 2a and 2b). It is probable that the sapwood was removed to prevent biological infestation and limit cracking resulting from shrinkage. This would likely correspond to several annual rings (roughly compatible to a decade). No visible difference in colour between heartwood and the sapwood can be distinguished.

Before the general shaping process began, an essential aspect was considered: the head should be carved from the block and not separately, so the sculptor had to deal skilfully with the raw material at his disposal in order to succeed in giving the work its correct proportions from the start of the process.
Hollowing-out

In all the figures carved in the round, the reverse was partly hollowed-out to reduce weight and avoid radial cracks or to prevent existing cracks from spreading. Most of the cavities are between 12 cm and 18 cm wide. These hollows are created in a regular rectangular shape. The top section of the statue remains whole, as is the base which forms a platform on which the figure stands (Figures 1a, 3, 4, 5a-5b).

Some groups of statues do not conform to this norm due to their more complex construction. This is the case of the Pieta (Figure 6) and of St. Michael trampling the devil (Figure 7) from Coimbra. The main tree trunk of the former, containing the seated Virgin, is exceptionally wide, and the shape of the garment determines the cavity dimensions in the trunk used for St. Michael. Only a few other exceptions exist. These are often related to defaults in the grain direction (twisted), seen on the Virgin and St. Joseph in the Holy Family (Tibães). The grain direction obliged the lay brother to hollow-out the trunks at an angle different (Figures 8b-8c).

The narrow openings rarely suggest the actual inner dimensions of the cavities. The internal sections are wider, deeper and hollowed out in a semi-circular manner until the pith of the trunk is removed. The process suggests that Cipriano da Cruz was very well versed in carving and fully understood the long term behaviour of wood. It is clear he efficiently left sufficient material required to form the desired shape and by leaving a narrow external opening inhibited dirt ingress into the hollow.

In addition to the reoccurring shape and depth of the cavities, marks left by the tool(s) used to hollow-out the trunk are distinctive. These tool marks indicate that the same well-sharpened tool was used. Wood was removed, leaving deep depressions, by carving both with the grain (longitudinal section), and across the grain (radial section), but also against the grain (the most difficult to perform in the transversal section). The curved cutting edge of the tool can be used to identify its shape – a gouge of 4 cm width. This was the standard tool for removing excess material (Figures 1b, 2a, 3b, 4c, 6b). From one artwork to another, the unchanged rhythm with which very regular portions of wood were removed, in successive horizontal rows from top to bottom, reveals the extensive knowledge of a man working rapidly and efficiently, with great accuracy and confidence.
Joint techniques

The main trunks were selected according to the height of the figures (Appendix I: Table 1). However, most of the statues requiring sizeable volumes were achieved by adding further pieces of wood, likely cut from the same large tree and, sometimes, from the same trunk (Figures 5a-5d).

Saw marks (from a two-man saw or a two handled saw called ‘whipsaw’), found on St. Ildefonsus for example, suggest that a certain portion of wood was deliberately saved to be employed afterwards, probably for the same statue, to complete the lateral folds of the garment (bearing in fact additional parts) or any other part (Figures 8b-8c).

The large volumes of some of the statues, much in demand for iconographic reasons, were achieved with additional sections of wood sometimes of considerable size. At first sight these seem to be attached to adjacent sections with a butt joint with a long-grain gluing surface. Animal glue was applied while the statues were lying down, as evidenced by the manner in which glue flows, perpendicular to the axis of the trunk (Figure 5c). However, a closer study of the joints show that many of these are mortise and tenon construction, discretely located in each figures and generally hidden under the polychromy applied afterwards. It is probable that this construction was intended to reinforce the gluing. The remarkable state of preservation of the tenons (oval and proportional in size according to the members to be hold together) shows that the assembly was performed by an expert.

While assembly was done under the strictest of rules, the additional sections have very often imperfections, such as knots, twisted grain and irregular cuts (Figure 5d). This deliberate choice by the carver to use these defective parts in hidden areas makes more evident the need to save as much as possible the raw wood, an expensive material as it was demonstrated elsewhere. [Le Gac 2011a]
St. Benedict statue

The statue representing St. Benedict from the main altarpiece of the church of Saint Benedict’s College, to which we attribute another ‘image maker’ despite Ascensão’s [1745] and Cardoso’s affirmations [1758], is particularly helpful in this study to serve as a counter-example (Figures 9a-9b). Indeed, several aspects do not match with those observed on artworks by Cipriano da Cruz:

1. The cavity carved in the reverse of the statue is extraordinary large and conceived as a functional opening to which a plank could be fixed, in such a manner that the whole figure is carved in the round, reverse included;

2. the main tree trunk was partly hollowed-out but the cavity extends unto the base, leaving no wood on the bottom edge of the statue;

3. the sleeves added to complete the habit were hollowed-out as well, which is an exception in the whole corpus studied;

4. the tool marks observed in the inner surface of the cavities are irregular and the gouge and mallet were handled so as to produce depressions distributed in semicircle and diagonal.

5. It is noteworthy that the morphological features characterising the head, hands and hair do not fit with those known as being by the Benedictine lay brother (Figures 10a-10e)

From these observations, it was deduced that this statue, the most important in Saint Benedict’s church in Coimbra, had already been carved and polychromed for the main chapel before the decision was took to construct an altarpiece for the sanctuary. This assumption would also explain why this figure did not need any polychromy in 1690. Documents indicating that it was part of Cipriano da Cruz’ œuvre were written within living memory of da Cruz and base on oral transmission. It is likely that these contain errors.

Polychrome Sculpture: Tool Marks and Construction Techniques
ICOM-CC Interim Meeting, Working Group Sculpture, Polychromy, and Architectural Decoration, Maastricht 24-25 October 2010

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Figure 10. a) St. Benedict, b) St. Anselm and c) St. Amaro’s facial features (Coimbra church). © Archives MNMC / A. Le Gac

Conclusion

The study of the reoccurring tool marks observed on statues said to have been carved by Cipriano da Cruz proved essential for the recognition of his activity. The obtained results, which are highly coherent, and constitute a new data, should contribute towards the identification of missing statues and a more trustworthy attribution of other works likely conceived by scholars but materialised by this lay brother, involved in the final result as “image maker”.

Acknowledgements

The author is grateful to Ana Alcoforado, Director of Museu Nacional Machado de Castro (MNMC), Fernanda Alves and Pedro Ferrão (MNMC), and to Maria João Dias Costa, Coordenator for St. Martin’s Monastery in Tibães. Agnès Le Gac is greatly indebted to Adília Alarcão for her unconditional support and for having provided the utmost conditions for this research.

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ASCENSÃO, Fr. Marceliano de, Chronica de Tibães, 1745, [Manuscript], Arquivo de Singeverga, Singeverga, folios 631-631v.


Please use the following when citing this paper:

## Table 1. Some of the wooden sculptures known to have been carved by Frei Cipriano da Cruz mentioned in this paper.

<table>
<thead>
<tr>
<th>Nº</th>
<th>Title and Description</th>
<th>Commissioner/Sculptor</th>
<th>Dimensions in cm (H x W x D)</th>
<th>Material</th>
<th>Original location of the sculpture</th>
<th>Former locations and/or actual location of the sculpture</th>
</tr>
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<tr>
<td>4</td>
<td>Holy Family Group</td>
<td>General Abbot - Triennial 1683-1686.</td>
<td>178 x 96 x 60 Chestnut wood</td>
<td>General Abbot - Triennial</td>
<td>Church of São Martinho Monastery, Tibães. 2nd Lateral altarpiece on the Epistle side.</td>
<td>In situ.</td>
</tr>
<tr>
<td>No.</td>
<td>Figure</td>
<td>Description</td>
<td>Dimensions</td>
<td>Material</td>
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Posters
The main retablo of the San Francisco Church, Trujillo, Spain: understanding the construction of a Spanish Baroque altarpiece through studying tool marks.

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Introduction
The main retablo of the Iglesia de San Francisco situated in Trujillo, Spain, is one of the most important examples of this kind of altarpiece in the middle west of Spain. The retablo can be classified as a "retablo de cascarón", altarpiece in which the pinnacle has a rounded form. This monumental altarpiece was investigated in situ in order to establish the correct procedure for a future conservation treatment. Some conclusions resulting from this research will be presented in this poster.

During the investigation a number of tool marks were observed on the reverse of the altarpiece. These were studied further to understand the original construction techniques used to assemble the altarpiece. Ten types of marks consisting of both tools marks and inscriptions were discovered on the reverse of the altarpiece and around 15 types of assembly methods where revealed during the study of the entire altarpiece.

Structural Components
Since the end of the 16th century carved altarpieces and wooden ceilings were mounted by "carpinteros de lo blanco" carpenters specialised in the assembly of altarpieces. The entire structure and decorative panels found on the Trujillo retablo are constructed from two types of wood: pinus silvestris for the decorative panels, sculpture and columns, and pinus pinea for the structural elements.

The retablo measures 16 meters in height and is structurally formed from four parts: the basement, the central section, the cornice and the pinnacle. The four levels rise from the ground upwards (which was normal practice for Baroque altarpieces in Spain) and are fixed together with metal nails. The retablo is attached to the wall with single beams. We think that the pieces for the internal structure where quartered in a temporary workshop situated in the church, which was set up in order to provide technical support during the construction of the retablo. The carved panels and the applied decorative elements were probably made in a permanent atelier months before the assembly process.

The principle sculpture of the altarpiece was housed within a central niche. This was originally accessed with wooden stairs, part of the original internal structure, but has been replaced with metal stairs. The individual panels were fixed into the principle framework using a combination of proteinaceous glues, metal staples and nails. The pinnacle is composed of fifty carved panels fixed individually into the wooden framework.

Conclusions
The tool marks discovered were registered and classified with a view to contribute to an inventory of tool marks founded on the reverse of the altarpieces in Spain. Unfortunately, the reverse of the Baroque altarpieces are currently over restored and have in some cases been destroyed. However, the reverse can still offer more information about the construction techniques than the front, which as been finished with a decorative layer.

At the moment in Spain some traditional retablo workshops still exist. A collaboration between conservators and traditional carpenters would be helpful to understand the original Baroque retablo assembly methods.

Please use the following when citing this poster:
The Arenberg Lamentation Disassembled
Yao-Fen You & John C. Steele
Poster Presentation
Detroit Institute of Arts
Email: YYou@dia.org

The Detroit Institute of Arts (DIA) has in its collection the Arenberg Lamentation, a masterpiece of Netherlandish sculpture from the second half of the 15th century (Figure 1). The Lamentation is carved from oak in high relief and dated to 1460 on the basis of style. In its present form, it comprises three blocks of wood of unequal sizes, with the block on the left being the largest and the one on the right, the smallest. The sculptural group is in good condition overall excepting numerous incomplete radial cracks throughout that have resulted in several areas of loss and detachment. The original polychrome surface has been stripped — save for minute traces of white, blue, green and red pigments — but the depth of emotion and mastery of execution remains. The relief was entirely unknown until it surfaced in 1913 in the Arenberg Palace, Brussels.

In the summer of 2009 we had the opportunity to take the Lamentation off view for extended study. Since it was acquired in 1961 and published in 1962, it has not received further scholarly or technical attention. The unexpected discovery of more traces of polychromy than previously identified encouraged us to carry out pigment identification using Raman, XRF, and FTIR analysis. Details of its construction were also of great interest. Remains of cut dowels and empty holes, visible on the surfaces between each section, indicate wooden dowels joined all three blocks at one time, presumably at the time of fabrication. While some joins indicate clear-cut points of detachment and reattachment, a fair number of others used to complete the surface are more challenging to interpret.

This poster will address the material construction of the Arenberg Lamentation, paying close attention to the diversity of joins employed and more broadly, the additive methods of assemblage. It will feature images obtained by x-radiography of each individual block, as well as discuss briefly various tool marks found.

Please use the following when citing this poster:
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

Please use the following when citing this poster:

MOON RING WOOD –
A WOOD DEFECT ON BALTIC WAINSCOT

Examples on Late Gothic Altarpieces in Mecklenburg (Northern Germany)


DEVELOPMENT AND CAUSE

The use of sapwood on Late Gothic works of art is generally noted and given adequate attention in art technological studies. Less well analyzed is a wood defect known as moon ring, which can be mistaken for sapwood on the basis of its optical characteristics. Moon rings may appear on locust, elm, walnut, cherry trees, and are primarily found on oaks. The moon ring is a bright, ring-shaped zone in the heartwood, 1-3 cm in width, which is not synchronous with the annual growth rings. It often runs through the entire trunk, beginning 29 to 50 cm above the roots. The phenomenon is caused by live branches breaking off young trees during a period of severe frost. After the branches break off, the tree is no longer able to compartmentalize. The subsequent incursion of air damages the parenchyma in the sapwood and causes a metabolic disturbance. This primarily hinders two phases of development in the formation of heartwood: tyloses does not take place and either no or only a small amount of phenolic substances are formed. The moon ring thus possesses neither the typical color nor the high natural durability of the oak heartwood. Moon rings are optically very similar to sapwood because of their bright color and, like sapwood, they are subject to attack by insects and fungi because of the absence of tannins.

FINDINGS ON LATE GOTHIC ALTARPIECES

The relevant literature mentions no mention of moon rings on panel paintings or polychrome reliefs, so that a report on recent observations made on three oak altarpieces seems particularly pertinent. These winged altarpieces, all dating from the same period, are in the Mecklenburg village churches of Berlin, Recknitz and Totenwikkel. The dimensions and the good quality of the wood indicate that the boards and planks used on these altarpieces are wainscot, an oak of superior quality and cut imported from the Baltic provinces for fine woodwork. Dendrochronological investigations verify that the oak came from the Baltic, from trees felled around 1500. Although the wood was apparently carefully selected, the altarpieces and/or their sculptures exhibit moon rings. These are visible as bright stripes in radial and tangential cross sections. A significant difficulty in dendrochronological investigations involves differentiating between moon rings and sapwood. The misinterpretation of moon ring wood as sapwood would inevitably lead to significant mistakes in dating.

RATIONALE FOR THE USE OF MOON RING WOOD

There were strict specifications regarding the quality of wainscot from the Baltic provinces. The first known definition of the characteristics of wainscot is in an account book from 1560 by Jakob Stolze, a clerk in the lumber trade. Accordingly, quality wainscot should have dense narrow growth rings, should be cleaved from the center to the bark, should be free of heart center, and should be without branches, cracks or spiral growth. Wainscot was traded in three grades. We do not know, however, whether the wood was allowed to include sapwood (and thus probably also moon ring wood). As far as the author knows moon ring wood is mentioned neither in guild regulations nor in relevant trade documents from that time. Based on wood technology, however, it seems likely that moon ring wood would have been equated with sapwood. There are in fact prohibitions against the use of sapwood, for instance in the Lübeck guild regulations and written documents regarding quality control for lumber are known.

The presence of moon rings and sapwood in many Late Gothic works of art proves that control of the lumber was not always consistent and that the criteria regulating its quality were not always met. The main reason for these discrepancies is that wider boards were available when the sapwood was left. The removal of moon rings would have meant a disproportionately large amount of scrap wood. This defective Baltic oak, however, did not meet the trade quality of wainscot of the highest grade.

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