The Renaissance Workshop

The British Museum
BP Lecture Theatre
10-11 May 2012

CHARISMA

The British Museum

The Renaissance Workshop

Thursday 10th and Friday 11th May 2012
BP Lecture Theatre, The British Museum

CONTENTS

LECTURE AND POSTER LIST

Oral Presentations

Poster Presentations

FOREWORD

Welcome to the British Museum and to this meeting dedicated to *The Renaissance Workshop*, which has been organized as part of the networking activities of the CHARISMA project[1]. The CHARISMA project is funded by the EU Community's FP 7 Research Infrastructures programme (Grant Agreement 228330) and aims to develop and promote best scientific practice for the study of cultural heritage and to disseminate this knowledge. Through project networking activities, opportunities are provided to share and compare the results obtained by the European scientific community, focusing on identified priority areas.

These include approaches to the study of groups of objects from one period, or related by style or technique. Thus the focus of this meeting is on the examination of the making and use of objects at a pivotal moment for European culture – *The Renaissance Workshop*. This subject provides an opportunity to examine the way in which various types of technical evidence can contribute to the understanding of workshop practices and inter-relationships between different artists and artisans: from the role of scientific examination and analysis in determining the nature and use of materials, through detailed examination of tool marks and imperfections, to the material or documentary evidence for practices, economic driving forces and trading of works of art. Each of these themes is explored in more detail in the contributions to this meeting.

A second reason for focusing on *The Renaissance Workshop* was that it is a subject that allows each of the participants in the CHARISMA project to contribute. The consortium comprises laboratories associated with major European museums and galleries together with universities and other research institutions that have particular interest and expertise in the analysis of works of art; each has experience in the examination of objects from the Renaissance. It is hoped that the topic will promote exchange of knowledge and expertise between both members of the CHARISMA consortium and other researchers and in consequence advance research in this area. We are delighted, therefore, to welcome contributions from a large number of other researchers working in the field and hope that this meeting will provide a forum in which to disseminate, share and compare recent research.

This book of abstracts gives summaries of the papers that will be delivered over the next two days and the poster contributions to the conference, providing an overview of the current state of research. To help to achieve the aims of the CHARISMA project and to provide a means to reach the maximum number of the researchers from diverse disciplines who are active in this area, it is planned to publish the proceedings of the meeting. As delegates you will receive a complimentary copy and it is therefore important that we have a contact address for you (and that you keep the organizers informed of any change of address prior to receipt of this publication). It remains only to wish you an enjoyable and informative meeting – both in the sessions and the informal discussions over coffee and tea.

David Saunders, on behalf of the Organizing Committee

BRITISH MUSEUM: ANDREW MEEK; CAROLINE BARRY; CATHERINE HIGGITT; DAVID SAUNDERS; DENISE LING; DUNCAN HOOK; FAYE MILES; JOANNE DYER; LYNNE HARRISON; MAICKEL VAN BELLEGEM; SARAH BARTHOLOMEW; TONY SIMPSON.

NATIONAL GALLERY: MARIKA SPRING.

[1] Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to conservation/restoration

Oral Presentations

Painting and illumination in early Renaissance Florence: the techniques of Lorenzo Monaco and his workshop

Paola Ricciardi[1,2]*, Michelle Facini[2] and John K. Delaney[2]

[1]*The Fitzwilliam Museum, Cambridge, England, UK*
[2]*The National Gallery of Art, Washington D.C., United States of America*
*pr364@cam.ac.uk

In the past two decades, scholars have furthered our understanding of painting and illumination in early Renaissance Florence through the study of artworks produced in the city's numerous artists' workshops and of historical documentation. Most interesting is the wide range of work accomplished by Florentine illuminators of the fourteenth and early fifteenth century that encompasses not only manuscript illumination, but also panel, canvas and fresco painting. Examples of the most celebrated artists who practiced varied painting techniques were Pacino di Buonaguida, Cenni di Francesco, Lorenzo Monaco, Fra Angelico, and Zanobi Strozzi, each a master with a flourishing workshop.

At the end of the fourteenth century, the Camaldolese monks of Santa Maria degli Angeli in Florence commissioned choir books for their own monastery and for the church of the adjacent hospital of Santa Maria Nuova, that are considered to be amongst the most beautifully illuminated volumes of the early Italian Renaissance. Contributing in a significant manner to the production of these books was Lorenzo Monaco, best known as one of the greatest panel painters of early fifteenth century Florence, and also an accomplished painter of manuscript illuminations. Despite his monastic status at Santa Maria degli Angeli, around 1396 Monaco set up an artist's workshop outside the monastery, which included a collaborative circle of both lay painters and young monks. He never renounced his vows and continued to have strong ties with the monastery throughout his life.

Art historians have observed a substantial identity of style and technique in Monaco's paintings on panel and parchment, and the analytical study of illuminated manuscript leaves attributed to the Master further supports these observations. By using fiber optics reflectance spectroscopy (FORS) and near-infrared (NIR) imaging spectroscopy, we have recently shown that fat and non-fat containing paint binders can be separated, and the compositionally selective use of egg yolk can be non-invasively identified in three choir books painted by Monaco and his circle (codex C71, codex H74, and codex Corale 8). As a panel painter, the artist would have been familiar with egg tempera, which however has seldom been analytically identified on manuscript illuminations. Egg glair and vegetable gums are traditionally considered the binders of choice for paintings executed on parchment, but references to the selective use of egg yolk tempera for manuscript illumination can be found in some fifteenth century recipe books.

The results of the in situ characterization of illuminated manuscript leaves can be compared with published data regarding paintings on panel and canvas, and reveal interesting similarities between the materials and techniques used for painting and illumination, informing us about their relationship in a Florentine Quattrocento workshop where both arts were practiced. They also suggest the presence of both '*miniatori*' ('illuminators', who decorated the margins of manuscript leaves) and '*dipintori*' or '*istoriatori*' ('painters' of illuminated initials) within the workshop. Further investigation will clarify our understanding of the use of egg tempera for manuscript illumination as a widespread practice or as a unique characteristic of Lorenzo Monaco and his close collaborators and followers.

Workshop practice as a common feature of several groups of wall paintings in Slovenia (fourteenth and fifteenth centuries)

Anabelle Križnar*

Department of Art History, Faculty of Philosophy, University of Ljubljana, Aškerčeva 2, 1000 Ljubljana, Slovenia
*akriznar@us.es

The present research is dedicated to a group of wall paintings in the Western and Central Slovenia, which date from the fourteenth and fifteenth centuries and stylistically originate to the North-Italian art of Friuli. They were carried out by different workshops related among each other. The oldest paintings are those attributed to the so called Workshops of Gorizia, divided into three successive groups. The first one was active at the end of the fourteenth century, the second one around 1400, and third one around 1420. From the last group an independent painter known as the Master of Bohinj's presbytery (ca. 1440) continued the tradition, however the Italian elements were mostly replaced by local Slovene ones. Three of his disciples carried on his work and are known today as the Suha-Bodesce-Prilesje group (ca. 1450-70).

The relation among these wall cycles was known from the art historical point of view, however, no technical or material analysis has been carried out so far. The principle aim of this research was, therefore, the exam of selected wall paintings in order to get more information on their painting procedures, materials and techniques applied. The results would offer a technical comparison among them and to the Friuli art. All selected paintings were first thoroughly studied in situ, then small samples of mortars and pigments were extracted and analysed by OM, SEM-EDX, FTIR and XRD.

The results showed that the paintings carried out by the Gorizia's workshops, were painted on two or three layers of plasters made of lime and sand. No lime-wash was found, however there was a very characteristic feature discovered: a thick basic colour layer, made of high quantity of lime and a selected pigment. This feature was confirmed in all studied cycles and can not be found in any other wall cycles in Slovenia. All paintings have incisions, but artists varied in using thin or thick ones. In all three groups, only yellow colour was applied for the under-drawing, while the red one was used for horizontal and vertical lines. Under-painting was in all samples a gray *veneda* under the azurite. The colour modelling goes always from light to dark. The construction of lights and shades, the use of thin and thick brushes, the form of several details such as eyes, mouth or hands is practically the same. The painting technique is *a fresco* with *a secco* finishing, however in the youngest paintings a larger proportion was carried out on a dry mortar.

Very similar results were found in Master of Bohinj's presbytery and the SBP Group: a characteristic thick basic colour layer, yellow under-drawing and red for straight lines, grey *veneda*, and the construction of colour layers from light to dark. However, some differences were discovered, due to the assimilation of local Slovene tradition. Nevertheless, the work practice in all these groups is very similar and the results obtained confirmed the workshop relation between the wall cycles.

Roccatagliata and the Female Nude

Shelley Sturman*

Head of Object Conservation, National Gallery of Art, Washington, DC 20565 USA
*s-sturman@nga.gov

A growing collective of small, nude female sculptures, attributed to Nicolò Roccatagliata (Genoa, c.1560-1636 or before, Venice) by art historians, has begun to emerge. These figures, characterized by vivacious modelling, rough casting, and minimal finish, are linked by their scale and also by their pose having the left foot placed on a raised and slanting block. All of the females have robust bodies, long necks, and small heads.

A salient trait in these statuettes is their similar method of fabrication as revealed through X-radiography. Roccatagliata was an innovative sculptor who utilized a process for creating repeated, but not identical forms by applying wax over pre-formed cores and then adding the separately fashioned wax head and limbs. Nicolò's technique was similar to that employed by his Paduan predecessor, Riccio, as first described by Richard Stone. By using pre-formed cores and added wax appendages, Roccatagliata was able to produce figures that harmonized well with one another yet retained a certain amount of individuality.

In addition to method of fabrication, analyses using X-ray fluorescence spectroscopy have also noted another critical relationship in their metallic composition, in that they are all cast in leaded bronze, specifically copper and tin with a deliberate addition of lead, and a trace of antimony, an alloy that flows well during casting. Since none of the bronzes are signed, technical analysis of secure works by Roccatagliata in Venice was undertaken in order to compare metallic compositions that might inform attribution.

Raffaele Soprani, Roccatagliata's biographer, recounts that the sculptor made figurines to assist the great Venetian painter, Tintoretto, in the study of poses for his compositions. When viewing the painting of *Apollo and the Muses* by Tintoretto from the British Royal Collection, the comparisons are striking between the robust bodies, long necks and small heads, of Tintoretto's female nudes, and it is likely that each artist influenced the other.

Bronze statuettes from the workshops of Antonio and Giovanni Francesco Susini: technical investigation of alloy composition and casting technique

Dylan Smith*

Object Conservation Department, National Gallery of Art, 2000B South Club Drive, Landover, MD 20785, USA
*dt-smith@nga.gov

Technical examination provides an important perspective on Renaissance bronzes, revealing workshop practices and providing insight into often complex histories of reproduction. Investigation of alloy composition and casting technique has proven valuable in the study of the statuettes produced by Antonio Susini and Giovanni Francesco (Gianfrancesco) Susini, inheritors of the workshop traditions of Giovanni Bologna, known as Giambologna. In the latter part of the sixteenth century, Giambologna established an influential workshop in Florence that produced large-scale sculpture, as well as highly refined small bronzes. These treasured objects were reproduced using the indirect lost wax method and executed by skilled assistants, notably Antonio Susini. After 1600, Antonio established his own workshop and continued to cast bronzes using his former master's molds and models, and also created original designs in a similar style. After Antonio's death in 1624, his nephew Giovanni Francesco Susini inherited the workshop and continued to cast bronzes from the models of Giambologna and Antonio, as well as creating original designs. The cumulative result of these decades of active production is an extensive group of closely related statuettes where questions remain about attribution.

Using an extensive database of alloy compositions collected by the National Gallery of Art, alloy classes have been linked to the workshops of Antonio and Gianfrancesco that can be distinguished from those used within Giambologna's workshop. This database was initiated with X-ray fluorescence analysis (XRF) in the museum laboratory of works in the NGA collection and sculpture on temporary loan starting in the 1980s. Since 2006, data has been collected using portable X-ray fluorescence spectrometry (XRF), allowing the most critical objects to be examined regardless of their location and greatly increasing the number of relevant works that have been studied. Subsequent research has emphasized the analysis of signed, documented, and well-attributed statuettes, many held in international collections without ready access to analytical facilities. The data collected on Antonio and Gianfrancesco defines the preferential use of certain alloys in their respective workshops and aids in the attribution of undocumented bronzes.

The evolution of practice in the Susini workshops from that of Giambologna is also reflected in casting technique. Their methods have been reconstructed through a combination of careful visual examination, XRF analysis, and X-radiography. Although all three artists use the indirect lost wax method, there appears to be a transition from integral casting of a complete statuette to production in stages by "casting-on" and a greater reliance on surface finishing. Recognition of this characteristic not only provides further insight into attribution of individual bronzes, but also provides a means of determining who invented certain models. Considered together, the distinctions observed in casting technique and alloy use appear to reflect a movement from Giambologna's 'heroic' processes to more practical production in Antonio and Gianfrancesco's workshop.

The influence of Neutron imaging and diffraction techniques on the study of Renaissance bronze sculptures

Robert van Langh*

Head of Conservation & Research, Rijksmuseum Amsterdam, Hobbemastraat 22, 1071 ZC Amsterdam, Netherlands
*r.van.langh@rijksmuseum.nl

The past five years both neutron imaging and neutron diffraction or combined neutron-imaging/diffraction at Large Scale Facilities have been used to study Renaissance bronze statuettes. Research was focused on the production techniques of hollow cast bronze statuettes. This type of research proved the following hypotheses: Neutron imaging is a more powerful technique for research on production techniques of Renaissance bronzes than X-radiography. Combined neutron imaging/diffraction can be used to determine an alloy composition non destructively. This study also proved that historic copper alloys can be magnetic as can be proven using neodymium magnets. And finally that the finishing techniques of bronze statuettes evolved during the third part of the sixteenth century as was indicated with stress and strain analyses using neutron diffraction. Based on these studies it appears that a difference in moulding materials forms the basis of the amount of time needed to finish Renaissance bronze statuettes to the beautiful luster that they are known of. During this talk several of the mentioned aspects will be highlighted and explained how the techniques can be applied in the field of Cultural Heritage. New insights on the production techniques of Renaissance bronze sculptures will be shared.

The Workshops of Benedetto and Giuliano da Maiano, Giuliano and Antonio da Sangallo and Baccio da Montelupo. A Research on the Construction Techniques of Renaissance Crucifixes

Peter Stiberc*

Opificio delle Pietre Dure, viale Strozzi 1, 50129 Firenze, Italy
*peterhans.stiberc@beniculturali.it

During the decades around 1500 an exceptional number of life size polychrome wood crucifixes had been created in Florence. The representation of the crucified Christ was certainly one of the major artistic challenges for its symbolic and theological value but - in particular for the Rennaissance artist - also a unique occasion of anatomical study. For some outstanding workshops as those of Giuliano and Benedetto da Maiano, Giuliano and Antonio da Sangallo and Baccio da Montelupo the making of crucifixes was a predominant factor in their sculptural production. While life size wood sculptures were traditionally carved from entire tree trunks and were frequently hollowed out to prevent their cracking, among the mentioned workshops, different construction techniques were introduced. These innovative techniques are based on a wooden block that was assembled from more elements and provided an efficient protection from cracking without the necessity of hollowing out the figure from behind. In this the assembled block construction certainly met the most updated formal needs, allowing to carve the figure from all sides without restrictions.

During the last years at the Opificio delle Pietre Dure about a dozen crucifixes by or attributed to the workshops of the Maiano, the Sangallo and Baccio da Montelupo were examined in collaboration among the polychrome wood sculpture department and the department for physical analysis in order to understand their particular construction techniques. In several of the examined sculptures joint marks on the surface indicated an assembled block construction. All sculptures were X rayed, most of them in situ and the results show that a correct understanding of the constructions without X ray based technology is not possible.

We are now able to distinguish several different types of construction that were typically used in the different artist's workshops. These techniques reflect a combination of highly specialized craft and experimental open mindedness that can be considered typical for the "Renaissance Workshop". In this presentation our research project will be described, the various examined construction techniques will be distinguished and related to the different workshops.

Rare Portuguese altarpiece's joinery techniques on the context of sixteenth century European workshop practices

Filipa Raposo Cordeiro*

Instituto de História da Arte, Faculdade de Letras da Universidade de Lisboa, Portugal
*f.cordeiro.veritage@sapo.pt

Methods of shaping and joining panels distinguish workshop practices in different times and places and dictate their influences.

Although many sixteenth century wooden altarpieces didn't survive to earthquakes, displacement or others disappearances, it is still possible to observe rare assemblies on Portuguese wood altarpieces.

Joinery systems can sometimes be seen by observing panel's front side, yet, regarding the cases presented herein, it was only possible to see them during the course of recent conservation/restoration work.

Studies refer that fifteenth and sixteenth century Portuguese panel's joinery work is generally composed by vertical wooden planks with butt joint aligned either by rectangular form splines, either by cylinder dowels inserted on the edges of boards, or by the first ones with four transversal dowels inserted on them. Chestnut wood (*Castanea sativa* L.) was generally used on those cases. Representative examples of panels with these particular techniques and materials will be shown.

This study shows Portuguese sixteenth century altarpieces made of diverse woods, with rare wood and metallic joinery system, different from those mentioned above, used not only for positioning planks but also to reinforce them.

One of the case studies is the panel by the painter Thomas Lewis (c.1565-c.1612), of plausible English origin, still considered a "mechanic" craftsman (as all painters working in Portugal at the time). This artist lived in Lisbon on the transition of the sixteenth to seventeenth century, legating magnificent panels and wall paintings ordered by Portuguese aristocracy for the Church and civil Palaces, between 1580-83 and 1603 (PhD research by the author).

Historical contract documentation refers that a "joiner" craftsman and "carpenter" (of plausible Flemish origin, as refereed on a study) was in charge of the support making for the above panel (part of an altarpiece of several "stories", unfortunately lost). The rare assembly he used will be compared with other unusual systems on panels by Portuguese and foreign painters that worked in Portugal during the same period.

Another artisan sometimes involved on the support making, although indirectly, as a unanimous material supplier, was the "smith", considered a "steel" craftsman, not mentioned on several consulted studies about altarpieces making, however documented in this study on the sixteenth century Lisbon context.

These unusual Portuguese cases are compared with Italian, Spanish and Flemish techniques and materials. Clues will be given regarding the influences those countries had on Lusitanian sixteenth century carpenter's techniques: certain internships; working relationship; and commercial trade.

Historical contract documentation, photos and drawings about Portuguese panel making compared with other European cases as well as results from panel material analysis - wood (microscopic identification) and metallic element's alloys (OM; SEM/EDX) will be schematically shown.

This multidisciplinary approach pretends to enlighten world heritage acknowledgement providing evidence of Portuguese rare workshop practices from the late sixteenth century European context.

Materials and Technological Signatures: Early Renaissance Altarpieces in Transylvania

Cristina Serendan[1]*, David Hradil[2,3], Janka Hradilova[3] and Joseph Cannataci[4]

[1]*Department of Conservation and Restoration, National University of Arts, Bucharest, 19 Budisteanu Street, sector 1, Bucharest, Romania*
[2]*Institute of Inorganic Chemistry of the AS CR, v.v.i., ALMA laboratory, 250 68 Husinec-Řež, Czech Republic*
[3]*Academy of Fine Arts in Prague, ALMA laboratory, U Akademie 4, 170 22 Prague 7, Czech Republic*
[4]*Chair in European Information Policy & Technology Law, Faculty of Law, University of Groningen, The Netherlands; Head of Department of Information Policy & Governance, Faculty of Media & Knowledge Sciences, University of Malta, Adjunct Professor at the Security Research Centre, School of Computer and Security Science, Edith Cowan University, Australia*
*cserendan@yahoo.com

The beginning of the sixteenth century was a flourishing period for arts and crafts in Transylvania (*Siebenbürgen*). Benefitting from relative political stability, prosperity and economic development, itinerant artists trained in painting workshops across Central Europe (especially Austria and South and Central Germany) were allowed to establish workshops in Transylvania with the same rights as the local craftsmen. From that period onwards until the Reformation introduced a new philosophy on the function of religious images and objects, Transylvania witnessed an impressive development of altarpiece production and wall painting decorations in Catholic churches. One of the most preeminent figures of that time is Johannes Stoss (son of the famous German sculptor Veit Stoss) who arrived in Transylvania at the beginning of the sixteenth century and established a painting workshop in Sighisoara (*Schassbourg*). Eight altarpieces are currently attributed to his workshop on stylistic grounds only. None of the works are signed however and only a few of them have the production dates indicated on the frames or panels.

In contrast with the case of un-signed works currently attributed to the workshop in Sighisoara, one of the few cases for which the authors are known is the signed altarpiece from Jidvei, a small village in the heart of Transylvania. Here, *magistros Simonem sculptorem* together with his son-inlaw *Vincencium pictorem Cibiniensem* were responsible for the construction of the altarpiece in the year 1508.

Against this background of scarce knowledge on the history of production and authors, this paper proposes an attempt for the identification of materials and technological signatures of these two workshops: the Johannes Stoss workshop in Sighisoara and the Vicentius workshop in Sibiu. Extensive research carried out during the past five years has brought to light important new findings regarding the materials and technologies[1]. Those particular features and similarities identified in the preparation, gilding and painting technique will be highlighted in this paper. For this purpose, complementary analytical and imaging techniques have been used to identify the structure and the composition of the pictorial layer and characterize the techniques. On site visual analysis and measurements with portable XRF equipment have been combined with light microscopy, SEM-EDX, micro-X-ray diffraction, FTIR and microchemical tests carried out on cross-sections. The results point to possible complementary "fingerprints" including poliments and gilding techniques associated with translucent painting.

[1]See "The Imitation of Brocade Fabrics in Late Medieval Altarpieces from Transylvania" by C. Serendan, J. Hradilová, D. Hradil published in Acta Artis Academica 2010, Proceedings of the 3rd Interdisciplinary Conference of ALMA, ed. Academy of Fine Arts in Prague, Praha, pp.43-61; C. Serendan, J. Hradilova, D. Hradil, Integrated approach for the Identification and Characterisation of Painting Grounds in Medieval Altarpieces from Transylvania, poster presented at MATCONS 2011 Matter and Materials in/for Heritage Conservation, 24-28 August Craiova, Romania.

The altarpiece of St. Dominic of Silos by Bartolomé Bermejo: An example of painting practices during the early Spanish Renaissance

Dolores Gayo*, Maite Jover de Celis and Laura Alba

Prado Museum Analysis Laboratory, Ruiz de Alarcón 23, 28014 Madrid, Spain
*dolores.gayo@museodelprado.es

In 1474, Bartolomé Bermejo (doc. 1468-1501) was contracted to execute the altarpiece for the church of St. Dominic of Silos in Daroca (Saragossa). Two of the panels and part of the architectural structure of this altarpiece (dismantled in the eighteenth century), are in the collection of the Prado Museum. The central panel, with the representation of Saint Dominic enthroned as a bishop, is considered by specialists to be a masterpiece of fifteenth century Spanish painting, and is attributed exclusively to Bermejo. The other panel, which represents Ferdinand I of Castile receiving St Dominic of Silos, seems to be collaboration between the master and his closest disciple, Martin Bernat (doc. 1450-1505).

The original documentation is very extensive, as much that concerning the commission as the legal disputes which occurred throughout the execution of the work, and which forced to Bermejo to abandon it, leaving the completion up to his disciple alone. Moreover, the regulations of the painters´ guild of the cities in Spain that regulated the organization and the practices of artist workshops in this period, bring us valuable information about the painting materials and the practices current in fifteenth century Spain.

With this contribution, we propose to compare documentary historical sources with the technical data obtained through analysis of the two panels of this altarpiece which are in the collection of the Prado. This integrated study will include analysis of the materials (support, binding media, pigments and gildings), as well as the way in which these have been employed by the artists concerned (radiography and infrared reflectography).

Furthermore, the study of these two panels which were probably been executed by two distinct artists, will allow us to establish the degree of collaboration between Bermejo and his disciple Bernat. The results could be compared with other works by these artists in the collections of other institutions.

The Techniques of the Renaissance Jeweller: Traditions and Transitions

Jack Ogden*

55 Florin Court, Charterhouse Square, London EC1M 6EU, UK
*jack@striptwist.com

A study of the techniques used by sixteenth and seventeenth century jewellers based largely on a microscopic study of extant Jewellery, including items in the seventeenth century Cheapside Hoard, reveals that many of the manufacturing methods being used would have been familiar to a Medieval or Classical goldsmith. However, some new technology was introduced during this period, including blowpipe soldering which was to have a fundamental influence on processes and design. The copious use of enamels during the period, which might be linked to the introduction of blowpipe soldering, presented challenges to the jeweller with regard to the order of assembly of his work. The techniques evidenced by surviving jewellery are also considered in the light of the contemporary representations of jewellers' workshops where both processes and individual tools are depicted.

Practical Magic: Gemstones and their Settings in Renaissance Europe

Joanna Whalley*

Victoria and Albert Museum, Cromwell Road, South Kensington, London, SW7 2RL, UK
*j.whalley@vam.ac.uk

As part of an on-going survey of gem materials at the V&A, the gems of over 80 European objects dating from the fourteenth to the sixteenth centuries have been assessed. The aim of the survey is to identify the species of gem material as well as the presence of any identifiable methods of treatment or enhancement.

Trade links for gemstones improved and expanded during the Renaissance, though the most desirable relied on contacts in exotic and often dangerous locations. The display of gems which were bold in colour and size reinforced the owner's status and, as such, the enhancement of more humble materials, combined with clever setting, was a valued art. Gems were most commonly set in closed-back settings, a practice which enabled setters to employ a broad palette of techniques undetected. Indeed, the great metallurgist Vannoccio Biringuccio compared gem-setting to alchemy in his Pirotechnia of 1540.

Methods include the use of pigments, oils, resins and dyes; the introduction of foils, textile fibres and patinated metals; the use of pastes (glass), and the manufacture of doublets and triplets. Over time the colours of simulants and enhancements have faded, or in some cases been lost completely, thus changing the overall interpretation of the object.

This paper will compare the materials and techniques employed using documents of the period with comparison to surviving examples from the V&A's collections.

The St. John Altar from the Baptistery of Florence: the goldsmith workshop through fourteenth and fifteenth centuries

Pamela Bonanni[1], Andrea Cagnini[2], Natalia Cavalca[2], Monica Galeotti[2], PierAndrea Mandò[1], Alessandro Migliori[3], Simone Porcinai[2]* and Marco Verità[4]

[1]*Dipartimento di Fisica dell'Università and Istituto Nazionale di Fisica Nucleare, Firenze, Sesto Fiorentino, Firenze, Italy*
[2]*Laboratorio Scientifico, Opificio delle Pietre Dure, Firenze, Italy*
[4]*LAMA Laboratory, IUAV University, Venice, Italy*
[3]*Istituto Nazionale di Fisica Nucleare, Firenze, Sesto Fiorentino, Firenze, Italy*
*simone.porcinai@beniculturali.it

The St. John Altar from the Baptistery of Florence is an outstanding masterpiece of Italian Renaissance. The wooden structure is covered with silver laminas depicting scenes from the life of St. John, patron of the city. The Altar is also decorated with dozens of silver statues, pillars, architectural elements and enamelled plaques (mainly basse taille enamels and some champlevé ones). The construction of the Altar was quite complex: the different parts were manufactured by several authors (Andrea del Verrocchio, Antonio Pollaiolo and others) starting from 1366 till 1480. Some additions and changes were made even in later centuries.

In this work, both silver elements and enamels from different parts of the Altar and dating to different periods were examined in order to evaluate the changes in workshop practice and in the supply of raw materials. More than 40 elements (statues, laminas and enamelled plaques) were investigated in order to determine the elemental composition of alloys and enamels using non destructive (PIXE and portable XRF) and micro-destructive (SEM and WDS X-ray microanalysis on enamels fragments) techniques.

Analytical investigations highlighted differences in the silver and copper contents that seem to be mainly related to the intended use of the alloy (manufacturing of statues or plaques) and to the position of the metallic elements in the framework of the Altar (in some cases hidden parts show a lower content of silver). Some compositional changes can also be ascribed to the various authors, and the presence or absence of minor elements (such as bismuth or gold) to the manufacturing period (different purifying methods or different ores).

The analyses of the basse taille enamels of the Altar are extremely interesting, since only few analyses on Italian enamels of the fourteenth-fifteenth centuries are available in literature. Results show an alkali-rich low-lime base glass composition and a shift from a K-rich mixed alkali to a Na-rich composition from the fourteenth to the end of the fifteenth century. Evidence is provided as well for the change of the cobalt ore used to colour the blue enamels along the subsequent manufacturing periods of the Altar. Similar results were found in the analyses of basse taille North Europe enamels of the fourteenth and fifteenth centuries, which reveal an astonishing manufacturing homogeneity.

These results support the hypothesis that enamels for basse taille applications were produced in highly specialised workshops which supplied the enamellers. A comparison with available ancient documentary sources on glassmaking should confirm such a hypothesis on possible relationships existing between glassmakers and goldsmiths.

Analyses of Renaissance Venetian enamelled glasses of the Louvre Museum

Marco Verità[1], Isabelle Biron[2]*, Françoise Barbe[3] and Rosa Barovier Mentasti[4]

[1]*LAMA Laboratory, Architecture University IUAV, Venice, Italy*
[2]*Laboratoire du Centre de Recherche et de Restauration des Musées de France, Paris, France*
[3]*Louvre Museum, Paris, France*
[4]*Venetian glass historian, Venice, Italy*
*isabelle.biron@culture.gouv.fr

A non-destructive analytical technique was applied to a group of Renaissance Venetian enamelled glass objects (goblets, beakers, ..) belonging to the Louvre collection to determine the quantitative chemical composition of the glass and of the decorative enamels. The objects were selected for analysis by a major expert on Venetian glass in agreement with the curators. The aim was to select a number of original Venetian Renaissance items and a number of objects of doubtful provenance. The transparent glass of each object was analyzed, as well as the white, blue and green enamels; in some cases, also other enamel colors were analyzed.

The aim of this study is to improve the present knowledge on one of the most significant themes of the Venetian Renaissance glass technology, which has not been exhaustively investigated up to now. In fact, due to the impossibility of even microscopic sampling of these precious artifacts, only rare analyses of Renaissance decorative enamels are available up to date. The existence in the Laboratoire du Centre de Recherche et de Restauration des Musées de France of an AGLAE accelerator allowed ion beam non-destructive analysis (in PIXE and PIGE modes) to be used to determine glass compositions without sampling.

These analyses allow:

- a first database on Venetian Renaissance enamelled glass objects to be created to allow distinguishing between manufacts made with a technology different from the Venetian tradition and genuine Venetian products (fakes will be recognized);
- new light to be thrown on this sophisticated, controversial decorative technique;
- any similarities between Venetian Renaissance enamels and Limoges enamels to be examined.

Furthermore, the comparison of the new analytical data with the recipes to prepare enamels in the Renaissance Muranese glassmaking treatises, will further improve understanding their manufacturing technique and help distinguishing between original products and fakes. In particular, it is known that reproductions and reinventions made in the nineteenth or twentieth centuries entered many collections of Renaissance enamelled glass.

"Christ carrying the cross", a surviving *tüchlein* by Luis de Morales, technical examination and workshop practices

Rafael Romero* and Adelina Illán

Icono, I&R, Virgen de los Peligros, 9, 28013 Madrid, Spain
*icono.i.r@nova.es

The recent discovery of the sole *tüchlein* type painting known to be by Luis de Morales (ca. 1509-1586) has paved the way for a precise comparison of the technical processes used by this Spanish Renaissance master when working on both wooden panels and fabrics, with this latter technique being referred to in Spain as *aguazo* or *sarga* painting. Luis de Morales was an artist with a profound understanding of the Flemish style and techniques of the time, yet he also had first-hand knowledge of the innovations that arrived in Valencia from Italy in the early years of the sixteenth century; specifically, through the delivery in 1521 of the unique paintings on fabric by Sebastiano del Piombo for Don Jerónimo Vich. Especially interesting is the comparison between the *Christ carrying the cross* and other paintings on fabric produced within the close circle in his studio, which clearly reveals the technical interactions between master and workshop. A differentiation necessarily has to be made between the diverse technical variations encompassed under the generic term of *tüchlein* or *sarga*; this research studies the variations between the various surviving examples that can be attributed to major Castilian studios active during the fifteenth and sixteenth centuries.

‘Sets and the City’ – Workshop practice in Elizabethan and Jacobean London

Catherine Daunt and Edward Town*

National Portrait Gallery, St Martin's Place, London WC2H OHE, UK
*etown@npg.org.uk

Sets of portraits of historical, mythological, religious, and contemporary figures became increasingly popular over the course of the sixteenth century in England. Based upon continental humanist tradition, the didactic and mnemonic properties of these sets appealed to individuals across society, and were a staple of many decorative schemes across Elizabethan and Jacobean England. Yet as fashions in both portable and decorative painting changed, many of these sets were either dispersed or destroyed. It is therefore extremely rare to see sets from this period intact, let alone in situ, and as a result art historians have found it difficult to speculate as to how such sets were put together and produced.

As part of the Making Art in Tudor Britain project, the National Portrait Gallery has undertaken a substantial program of technical analysis on portraits from two surviving sets, one dating from the 1590s and the other from 1618-20. The findings from this analysis have substantially furthered our understanding of methods by which portrait sets of this type were assembled. Analysis showed that these portraits were produced both rapidly and cheaply, and were based on pre-established patterns that could be transferred or copied by artists to make multiple versions. At least three individual hands were discovered in the earlier of the two sets, with the further possibility that there was an additional artist responsible for the depiction of the jewels and the application of gilding in two particular portraits.

These discoveries raise important questions regarding the size, make-up and capabilities of the workshops responsible for producing these portraits. They also encourage us to ask questions as to the relationship between portraits that were produced speculatively for the retail market, and those commissioned specifically for individual patrons. This paper will address these questions by bringing together the findings from these two recent case-studies and from analysis on a portrait set at Knole House, Kent, with documentary evidence in order to shed new light on this significant, but little understood aspect of workshop production in England during the Renaissance.

The Botteghe degli Artisti: artistic enterprise at the Della Rovere and Medici courts in the late sixteenth century

Erma Hermens*

Lord Kelvin Adam Smith Lecturer in Technical Art History, Centre for Textile Conservation and Technical Art History, History of Art, College of Arts, 8 University Gardens, University of Glasgow, Glasgow G12 8QQ, UK
*Erma.Hermens@glasgow.ac.uk

In the early 1580s, Francesco Maria II Della Rovere, Duke of Pesaro and Urbino, established a series of *Botteghe* within the Ducal Palace in Pesaro, where he employed a wide range of artists and artisans, including painters and sculptors, but also gold-and silver smiths, embroiderers, clock and scientific instrument makers, armourers. Correspondence of the Duke with his ambassadors in Rome, Florence and Venice demonstrate a very active recruitment of artists and artisans with excellent skills. The ca. 16 workshops formed a row of work spaces on the ground floor of the new extension of the east wing of the palace, with living space on the first floor. Employees received a monthly payment, plus bread, wine and firewood, and were paid separately for larger assignments.

From ledgers and other documents, an image emerges of a very active enterprise with ample interdisciplinary collaborations, communal buying in of materials, exchange of designs and reference materials, guided by supervisors for both quality control and daily 'household' organisation. The supervisor combined the wide range of expertise present for specific projects and divided tasks, and had preliminary designs made to show the Duke for approval. Some of these collaborative projects can be illustrated with information from invoices as well as an album of drawings (Vatican Library). From documents it is clear that the main output of the *Botteghe* concerned artefacts for the new gallery extension of the palace, as well as for political and family gifts. However, the workshops also opened to the street, allowing a limited production for the open market, and documents indicate commissions from the local nobility. It should be noted however, that the Duke still bought artefacts, paintings, prints and books from artists working outside the Duchy.

The Della Rovere Court maintained strong connections with the Medici in Florence, both through family and military relations. In 1588, Ferdinando I De Medici, by official decree, announced the establishment of the new *Galleria dei Lavori*, a very similar conglomerate of artists' and artisans' workshops as found at the Pesaro court. Both enterprises may have found an example in the Florentine *Officine Medicee*, the famous precious stone and gem cutting workshops, set up by Franceso I De Medici near the San Marco convent. Some of these workshops were relocated to the *Galleria* and complemented by many other disciplines. Ledgers and other documents concerning the *Galleria* indicate a very similar configuration as found in Pesaro, and indeed, the same patterns of collaboration and organisation. Materials were communally bought covering several workshops and/or tailored to specific assignments. Collaboration between disciplines was key, and a large part of the production was meant for the Medici's own palaces.

This paper will discuss the collaborative character of these enterprises, their specific tasks and function, the influence of their configuration on the production process, and the specific parts the supervisors played within these organisations.

Some ornamental prints and their links with craftsmanship

Antony Griffiths*

c/o Department of Prints and Drawings, The British Museum, Great Russell Street, London, WC1B 3DG, UK
*Antony.griffiths@clara.co.uk

Ornament prints are usually regarded as part of the material of the history of the print, and those concerned with the decorative arts have sometimes laid less attention to them than their interest warrants. For some classes and types of these prints were produced not by professional engravers and printmakers, but by the craftsmen working in the metal trades within the decorative arts. They made them for distribution and sale within their own professional peer group. Not having been trained as printmakers, they inevitably used the methods of metal working that they had learned as apprentices in their own profession. This gives them a very particular character that sets their prints apart from the main run of ornament print production.

After a short introduction to the nature and function of ornament prints, this paper will concentrate on the links between surviving prints and craftsmen in the field of enamelling on jewellery, and in the area of embossed metalworking. The prime period of such enamelling was in France in the first half of the seventeenth century. For embossed metalwork, the evidence begins in the second half of the sixteenth century in Germany, and lasts through to the seventeenth century, where it is found especially in Italy.

Charismatic Copper: An Examination of the Materials and Practices Used in Northern Renaissance Engraving

Angela Campbell*

The Sherman Fairchild Center for Works of Art on Paper and Photograph Conservation, The Metropolitan Museum of Art, 1000 Fifth Avenue, New York, NY 10028, USA
*angela.campbell@metmuseum.org

In the late fifteenth and early sixteenth centuries, in northern Europe, the art of copper-plate engraving experienced what was to become its defining moment. Albrecht Dürer and, later, members of his atelier, such as Georg Pencz, transformed what had once been exclusively a goldsmithing tradition into an aesthetically and financially rewarding form of fine art. In closely observing and documenting over 100 impressions of Dürer's three most iconic engravings: Knight, Death, and the Devil (1513); Melencolia I (1514); and St. Jerome in His Study (1514) in the US and Europe, and in analyzing three of Pencz's engraved copper plates owned by the Metropolitan Museum of Art, information about both artists' preferences and practices and the availability of materials during the Northern Renaissance was made evident.

While examining the Meisterstiche impressions, it became clear that as Dürer's copper plates deteriorated, each successive impression was printed with distinguishable signs of plate wear. Ultimately, the engraved lines lost their crispness and the images lost their definition. As part of an Andrew W. Mellon Fellowship in Paper Conservation at the Metropolitan Museum of Art, these minute signs of wear visible in all of the impressions were photographed and compared to one another and an impression chronology was built. Though the impressions themselves revealed information about Dürer's papers, inks, and degrading plates, I relied on later copper plates, engraved by Georg Pencz, for information about the manufacture and structural strengths and deficiencies of contemporary metal matrices.

Using the tools available to scientists and conservators at the Metropolitan Museum, both Dürer's prints and Pencz's plates underwent complex analysis. Polarized light microscopy allowed for examination of Dürer's and Pencz's carbon-based inks, Raman spectroscopy confirmed that they were, in fact, almost entirely carbon black. X-ray radiation and transmitted light documentation revealed the consistent and particular nature of Dürer's Meisterstiche papers—and how they differed from the papers used for his other prints. X-ray analysis, XRF spectroscopy, and Reflected Transformation Imaging of Pencz's copper plates yielded a better understanding of both the copper-plate-making process and of the composition of the sixteenth century matrices. With this information, and with an interest in reproducing as closely as possible a Northern Renaissance engraving, a copper plate was beaten into plane, Andrew Raftery, a professor of engraving at the Rhode Island School of Design, engraved a copy of Dürer's Saint Paul (1514) into the matrix, and the plate was systematically documented as several hundred impressions were pulled from it. Both the analysis of original material and analysis of the modern material revealed further information about the manufacturing methods of Renaissance plates and inks. Additionally, but not surprisingly, it became apparent that Dürer was as deliberate in choosing his papers and tools as he was in engraving his plates.

Anathomia: A Pair of Sixteenth Century Movable Anatomical Prints

Theresa Smith*

Harvard Library, Weissman Preservation Center, 90 Mt. Auburn St., Cambridge, MA 02138, USA
*theresa_smith@harvard.edu

This paper examines of a pair of remarkably beautiful sixteenth century anatomical prints with movable flaps in order to uncover evidence of their materials and manufacture, which in turn provide clues to patterns of print shop practice. The hand-coloured woodcuts (Countway Library of Medicine, Harvard University) show the human anatomy with the torso and nine organs assembled into seven superimposed flaps. In preparation for the Harvard Art Museum exhibition, *Prints and the Pursuit of Knowledge in the Early Modern World*, I prepared the prints for exhibition, working closely with conservation scientists, art historians and historians of science to analyze the structure of the prints and the colorants used, and to research the context of their production, circulation and use.

The pair of prints are entitled *Anathomia oder abconterfettung eines Weibs [Mans] leib / wie er inwendig gestaltet ist*. They were printed by Jakob Fröhlich in Strasbourg, Germany in 1544 using twenty-four woodblocks, originally cut by Heinrich Vogtherr the elder. Surrounding the figures are woodcut depictions of each organ with explanations of their functions. The organs for the liftable flaps were printed separately, cut out and assembled in the print shop. Close study of these prints revealed clues not only about paper manufacture and the printing process, but also about the shop's economical use of paper and creative reuse of woodblocks. The complex printing and construction of these anatomical models, as well as their detailed coloring, suggests much about the employment of assistants, their training and skills and the workflow at the print shop.

To maximize their salability, the prints would have appealed to many audiences. They utilize the bold graphics and layout of popular broadsides and are as beautifully hand coloured as devotional prints. Their delicate moving parts would have been a novelty, though the intricacy of their construction must have made them relatively expensive, both to produce and to purchase. Vying for the attention of the university-educated physician, the literate barber-surgeon, and the student of anatomy, the prints combine Latin names on the organs with vernacular German explanatory text. The prints also straddle two eras in anatomical knowledge. Originally cut and printed by Vogtherr in 1538, they predate Vesalius', *De Humani Corporis Fabrica* of 1543. Printed only one year later by Fröhlich, these prints do not reflect the latest understanding of anatomy, yet copies of these blocks continued to be printed into the seventeenth century, underlining their broad appeal. Twenty-four woodblocks represent a substantial investment in materials, so it is not surprising that they were reprinted over a long period. Through examination of these prints and the evidence of their hand production, a complex picture emerges of a print shop balancing the expense of a seemingly extravagant project with production techniques enacted to save time and money. Just as the handmade paper of these prints retains the impression of the paper mould on which it was made, the paper, printing, construction, and hand colouring of these broadsheets are the physical traces of the print shop in which they were made.

Visual Evidence for the use of *carta lucida* in Italian Renaissance workshop

Maria Clelia Galassi*

DIRAS – Università di Genova, Via Balbi 4, 16126 Genova, Italy
*mcgalassi@lettere.unige.it

The use of transparent sheets (linseed oil-soaked parchment or paper) for tracing and transferring images from one support to another is recommended in treatises of the fifteenth century (Cennini and Jean Le Bègue) and sixteenth century (Borghini and Armenini). Such a versatile, multifunctional tool must have been used daily in the workshop, for the training of apprentices (for copying exemplars/compositional models by the master) as well as for designing and replicating stock figures or individual details. Nevertheless, very few examples of drawings on *carta lucida* survive, probably because few collectors were interested in collecting such mechanical and impersonal artworks. Examples include a drawing on oil-soaked parchment from Pollaiolo's workshop (inv. 1885-5-9-1614; published by L.Melli [1]) and a drawing on oil-soaked paper attributed to Perino del Vaga (inv. 1978-3-4-7; E.Parma [2]), both housed in the Department of the Prints and Drawings of the British Museum. A *carta lucida* with a study of a horse, possibly traced from a sixteenth century drawing is in the Gabinetto Disegni e Stampe of the Uffizi (A. Petrioli Tofani [3]). And a tracing from a copy of Leonardo's *Virgin of the Rocks* has been reported in the Département des Arts Graphics of the Louvre (inv. 2342; C. Bambach [4]). Visual evidence for the use of tracing paper can be found by studying the design process for drawings, engravings, embroideries (see again C. Bambach [4]), panel paintings, and frescoes. As I have shown (Galassi [5]), infrared reflectography of Michele di Ridolfo's underdrawing demonstrates that his workshop used *carte lucide* for producing exact replicas of compositions. This essay will present new visual evidence for the use of *carta lucida*, with examples of underdrawing, incised lines and *sinopie* in panel and wall paintings by Italian Renaissance painters, such as Mantegna and Andrea del Castagno. In particular, I would like to stress the function of tracing paper as a workshop tool for producing symmetrical images, and for transferring preparatory drawings from one support to another, specifically in fresco painting, when transferring the *sinopia* from the *arriccio* to the in*tonaco*.

1. L. Melli, "Sull'uso della carta lucida nel Quattrocento e un esempio per il Pollaiolo", in *Paragone*, LII, 36, 2001, pp.3-9.
2. E.Parma, ed., *Perino del Vaga tra Raffaello e Michelangelo*, Exhibition Catalogue , Milan 2001.
3. A.Petrioli Tofani, "Pentimenti, metodi di trasferimento, manomissioni", in A.Petrioli Tofani,S.Prosperi Valenti Rodinò, G,C,Sciolla, *Il Disegno.Forme, tecniche, significati*, Cinisello Balsamo (MI) 1999, pp.247-251.
4. C.Bambach, *Drawing and Painting in the Italian Renaissance Workshop, Theory and Practice, 1300-1660*, Yale University Press 1999.
5. M.C.Galassi, "The Re-Use of Design-Models by Carta Lucida in the XVI Century Italian Workshops: Written Sources and an Example from Michele di Ridolfo del Ghirlandaio", in *La peinture dans les Pays-Bas au 16ème siècle. Pratiques d'atelier. Infrarouge et autres méthodes d'investigation*, Colloque XII pour l'étude du dessin sous-jacent et de la technologie dans la peinture, Bruges 11-14 settembre 1997, ed. Louvain-La-Neuve 1999, pp.205-213.

Evidence for workshop practices at the Tudor mint in the Tower of London

Justine Bayley[1]* and Harriet White[2]

[1]*Howcroft, High Street, Harmondsworth, Middx UB7 0AQ, UK*
[2]*Institute of Archaeology, UCL, London WC1H 0PY, UK*
*mail@justine-bayley.co.uk

The Tudor period was one of great activity at the Mint in the Tower of London as there was wholesale re-coinage in the aftermath of Henry VIII's great debasement of 1545-51.

Rescue excavations at Legge's Mount, in the Tower, in the late 1970s uncovered two brick-built furnaces as well as retrieving considerable quantities of metal-working debris. The scientific investigation of these finds has identified a range of metallurgical processes that were carried out at the Mint, though no coins or dies were found. The processes that were identified include the melting of base and precious metals, the assaying of silver in bone-ash cupels, and the parting of gold from silver by two different processes. There is documentary evidence that some of the ceramic vessels that were used were made in the Tower while others were brought in from outside.

Sixteenth Century Life-Casting Techniques, a reconstruction

Tonny Beentjes[1]* and Pamela H. Smith[2]

[1]*University of Amsterdam, Ateliergebouw, Hobbemastraat 22, 1071ZC Amsterdam, Netherlands*
[2]*Department of History, Columbia University, Fayerweather 605, 1180 Amsterdam Ave, New York, NY 10027, USA*
*t.p.c.Beentjes@uva.nl

Almost every Kunstkammer in sixteenth century Europe contained small reptiles or plants cast from life in a variety of media. This widespread technique, which used small, recently killed animals as a pattern to create lifelike sculptures, was often prized more highly than works sculpted with the hand. These so called life-casts often display remarkable life like detail, especially the metal life-casts. Good examples of these are the Merckel Table piece in the Rijksmuseum and the "Cellini" bell in the British Museum, both by Wenzel Jamnitzer. Scholars have often wondered how these incredibly detailed castings were achieved with the limited means of a sixteenth century workshop. A previously unstudied, late sixteenth century French technical manuscript (BnF Ms.Fr. 640 [1]) records a practitioner's experiments in casting from life, among many other subjects, and gives a rare insight into a sixteenth century foundry. This manuscript, preserved at the Bibliothèque Nationale Paris, diverges from most collections of recipes in its detail, its constant reference to the writer's own experiences, its seeming lack of formulaic recipes, its extensive observations of animal behaviour, its illustrations and its apparent purpose as a working manuscript. In the molding and casting sections, the author records his trials and even reminds himself to "Try this!". And this is exactly what the authors of this paper set out to do. Using the manuscript as the basis of their experiments they followed the instructions for life casting, animals and plants. While manuscript BnF Ms. Fr. 640 was the main source of information, the authors managed to locate and study other sources such as Hugh Platt's Jewell House of Art and Nature (1594) and several other seventeenth and eighteenth century German and English publications [2]. The process of reconstruction and life-casts produced gave valuable insights into the life-casting process. After their experimentation the authors studied surviving sixteenth century life-casts again and noticed small details, previously overlooked or deemed insignificant. These traces of the casting process gave clues to the use of molds, how the plant or animal was prepared for the casting and even clues for dating the life cast.

1. BnF Ms. Fr. 640, fol. 131r.
2. Platt, Hugh. The Jewell House of Art and Nature: Containing divers rare and profitable Inventions, together with sundry new experimentes in the Art of Husbandry, Distillation, and Molding. London, 1594.
   Johann Kunckel, Ars Vitraria Experimentalis. Leipzig, 1679.
   Anon. Der Curieusen Kunst- und Werck-Schul. Nuremberg, 1696.
   Dossie, Robert, The Handmaid to the Art. London, 1758.
   Smith, G. The Laboratory: Or, School of Arts. London, 1770.

Bernard Palissy: scientist and ceramist from the Renaissance in France

Anne Bouquillon[1]*, Françoise Barbe[2], Patrice Lehuédé[1], Jacques Castaing[1,3] and Thierry Crépin-Leblond[4]

[1]*C2RMF, Palais du Louvre, 14 quai François Mitterrand, 75001 Paris, France*
[2]*Département des Objets d'art, Musée du Louvre, 101 Rue de Rivoli – 75001 Paris, France*
[3]*UPMC CNRS UMR 8220, Université Pierre & Marie Curie, Site Le Raphaël, Laboratoire d'Archéologie Moléculaire et Structurale, 3 rue Galilée, 94200 IVRY-SUR-SEINE, France*
[4]*Musée national de la Renaissance, Château d'Ecouen, 95440 Ecouen, France*
*anne.bouquillon@culture.gouv.fr

Bernard Palissy was born in southwest France in 1510 and died in Paris in 1590 where he worked for the king only between 1566 and 1572, ending his period of ceramic production. Besides being a potter, he was also involved in glass making, geology, hydrology, etc. and he wrote several scientific books.

The workshop of Bernard Palissy has been discovered during the excavations carried out around the Carrousel near the Louvre Palace. This famous ceramist of the French Renaissance was invited by Catherine de Médicis to set up a grotto in glazed terracotta in the Tuileries gardens. Several thousand fragments of terracotta have been collected. They correspond to different types of use: architectonic ceramics, floor tiles, common and luxury wares, fragments of "Rustique Figulines", plaster molds, firing boxes and accessories.

Mineralogical and physico-chemical analyses of the constitutive materials, along with a careful study of the techniques used, especially those concerning moulding on living animals reveal the wonderful know-how of the artist. He was able to mimic Nature both in forms and colours, through ceramic Art, and to the closest of truth.

We could differentiate more than 10 sorts of clays, either coming from Paris area or farther away in France. They have been chosen and worked by Palissy to obtain special colours or specific properties well suited to his projects.

Transparent, semi-transparent and opacified glazes are usually lead-rich. Their colours are remarkable by their similarities with the natural hues as well as the quality of the reconstitution of the surface patterns (for example the recreation of the lizard's skin). This is due to subtle oxide mixtures that Palissy tested on small albarelli found in the workshop.

Our results shed light on the technical information published by Palissy in his books "Discours Admirables" or "La recepte veritable".

Thanks to the analyses performed on these authentic Palissy materials we can now propose some criteria to ascertain Palissy artefacts exhibited in many museums over the world : first applications are presented thanks to the study of dishes from the Louvre museum, or the Ecouen museum and from La Cité de la Céramique de Sèvres.

Poster Presentations

Stylus drawing in the Renaissance workshop – Investigating the appearance of leadpoint and blind stylus in a Leonardo drawing on unprepared paper

Jenny Bescoby, Judith Rayner* and Joanna Russell

Dept. of Conservation and Scientific Research, The British Museum, London, WC1B 3DG, UK
*jrayner@thebritishmuseum.ac.uk

The metal stylus was a common drawing tool in the Italian Renaissance workshop. Its earlier use in the production of medieval books and illuminated paintings meant artists and craftsmen of later generations were familiar with its various functions and learning to draw with a stylus remained a vital part of the workshop training of a young Renaissance artist.

A stylus leaves a different mark according to its metal constituents. Silver, gold, copper or brass alloys all need a prepared ground in order to leave a mark. Only leadpoint is soft enough to use on an unprepared paper surface. A blind stylus - usually made from iron – can also be used on unprepared paper to draw blank, scored lines.

Leadpoint (actually a lead-tin alloy) typically leaves metal particles on the paper fibres without indenting the surface, while blind stylus indents more deeply but does not leave a metallic trace.

The recent examination of some pen and ink drawings by Leonardo da Vinci in the British Museum collections showed that Leonardo often used both leadpoint and blind stylus for initial sketching. However, some of the lines found on these drawings appeared to combine characteristics of both tools, suggesting there might have been more variation in their composition and use than is generally recognised.

On one particular sheet of studies, *Man with a trumpet*, several different types of line are present. These were examined using magnification, raking light and IR imaging to investigate and record their qualities and characteristics. Lines were also drawn with modern styli on historic papers for comparative study.

Technical analysis and conservation of a Renaissance limestone altarpiece

Ana Bidarra[1,2]*, Pedro Antunes, Teresa Desterro[3], João Coroado[2,3] and Fernando Rocha[1,2]

[1]*Departamento de Geociências - Universidade de Aveiro. Campus Universitário de Santiago. PT - 3810-193 Aveiro, Portugal*
[2]*Geobiotec Research Centre, Campus Universitário de Santiago, PT - 3810-193 Aveiro, Portugal*
[3]*Departamento de Conservação e Restauro – Instituto Politécnico de Tomar, Campus Tomar - Quinta do Contador - Estrada da Serra, PT - 2300-313 Tomar, Portugal*
*bidarra.ana@gmail.com

The multidisciplinary approach to the conservation and restoration of a limestone altarpiece followed several proceedings that involved not only historical and aesthetical features, but also the technical analysis of the materials – pigments and support.

The studied altarpiece is assigned to João de Ruão, a prominent Renascence sculpture - born in Rouen, capital of Normandy where he first had contact with Italian Florentine Renascence sculptures - who lived in Portugal for nearly fifty years (c. 1528-1580). João de Ruão is considered to be the responsible for the definitive divulgation of the Renascence aesthetic in Portugal, mainly through his sculpture and architectural works.

The studied altarpiece experienced several alterations during the past centuries; the determination and assessment of the causes and processes of weathering, involved several actions with origin in the microclimate and surrounding atmosphere (meteoric action), and in the direct human action, the main responsible for its material, historical and aesthetical degradation. The use of an Ordinary Portland Cement (OPC) mortar, the attempt to homogenize the colour with a lime layer, its reallocation in an hostile environment with high humidity levels (in a room below the phreatic level) and its abandon, were essential for the poor state of preservation. Furthermore, the free entrance of outside air and its aggressive agent's and the direct action of the sun, originated the formation of brown irregular stains that covered the altarpiece surface and caused irreversible alteration on the few evidences of polychromy.

Along with the historical study and the determination of the causes and processes of alteration an analytical study of the materials was also performed. The qualitative and semi-quantitative analysis of the samples were executed by optical microscopy (OM) of the cross-sections using reflected light and by scanning electron microscopy (SEM) in combination with energy dispersive spectroscopy (EDS) for the polychromy and by X-ray diffraction (XRD) for the stone. The results confirmed the use ofAnçã stone (limestone) and in the few traces of polychromy it was possible to identify the presence of azurite, vermilion, lead white and gold leaf, being visible in some of the samples the presence of an overpaint.

Along with the technological study of the altarpiece another main goal of the project was to stop the ongoing degradation process by removing the foreign materials such as the OPC mortar and the lime layer from the support and to stabilize the detaching polychromy. The mechanical and chemical cleaning of the surface, the closing of the joints, the geometrical volumes reposition and the application of a protective layer in the polychromy were some of the processes involved in the conservation and restoration of the altarpiece.

Currently, the results obtained in this study are being compared with other works assigned to João de Ruão in order to define a clear analysis of the materials and techniques applied by the sculptor.

Case study of the Mausoleum of Jean V de Hénnin-Liétard at Boussu (B) attributed to Jacques Du Broeucq. Restoration and study of the alabaster sculptures

Judy De Roy*

Royal Institute for Cultural Heritage (KIK-IRPA), Jubelpark 1, 1000 Brussels, Belgium
*judy.de.roy@kikirpa.be

Not long before the death of Anne de Bourgogne, the spouse of Count Jean V de Hénnin-Liétard, in 1551, a mausoleum was erected in the family chapel known as “la Chapelle des Seigneurs de Boussu”. Count de Boussu Jean V de Hénnin-Liétard, Knight of the Golden Fleece and Grand Equerry of Emperor Charles V, is known to have commissioned Jacques Du Broeucq, one of the most renowned Renaissance artists of the Lower Countries, to design a castle at Boussu. Due to his close bond with the family and style similarities with his oeuvre, he is also generally considered as the designer and sculptor of the family mausoleum. A closer examination of the involvement of Jacques Du Broeucq in the conception of this monument, which is part of Belgium's ‘Patrimoine exceptionnelle’, will be conducted during the current restoration of the mausoleum.

The architecture of the mausoleum is composed of red and black Belgian marble and is enriched with alabaster sculptures. The family is depicted on the sarcophagus in the arch niche, kneeling in front of a Christ on a Cross placed in the middle of the group under a titulus, also made out of alabaster. On top of the mausoleum is a relief with God the Father surrounded by angels. On both sides of this relief are positioned two three-dimensional warriors carrying the commissioner's coat of arms. Somewhat lower we find the allegorical angels Strength and Faith. Four architectural elements are made out of the soft alabaster stone as well, namely two composite capitals and two reliefs in the bases of the columns.

The poster will focus on these alabaster sculptures, their construction techniques and traces of tool marks. The various tool marks will be defined in order to make a chronological study in the applied working methods. Also the assembly of the different parts of alabaster will be included. Their restoration, which consisted mainly of a surface cleaning and some minimal interventions, will briefly be discussed as well.

Neri di Bicci and the Diffusion of Cartoons in Fifteenth-Century Florentine Workshops

Jennifer Diorio*

802 – 150 Queen Elizabeth Driveway, Ottawa, Ontario, K2P 1E7, Canada
*jennydiorio@gmail.com

The sheer quantity of paintings produced in Neri di Bicci's workshop has led many to compare his workshop to a kind of factory, where assistants were employed in assembly-line fashion to produce hundreds of Madonna panels [1]. Although this is a simplistic means of rationalizing his enormous output in relation to other Renaissance artists, in some ways it is a very appropriate analogy for what must have been an exceedingly organized workshop. As his account book reveals, Neri was commanding a lower price than was usual for the period [2]. However, the key to his success was that he completed his commissions much faster than his contemporaries. Neri averaged seven months per panel, and often completed works in two or three months [3]. In the 22-year period covered by his account book, Neri produced at least 73 altarpieces, and 83 domestic tabernacles [4]. To accomplish this extraordinary output, Neri would almost certainly have used cartoons to facilitate production.

Unfortunately, the lack of extant cartoons renders this area of research problematic. Despite this handicap, visual analysis of the evidence available on the surface of paintings, such as incision lines, the dimensions of figures and their relative scale, and the size of design elements such as architecture and decoration, can provide extensive testimony concerning the use of cartoons.

As part of my doctoral dissertation, I have amassed images and dimensions for over 300 paintings attributed to Neri di Bicci and his workshop. In several instances, I acquired this information by visiting the paintings in situ, where incision lines were often observable. With Photoshop, I overlaid scaled images of his paintings, and of those artists working in his circle. This process has revealed that Neri and his workshop were using the same cartoons throughout at least a 30-year period to reproduce not only the outlines of figures, but also architectural and decorative elements. In a few instances, I also found empirical evidence that the same cartoon was shared between workshops. By participating in this conference, I hope to prompt dialogue concerning methods for analysing cartoon usage in *quattrocento* Florence.

1. See, for example, Anabel Thomas, *The painter's practice in Renaissance Tuscany* (Cambridge: Cambridge University Press, 1995), p. 61.
2. Megan Holmes, 'Neri di Bicci and the Commodification of Artistic Values in Florentine Painting (1450-1500),' in: *The Art Market in Italy*, Marcello Fantoni, Louisa C. Matthew, Sara Matthews-Grieco, eds. (Modena: Panini, 2003), p. 214.
3. Holmes, 'Neri di Bicci,' p. 214; Anabel Thomas,'Neri di Bicci, Francesco Botticini and the Augustinians' *Arte Cristiana*, (vol. 81, 1993), p. 26; Eve Borsook, 'Review: Neri di Bicci, Le Ricordanze (10 Marzo 1453-24 Aprile 1475), ed. and annotated by Bruno Santi,' *The Art Bulletin* (vol. 61, No. 2, 1979), p. 316.
4. Borsook, 'Review: Neri di Bicci,' p. 314.

Research on metallic material in liturgical textiles of the fifteenth-sixteenth centuries. Studies about production technology

Livio Ferrazza, David Juanes* and Mª Gertrudis Jaén

Instituto Valenciano de Conservación y Restauración de Bienes Culturales, Calle Pintor Genaro Lahuerta nº 25 planta 3., 46010 Valencia, Spain
*djuanes@ivcr.es

The Department of Textile Restoration and Materials Laboratory of the Valencia Institute of Conservation and Restoration of Cultural Heritage (IVC+R), have begun a research focused on the historical and technological study of the textile heritage through analysis and characterization of different metallic material applied to liturgical textiles from the fifteenth and sixteenth centuries.

One of the main objectives of the study of metal components of textiles is to understand the artistic and technological influences over the centuries among the Mediterranean countries. The first results of this extensive project, presented in this paper, are the comparative study of metal components from the same textile technique from Spain and Italy.

The metallic threads are generally making with a core (silk, cotton, etc.), around which is wrapped a thin sheet of different metals. Their appearance can be gold or silver, varying in composition and manufacturing technique based on the historical period.

The research develops the most appropriate methodology to identify the composition and the techniques used in of silver and gold metallic threads, strips and wire. Also, we are studying the various metallic coatings and the core of the wires using optical microscopy (OM) and variable pressure scanning electron microscopy (VP-SEM).

The experimental part usually includes microsampling of different types of metallic elements that have been observed in embroidered and/or supplementary wrapping weft. The samples were divided into two parts. One fragment was used to study the surface composition of metallic elements, providing information of the alloy and corrosion products, and the other fragment was prepared in cross section. These samples are previously studied with stereoscopic techniques and optical microscopy. The analyses of the constituent materials were made with VP-SEM coupled to a microanalysis system (EDX). The measurements were taken from the surface of metallic elements and from cross-section samples. The analysis of the degradation products were made by VP-SEM-EDX and μ-FTIR from the surface of the metallic element.

The results of these scientific studies give us practical information that reveal the nature of the materials, the technological knowledge of metal components, and various alterations to the different materials to reach their current appearances. The presence of longitudinal grooves parallel to each other on the surface layers can indicate the use of a device for processing the spinning of the filament and / or thinning of the sheet. The results obtained so far show the use of a technique of gilding with heat such as welding between a sheet of silver with fine gold, with the formation on the surface of alloy gold / silver, following the method described in *De la Pirotechnia* by Biringuccio in the sixteenth century. In this case, takes advantage of melting points of metals without using any filler, and applying pressure and stretching of the gold sheet.

Striptease and dressing-up in Titian's Workshop: a technical comparison of the Young Ladies in the Galleria Palatina, the Hermitage, the Kunsthistorisches Museum

Helen Glanville[1], Patrizia Riitano[2]* and Claudio Seccaroni[3]

[1]*Hamilton Kerr Institute, Cambridge, UK*
[2]*Opificio delle Pietre Dure, Viale Filippo Strozzi 1 - 50129 Firenze, Italy*
[3]*ENEA, Rome, Italy*
*patrizia.riitano@beniculturali.it

Typically Titianesque is the artist's inclination to replicate schemas, compositional elements or even particular compositions, years or even decades after first employing them. As part of this particular modus operandi, he would also elaborate compositions in parallel with each other, experimenting with different solutions to particular compositional ideas or problems. The resulting paintings might differ substantially, or they might embody variations on a particular theme.

Titian's Bella in the Galleria Palatina in Florence, (which has been recently restored at the Opificio delle Pietre Dure in Florence), is a prime example of this. The painting is one of a nucleus of works which are intertwined and interlinked, and which includes the Girl in a fur wrap (Vienna Kunsthistorisches Museum), Girl in a plumed hat in the Hermitage Museum, St. Petersburg) and the Venus of Urbino in the Uffizi, Florence.

In these four paintings, executed between 1536-1538, not only is there the facial resemblance between the women depicted, but tracings taken of the heads all correspond with one another.

Apart from the Venus of Urbino which has a landscape format, in the three other paintings in Florence, Vienna and St.Petersburg (all of the same portrait format), we are presented with a kind of "meditation" by Titian on the subject of beauty and female form, which leads him to explore different solutions in each of the three paintings, with results which in their variations, evoke different emotions in the beholder. A comparison of the X-radiographs of these three paintings seems to show that they were worked on at the same time in Titian's studio: for instance, beneath the Girl in a fur wrap of Vienna appear elements which can be linked both to an underlying face which resembles that of Eleonora Gonzaga as well as La Bella, and on top of this face a version of the latter, brought to an advanced degree of completion, before the artist eliminated the gown, replacing it with a deshabillé and a fur wrap, the model's arms changed to hold up (or release) her garments. Beneath the Girl in the plumed hat of St.Petersburg, we find elements from the Vienna Girl, whilst the Bella is the only one of the three paintings in which no variants or underlying painting can be seen.

The elements revealed by X-radiography suggest a chronological succession for the execution of the three paintings. Titian painted the Bella first, after which he reworked a ricordo from this painting transforming it into the Girl in Vienna; before completing this Girl, the composition was replicated, and newly transformed into the St.Petersburg Girl.

The Bella is at the beginning of the chain, but in a certain sense it can also be considered to be the final elaboration of the creative process. However, the complete replica of the Bella under the Girl in Vienna slightly differs from the original in its mise-en-page – an airier composition, with more space above her head, and in the colour of the dress, which was green instead of blue.

This study of the three beauties in various states of dress and undress, has provided a wonderful opportunity to compare physical data from the paintings with what we know of Titian's practice from contemporary sources such as Boschini: Titian described as a "surgeon" in his manner of proceeding, always refining – cutting away and altering – until he achieved the effect he desired; living flesh that breathed, and which he exposed and dressed to arouse different emotions in the eyes contemplating its beauty.

The results of the study also question the accepted distinctions between original and replica, and make one ponder the concept of authenticity and ultima mano.

A precious Renaissance manuscript, Les Vies des femmes célèbres : Laboratory investigations of the miniaturist Jean Pichore's practices and techniques

Hélène Guicharnaud* and Alain Duval

Palais du Louvre, Porte des Lions 14 quai François Mitterrand, 75001 Paris, France
*helene.guicharnaud@culture.gouv.fr

In 1504, Anne, duchess of Brittany and queen of France ordered a work, Les Vies des femmes célèbres, today in the musée Dobrée in Nantes. This book, one among the queen's more beautiful illuminated manuscripts, was illustrated by a famous miniature painter: Jean Pichore and his workshop, one of the most important in Paris. It includes 81 illuminations painted on 77 parchment folios.

The following research questions are investigated: What range of colours have been utilized to illustrate this very precious manuscript? How have the pigments been chosen? How has the artist painted in accordance with the different motifs (for example, the vegetation and the protagonists faces are treated very differently)? The various non destructive analyses and imaging processes used by the C2RMF (Centre de Recherche et de Restauration des Musées de France) to investigate the manuscript give unambiguous answers to these questions.

In fact, the pictorial technique is more complicated that it was thought before our investigations. The palette of pigments is numerous and their use is complex.

So, based on a lot of significant examples and their illustrations, our poster will show how the obtained results allow us to penetrate the practice of a very significant Renaissance miniaturist workshop applied to this luxurious manuscript.

Grisaille technique and new materials in renaissance painted enamels objects in Europe. *"Limoges white"* and mediums as part of the interrelationship between crafts as enamelling on metals and printmaking, in chiaroscuro results

Nuria López-Ribalta*

C/ Dega Bahi, 41 3º - 3ª, 08026 Barcelona, Spain
*nribalta@suport.org

This presentation aims: a) to contribute to the knowledge of the process, materials, tools and methods used on enamelled grisaille objects of the sixteenth century and their influence in the final appearance, b) to shed light on how craftsmen of the decorative arts in that period influenced one another, both intra- and inter-discipline mutual influences and worked transversally, and c) to review the differences and characteristics depending on the materials and mediums used.

At end of *Quattro cento* the Gothic art changed to Renaissance concept. For enamelling it was a decisive moment. It marks a very important departure: its independence from metalworking. No subordination, no more being a complement. Enamel became a pictorial technique. The new use of transparent enamels and artistic evolution led the transition to the "painted enamels" of the Renaissance. New materials were favourable to this move. Not necessary metal lines, inlay or chasing the metal surface. From then, vitreous coloured powder is juxtaposed and superposed as in painting or drawing.

The challenge is the imitation of the chiaroscuro and new technologies in glass permits to discover a new material: fine grind glass powder called "*Limoges white",* and grisaille appears towards 1530. First developed in northern Italy, but especially used in the workshops of Limoges, the heirs of the medieval knowledge.

The research in glass makers' workshops produced a semi-translucent white enamel that allowed them to model the anatomy of the bodies in chiaroscuro, in a bass-relief manner. The new technique gave way to monochromatic enamelled objects, a result of copying prints or imitation of drawings. Grisaille enamel was used alone or in combination with polychrome and was perpetuated for two-and-a-half centuries. Many famous Limoges family's names can be signalled as examples and good collections are in Museums, as the British.

The ancient formula of Limoges white is not exactly known yet. Few documents give light to this question, but none differ a lot from the material and processes rediscovered in the nineteenth century. A technique based on applying translucent white enamel on a dark fired background with superposition of several layers of varying thickness to create the chiaroscuro by transparency.

It is very interesting is to compare similar graphic effects made on prints by etching, done in enamels with system: "*enlevage a l'aiguille*" for lines or scratched parts. For many grisaille effects the medium used to agglutinate vitreous paint is essential. Powder could be mixed with oily products or water. Historically water was not considered as a medium, but we can confirm that it was used. Also very important is the translucency/opacity of the white parts to create forms, shades or light, in the foregrounds. The tools and the way of packing can condition formal aspects or surface textures, after firings. Objects were worked in series, very skilled specialists existed and tasks were distributed. Analysing these features makes it possible to identify the masters and ateliers.

I would like to put an end to the idea that a lot of time was needed to create elaborated pieces. It was less than is supposed.

An exemplification of the Renaissance ideals of urban planning: scientific examination for the investigation of the extraordinary panel painting 'The Ideal City' in Palazzo Ducale, Urbino

Rocco Mazzeo[1]*, Giorgia Sciutto[1], Maria Letizia Amadori[2], Sara Barcelli[2], Silvia Bersani[1], Irene Bonacini[1], Brunetto G. Brunetti[3,4], Laura Cartechini[3,5], Emilio Catelli[1], Catia Clementi[4], Marta Quaranta[1], Melissa Palmieri[3], Silvia Prati[1], Francesca Rosi[3,4] and Manuela Vagnini[6]

[1]*Università degli studi di Bologna, Laboratorio Diagnostico di Microchimica e Microscopia*
[2]*Università degli studi di Urbino Dipartimento di Scienze di Base e Fondamenti (DiSBeF)*
[3]*Università degli studi di Perugia, Dipartimento di Chimica*
[4]*Centro SMAArt c/o Università degli studi di Perugia, Dipartimento di Chimica*
[5]*CNR-ISTM c/o Università degli studi di Perugia, Dipartimento di Chimica*
[6]*Associazione Laboratorio di Diagnostica di Spoleto*
*rocco.mazzeo@unibo.it

Despite a variety of attributions, the true author of 'The Ideal City' remains uncertain. Some scholars have argued that it was painted by Piero della Francesca, while the majority opinion continues to favour Duke Federico da Montefeltro's court architect Luciano Laurana (d. 1479) as the artist. There are also two sister panels on the same theme at the Walters Art Museum in Baltimore and the Gemäldegalerie in Berlin.

A contribution to the ongoing attribution studies has been achieved through the use of complementary analytical techniques made available by the teams of three collaborating universities. In particular, portable non-invasive techniques, such as multispectral imaging, X-ray fluorescence, mid-infrared reflectance spectroscopy, X-ray diffraction, UV-VIS spectroscopy in absorption and emission, have been used to extensively investigate painting materials and technique.

The underdrawings highlighted by infrared reflectographic examination are more than simple steady and firm lines executed with fine black chalk. The precision and wealth of execution that prefigures the shapes, volumes and the linear centric perspective of the entire representation cannot be assigned to the hands of a painter, even though fond of geometrical representations such as Piero della Francesca, but rather to an architect used to put in practice the renaissance concept of the representation of the reality.

At the same time, the use of combined molecular and elemental analysis highlighted the use of a complex and sophisticated paint palette where the application of pigments has been mastered in order to achieve the many shaded colours of the architecture. In fact, brown tonalities have been created with the expert and combined use of cinnabar, ochers and earth pigments. The presence of malachite and, surprisingly nantokite, mixed with lead tin yellow has been identified in the background green vegetation. Moreover, the sky, which is characterized by an intense variation of blue tonalities, was found to be composed of lead white, azurite and natural ultramarine as confirmed by stratigraphic analyses which highlighted the presence of two subsequent blue layers applied over a calcium carbonate priming layer and a gypsum ground. The first blue layer is composed of a mixture of lead white with azurite, while the uppermost layer is made up of lead white with natural ultramarine. Such a complex and skilful use of pigments may attest to an experienced Renaissance painter who may not necessarily coincide with the author of the underdrawings.

The research, which is still in progress, foresees the examination of the other two sister panels whose results will certainly help better interpreting those so far achieved on 'The Ideal City' in Urbino.

Reassertion of a Renaissance jewel? : The investigation and interpretation of two enamelled panels from the Wallace Collection

Andrew Meek[1]*, Jamie Hood[1] and Jeremy Warren[2]

[1]*Dept. of Conservation and Scientific Research, The British Museum, London, WC1B 3DG, UK*
[2]*The Wallace Collection, Hertford House, Manchester Square, London, W1U 3BN, UK*
*ameek@thebritishmuseum.ac.uk

Portable objects of devotion from Renaissance France are often found in inventories of the period, but sadly, extant objects are very rare. A possible addition to this rare group of objects exists in the Wallace Collection. This object (Reg.no.: W34) consists of a pair of arched sub-rectangular gold panels decorated on both sides with a combination of *basse-taille* and c*hamplevé* enamelling. These panels probably made up the outer wings of a triptych that, when open, would have faced a now lost centrepiece. They are presently mounted together; pinned and soldered on to a gold frame. The history of this object can only be traced back as far as 1838. Previously it has been suggested that the enamelling techniques and colours used on these panels were inconsistent with the supposed production date of *c*.1500. This has led some researchers to suggest that these panels were produced during the early nineteenth century.

The panels feature Pierre II duc de Bourbon (1438-1503) with St Peter, and Anne de Beaujeu (1460/1-1522) with St Anne on the inner faces, and Charlemagne and Louis IX on the outer faces. The daughter of King Louis XI of France, Anne was regent of France between 1483 and 1491, and an important patron of the arts. The representations on the panels have analogues in paintings contemporary with the supposed date of production. The composition of the inner panels are closely related to very similar groups on the inner shutters of the *Moulins Triptych*, made for Pierre de Bourbon by Jean Hey (the Master of Moulins) *c*.1498. The figure of Charlemagne is similar to that in another work by the Master of Moulins, *c*.1500, *The Meeting at the Golden Gate*. If these panels were indeed produced around 1500 they would provide evidence of interactions between the various specialist workshops operating under the patronage of Pierre de Bourbon and his wife.

The object was submitted to the Department of Conservation and Scientific Research at the British Museum for investigation to discover more information about its date of production. Qualitative compositional analysis was carried out using surface micro X-ray fluorescence analysis. All colours of enamel present, as well as the metals of the panels, frame, pins and solder, were analysed. It was possible to identify and characterise the raw materials used by the workshop which produced these panels. The results provide no definitive evidence that the panels were produced in the nineteenth century. Low magnification examination and radiography of the object also illustrated how the panels had been altered from their original design or use.

Features of dress on the panels, specifically the arms and armour depicted in the panel representing Charlemagne, further supported the probability of a date, based on stylistic comparison, which corresponds to a period from the second quarter of the fifteenth to the early sixteenth centuries, possibly even as tight a date range as *c*.1450–1500. This suggests that the object was either produced in this period, or the maker was heavily influenced by depictions of arms and armour from that period.

This poster will present the results of this study which show that there are no compositional, constructional or decorative features that suggest the panels were not produced in the late fifteenth to early sixteenth century.

Describing the « elusive » : a new Perception of the Practices and the Resources of Illuminators in the North of Europe from the fourteenth to the sixteenth century

Sylvie Neven*

Université de Liège, Département des Sciences historiques, Histoire de l'art et archéologie des Temps Modernes, Quai Roosevelt, 1B (bât. A4), B-4000 Liège, Belgium
Max Planck Institute for the History of Science, Boltzmannstraße 22, 14195 Berlin, Germany
*sylvie.neven@ulg.ac.be, sneven@mpiwg-berlin.mpg.de

Due to their trade value, a huge range of artistic materials are documented and recorded in historical written sources. However, certain substances are not registered in these archives because they did not have a market value. This is especially the case for vegetal species which artists easily found in nature and used for their colouring principles, like anthocyanin colorants. As they are characterized by a great sensitivity to the slightest changes in pH and as they are highly unstable in ordinary daylight, these colorants were not frequently used in the dyeing of quality materials or in painting. Up until now, they have been mainly considered as being used in a domestic context, for the dyeing of everyday clothes. Moreover, after ageing, the plant species are difficult to identify with currently-used analytical methods.

We therefore intend to bring to light these « elusive » substances through the close examination of an original and primordial source: *artistic recipe books*. Our previous researches have highlighted that these books not only describe these organic colorants, but that they also indicate their use in illumination. From the fourteenth to the sixteenth century, hundreds of recipe books containing information relating to these colorants were produced. They describe both their preparation, their diverse applications and the required conditions for their conservation. These recipe books also inform us about the different hues obtained from these colorants.

Our study will involve analysing the significance of these organic substances as well as (re)defining their use with a view to increasing our knowledge of historical artistic practices and materials. Furthermore, it could also help to identify specific artistic productions or workshops. Finally, it would be possible to learn more about the status of artists, their working conditions and their training.

It will be based on a corpus of more than 300 manuscripts from the North of Europe. These texts have been selected because they contain a great number of prescriptions specifically dedicated to anthocyanin colorants. These manuscripts and their content have previously been recorded in a specific database containing records of and information on every recipe in these books. This tool will facilitate their consultation and allow them to be analysed according to different criteria. It will help us not only to observe the recurrence of the recipes dedicated to anthocyanin colorants but also to deduce the availability of these colourants in a chronologically and geographically defined area. It implies the identification of the specific processes and species through the recipe texts. It will also be possible to establish and to compare the different ways in which these colorants were prepared and how they were used in illuminating techniques.

Several series of dummy samples will be prepared from the juice of *Papaver Rhoeas* L. and some *Sambucus* species. They will be characterized by colour spectrophotometry and HPLC, before and after ageing process. The final step will consist of the comparison with historical witnesses in works of art.

Jacobean workshop practise: a technical investigation into a series of portraits of James I attributed to his Serjeant-painter John de Critz

Caroline Rae*

67B Grand Parade, Green Lanes, London, N4 1DU, UK
*carolinejrae@hotmail.com

Due to fortuitous trade relations and, later, the religious persecutions of Protestants by European rulers such as the Spanish Habsburgs in the Netherlands, there was a large influx of émigré artists into England during the Tudor and Jacobean eras.

This essay will examine the materials and techniques used for portrait painting by an Anglo-Netherlandish émigré artist working in England at the time, Antwerp born artist John de Critz (c.1552 – 1642). De Critz was Serjeant-painter from 1605 until his death in 1642 and was a highly prominent figure at the time. However, little technical study has been published regarding his works to date. This in part may be due to the fact that de Critz has an *oeuvre* which is hard to define. Unlike many of his contemporaries, de Critz and his workshop did not appear to sign or inscribe their works, and the size of de Critz's workshop and the demand for portraits of his eminent sitters both at the time and as later copies means that there is huge volume of paintings attributed to his name.

Discussion will focus on a technical examination of portraits of James I attributed to the workshop of De Critz and dated to the first decade of the seventeenth century. This comparative technical study shall focus on a group of portraits of the King which, using documentary evidence, can be strongly associated with the de Critz workshop, and which share significant stylistic similarities between them. The study shall illuminate de Critz's workshop practise, by examining comprehensively his painting technique (including pigments and binding media used, brushwork and the use of painting tools, the use of patterns, underdrawing techniques and the presence of different studio hands). A range of well established methods for the technical study of paintings will be employed in this examination, including X-radiography and infra-red reflectography, with characterisation of the materials using microscopy and instrumental analytical method.

This research is part of my wider research into Anglo-Netherlandish workshop practise in the 1590s and early 1600s, undertaken as part of my ongoing Ph.D (a collaborate venture as part of the 'Making Art in Tudor Britain' project at the National Portrait Gallery, and supervised by Professor Aviva Burnstock in the Dept. of Conservation and Technology at the Courtauld Institute of Art).

Towards a history of the techniques of the Tudor artist's workshop: recent research using a combination of analytical surface microscopy and reconstructions

Libby Sheldon[1], Tarnya Cooper[2], Sophie Plender[2] and Charlotte Bolland[2]*

[1]*University College London*, Gower Street, London, WC1E 6BT, UK
[2]*National Portrait Gallery, St Martin's Place, London, WC2H OHE, UK*
*cbolland@npg.org.uk

Microscopic analysis of sixteenth century British panel paintings, undertaken as part of the ongoing *Making Art in Tudor Britain* research project at the National Portrait Gallery, has revealed the variety of marks and paint textures produced by sixteenth century artists. From blotting and combing, to fine blending, the evidence from close examination of the paintings suggests that various tools and techniques were commonly used within the workshop in order to achieve different surface effects. Furthermore, the choice of drawing tool could make an important contribution to the finished work, whilst the level of detail that could be accomplished in paint indicates that artists were working with magnification. The nature of these methods of paint handling and drawn marks, which were largely invisible to the naked eye, seems to correspond to the principle of perception without awareness in the period eye – that is, perception of the aesthetic effect without being aware of how it had been produced.

In order to further the interpretation of these findings following the presentation of earlier research in this field in the poster 'Combing, texturing and Hidden Effects in sixteenth century Painting' by Sheldon at the National Gallery Conference in 2009 (and recognising the paucity of literature and documentary data referring to workshop tools) a number of reconstruction projects were designed by the authors for execution by students studying the methods and materials of artists at University College London. These projects aimed to replicate both the graphic and painterly effects that had been seen during microscopic examination of Tudor portraits at the National Portrait Gallery. This work has been undertaken in order to investigate the practical implications of different techniques on critical issues affecting the aesthetic finish. The questions investigated included the manner in which it was possible to take up a certain quantity of paint for application with a 'tool', the types of tools that might have been used in the workshop, the ratio of medium to pigment within the paint and systems of transferring designs to panel or canvas. In one case, tools were constructed to investigate combing techniques and their use as a method of manipulating paint that can only be seen under high magnification. In another case study, blotting, which can often be seen in depictions of soft material such as velvet, and which was used to replicate the surface texture of the material, was carried out using different types of cloth in an attempt to make the same type of marks visible under magnification on a particular portrait. This paper will present the findings of these projects, placing them into the wider context of the artist's workshop in order to begin to chart patterns in production and European influences.

An investigation of distinctive materials in a late sixteenth century Bolognese portrait

Libby Sheldon* and Gabriella Macaro

History of Art Dept., UCL, Gower St, London, WC1E 6BT, UK
*l.sheldon@ucl.ac.uk

Analysis of the materials of a late sixteenth century Italian portrait, during its conservation, revealed two distinctive features. The first was an interesting canvas weave with a lozenge-type pattern; and the second was an unusual form of lead-tin yellow employed for the costume highlights. The painting has been attributed to the Bolognese painter, Lavinia Fontana, and is thought to have been painted circa 1585. This poster presents comparative research conducted into the canvases and types of yellow pigment used in works by Fontana, as well as works by other artists of the period, to gauge the singularity or otherwise of these materials.

The use of similar types of diamond-pattern weave have been noted by other researchers for the canvases of sixteenth century paintings in Italy (Veronese, for example); and also in early seventeenth century Spain (Velasquez). Sightings of such canvas weave seem to be more common than presently published data indicates, but findings in relation to this work by Fontana could suggest geographical location of usage or particular reasons for the employment of this rarer type of canvas by a workshop. Similarly, the physical form of the yellow pigment (identified by EDX as containing lead and tin) which is composed of coarse angular particles, might, again, have been noted under conservator's microscopes more often than is apparent from published reports. Patterns of usage are thus examined in this comparative research.

Presentation of these two aspects of the painting raises the question of how far the slightly unusual character of these materials can help in the investigation of attribution, either to a location or to a workshop. Can enough physical evidence be found to differentiate this work from other late sixteenth century paintings? Indeed, the poster hopes to bring forth from the Renaissance workshop other analytical findings, which may support or modify this research.

The Gdansk Painting Workshop at the turn of the sixteenth/seventeenth century

Bozena Szmelter-Fausek*

ul. Gałczynskiego 27/20, 87-100 Torun, Poland
*bozenasz@doktorant.umk.pl

The paper discuses on the Gdańsk Painting Workshop at the turn of the sixteenth and the seventeenth century. It focuses on the workshop practices and the technical aspects of paintings. Workshop of three notable artists of the Golden Age in Gdańsk will be presented: Anton Möller (1563-1611), Isaac van den Blocke (before 1589-after 1624), and Hermann Han (1580-1628). Möller and Han had its own big workshops with apprentices. The examination of paintings by above artists exhibit significant differences between their techniques. Anton Möller mainly painted on oak wood with white chalk-glue ground, and lead white oil imprimatura followed by two to three painting layers, whereas the paintings by Isaak van den Blocke who was Möller's apprentice had white chalk-glue ground and grey imprimatura. The painting technique by Hermann Han is totally different because he used very thin grey chalk-glue ground with lead white and charcoal.

Painting technology and technique as well as the set of materials, including the pigment palette, fit the rules of the sixteenth century European painting workshop. Painters in Gdańsk maintained connections with major cultural centers of Europe of this time. For instance, it is supposed that Anton Möller and Hermann Han visited Antwerp to study works of artists of that place.

The Gdańsk's artists had a great contribution to the formation of the Gdańsk's Painters Guild that was appointed by the City Council of Gdańsk in 1612. The practices of the Guild are known from archives and will be also presented.

The Florentine art of painting on tile in the fifteenth-sixteenth century: evidences from the examination of artworks by Fra Bartolommeo

Deodato Tapete[1]*, Cristina Giannini[2] and Fabio Fratini[3]

[1]*Earth Sciences Department, University of Firenze, Via G. La Pira 4, I-50121 Florence, Italy*
[2]*Dipartimento di studio delle componenti culturali del territorio, Seconda Università degli Studi di Napoli, Italy*
[3]*Institute for the Conservation and Promotion of Cultural Heritage – National Research Council of Italy, Via Madonna del Piano, 10, I-50019 Sesto Fiorentino, Florence, Italy*
*deodato.tapete@gmail.com

Since the fifteenth century, in the Italian art, roof tiles, terracotta and, more generally, brick materials were adopted as artistic support for mobile paintings, curiously exploiting materials and techniques of mural painting. The small size and the low cost of these materials, jointly with easy availability as construction elements left over from building works, presumably favoured their use by artists for (self-)portraits, sacred and mythological representations. Both the application of pigments onto moist plasters following the typical procedure of fresco technique and the execution of details, even the entire depicted subject, by means of secco techniques, seem to testify a strict relationship with the coeval mural painting, as suggested by the evidence that the artists who experienced this type of mobile painting were also expert fresco painters (e.g., Andrea del Sarto, Pontormo, Giovanni da San Giovanni, Il Volterrano). The significant number of painted tiles preserved in the Florentine museums, dated back to the first two decades of the sixteenth century and mainly attributed to Bartolommeo di Paolo del Fattorino, known as Fra Bartolommeo (1472? - 1517), encouraged a specific multidisciplinary study, to figure out how such an interesting artistic production developed and if it actually constituted a workshop practice diffuse in the Renaissance Florence. To achieve this purpose, technical and scientific examination was carried out on the entire corpus of paintings on tile by Fra Bartolommeo, in the framework of co-operation with the Director and technical staff of the Museum of San Marco, Florence, where these paintings are permanently exhibited. In addition to the various style that seems to distinguish these artworks in different groups, nowadays attributed to distinct periods of the painter, the variety of the methods used to apply the plaster layers onto the brick support, the typology of the tiles and the technical features of the paint layers induce to rethink the classification of these paintings, starting from a more correct terminology for the description of the supports and a more precise identification of the manufacturing techniques. The documentary evidence about the provenance of all these tiles from the Convent of Santa Maria Maddalena in Pian di Mugnone (an hospice belonging to the Dominican Order of San Marco located just few metres from the north entrance to Florence) opened to promising results. Here a tile painted by Fra Bartolommeo, representing an *Ecce Homo*, is still inserted within the wall surface of a corridor at the ground floor, providing a reliable proof that the tiles were formerly wall embedded, as recorded by an archival document (1736). The results of the ongoing research on the artistic and building materials of the convent and its surroundings, undertaken in co-operation with Biblioteca Medicea Laurenziana, are shedding new lights on the manufacturing techniques of painting on tile in fifteenth-sixteenth century, whose fortune continued until the Baroque period, as it was appreciated by the Medici family itself to create architectural decorations.

Sixteenth century Netherlandish Workshop Practices: a Technical Investigation of the Copenhagen Version of *Christ Driving the Traders from the Temple*

Hannah Tempest* and Anne Haack Christensen

National Gallery of Denmark / Statens Museum for Kunst, Sølvgade 48-50, 1307 København K, Denmark
*Hannah.tempest@smk.dk

This poster focuses on technical investigation of the 'Copenhagen version' of a sixteenth century composition of *Christ Driving the Traders from the Temple* by followers of Hieronymus Bosch and Pieter Bruegel the Elder. The investigation of this particular painting is set against the backdrop of an international collaborative project, *Tracing Bosch and Bruegel: Four Paintings Magnified*. During this project, four different paintings depicting the same composition, all of which are on panel supports, were researched and investigated. Compelling differences in technique within the four paintings, such as distinctive underdrawing styles and different preparatory layers, are suggestive of separate studios. The research has shed light particularly onto processes of copying and replication in Netherlandish painters' workshops of the mid- to late-sixteenth century. This relates not only to the physical processes involved in replicating an image, but also to the ways in which a commercially successful composition could be passed on and reused by different workshops for the European art market.

In spite of similarities in composition and materials between the four paintings, the Copenhagen version displays several unique characteristics related to the application of the preparation and paint layers. The rough level of finish of the Copenhagen version, which is economically and quickly executed, but with finely painted details suggestive of a skilled artist, may give an insight in to the function of the work. Typical for this version is the presence of a streaky imprimatura which serves an important role in the overall appearance of the painting.

The role of the characteristic layers present in the Copenhagen version as well as the distinct features of the panel support are debated and set against the technical results of the three additional versions of the composition, as well as sixteenth century Netherlandish workshop practice more generally.