LEONARDO DA VINCI:
THE EXPERIENCE OF ART
FRIDAY 25 OCTOBER 2019

L O U V R E
LEONARDO DA VINCI: THE EXPERIENCE OF ART

SYMPOSIUM ORGANISED TO COINCIDE WITH THE “LEONARDO DA VINCI” EXHIBITION (IN THE HALL NAPOLÉON UNTIL 24 FEBRUARY 2020)

In collaboration with the C2RMF, the CNRS, the E-RIHS and IPERION-CH

Scientific and organising committee:

Vincent Delieuvin, Musée du Louvre
Louis Frank, Musée du Louvre
Michel Menu, C2RMF
Bruno Mottin, C2RMF
Élisabeth Ravaud, C2RMF

The Louvre’s Leonardo exhibition and recent unveiling of IPERION CH (Integrated Platform for the European Research Infrastructure On Cultural Heritage) provide the perfect opportunity to present the public with the latest findings of studies on Leonardo’s oeuvre. The fruit of ten years of research carried out across various institutions, these new discoveries will allow greater insight into Leonardo’s unparalleled technique.

PROGRAMME

10 A.M.
Introduction
by Isabelle Pallot-Frossard, C2RMF, and Dominique de Font-Réaulx, Musée du Louvre

Morning
Chair: Vincent Delieuvin, Musée du Louvre

10:15 A.M.
Leonardo’s science and encyclopedic models of his time
by Carmen C. Bambach, Metropolitan Museum of Art, New York

10:45 A.M.
Recent investigations into the Windsor Leonards
by Martin Clayton, Royal Collection Trust, Windsor Castle
11:15 A.M.  
**Three “preparatory cartoons” attributed to Leonardo: the “Portrait of Isabella d’Este”, the “Nude Mona Lisa” and “Head of a Child in Three-Quarter View”**  
by Bruno Mottin, C2RMF

11:45 A.M.  
**Conservation techniques and the shortcomings of literary texts: Giorgio Vasari, a case study**  
by Louis Frank, Musée du Louvre, and Leticia Leratti, painter and sculptor

12 P.M.  
**Using chemical analysis to identify the materials and techniques employed by Leonardo: lead white**  
by Victor Gonzalez, Rijksmuseum, Amsterdam

12:30 P.M.  
**From Verrocchio to Leonardo: scientific and art historical researches in the “Baptism” of San Salvi, the Monteoliveto “Annunciation”, and the “Madonna di Piazza”**  
by Cecilia Frosinini, Opificio delle Pietre Dure, Florence

**Afternoon**  
Chair: Louis Frank, Musée du Louvre

3 P.M.  
**Engineering for artwork conservation: mechanical study of the Mona Lisa’s wooden support**  
by Joseph Gril, CNRS/Université Clermont Auvergne

3:30 P.M.  
**Leonardo da Vinci’s “Benois Madonna”: history and technical examinations**  
by Zoya Kuptsova, State Hermitage Museum, Saint Petersburg

4 P.M.  
**“The Lady with an Ermine (portrait of Cecilia Gallerani)”**  
**Research into Leonardo da Vinci’s painting materials and techniques and the state of preservation of the painting**  
by Julio M. del Hoyo-Meléndez, National Museum in Krakow

4:30 P.M.  
**New insights into Leonardo’s work through scientific imaging**  
by Élisabeth Ravaud, C2RMF

5 P.M.  
**Leonardo’s “Virgin of the Rocks” in the National Gallery, London: new discoveries from macro XRF scanning and hyperspectral imaging**  
by Marika Spring, National Gallery, London

5:30 P.M.  
**“The Madonna of the Yarnwinder – The Lansdowne Madonna”: a hypothesis of Leonardo da Vinci’s influence on the execution of the painted work**  
by Cinzia Pasquali, Arcanes, Paris

6 P.M.  
**Round table**  
**Leonardo’s art**  
Guests: Carmen C. Bambach, Vincent Delieuvin, Louis Frank and Michel Menu
Leonardo’s science and encyclopedic models of his time
by Carmen C. Bambach

The occasion of this conference offers the opportunity for exploring what “science” meant to the great master and his contemporaries, with some questions in mind. The universality of Leonardo’s genius has been among the most enduring topos of our time, both in popular and scholarly writings, and more specifically, the notion of Leonardo the artist-scientist who transcended his time continues to fascinate us. In this process, however, have we sacrificed a more balanced, historical perspective? How do we achieve an understanding of Leonardo’s contribution to “science” that reflects the state of knowledge of his time, and can we see this in a positive light? One of the models of interpretation that I intend to explore arises from a closer look at the major encyclopedia of Leonardo’s time, Giorgio Valla’s De expetendis, et fugiendis rebus, published in Venice in 1501 after that author’s death. It is clear that by 1503-5, a book by Valla was in Leonardo’s possession, as indicated by the artist’s book inventory in the Codex Madrid II. What is it about the themes and construct of knowledge in Valla’s encyclopedia that may have particularly resonated with Leonardo and his work as a painter? Geometry and geometric proof were considered to be a foundation for a number of scientific disciplines in Leonardo’s time.

Carmen C. Bambach is Curator of Drawings and Prints at The Metropolitan Museum of Art; Fellow of the American Academy of Arts and Sciences. She received the Inaugural Vilcek Foundation Prize for Excellence for her contribution to U. S. society and culture as an immigrant, April 4, 2019. Her Michelangelo: Divine Draftsman and Designer accompanying her exhibition at The Met won the Phyllis Goodhart Book Prize of the Renaissance Society of America in 2019, and also from the Association of American Museum Curators in 2018. She was Andrew W. Mellon Professor in 2010-12 at CASVA (Center for Advanced Study in the Visual Arts), National Gallery of Art. Her books include Drawing and Painting in the Italian Renaissance Workshop: Theory and Practice, 1300-1600 (“Premio Salimbeni 2000”). Her Leonardo da Vinci Rediscovered, 4 vols. (Yale University Press), has just been published (July 2019). She has organized several exhibitions at The Met.
**Recent investigations into the Windsor Leonards**

by Martin Clayton

The drawings by Leonardo at Windsor Castle – more than 500 sheets – show the full range of Leonardo’s drawing materials and techniques. Recent scientific investigations conducted by Royal Collection Trust conservators, in collaboration with several other organisations, have allowed a much more precise understanding of the materials that Leonardo used, and the ways in which he used them. These investigations have included microscopy, imaging in infrared and ultraviolet, Raman spectroscopy, X-ray fluorescence, and synchrotron-generated XRF microanalysis. We have been able to analyse the composition of Leonardo’s metalpoints, understanding why some of his metalpoint drawings have faded to invisibility; identify the pigments and dyes of his prepared grounds and watercolours; differentiate his use of leadpoint, charcoal and black chalk for underdrawing, and study those underdrawings in infrared light; examine the different types of paper that Leonardo used; and so on. These investigations are summarised in a book by Alan Donnithorne, *Leonardo da Vinci: A Closer Look*.

**Martin Clayton** is Head of Prints and Drawings for Royal Collection Trust, based at Windsor Castle. He has published widely on the Italian drawings in the Royal Collection, and has curated several exhibitions on the drawings of Leonardo da Vinci, including “The Divine and the Grotesque” (2002) and “Leonardo da Vinci: Anatomist” (2012). During 2019 he has organised 14 exhibitions of Leonardo’s drawings at museums and galleries across the United Kingdom, culminating in the show “Leonardo da Vinci: A Life in Drawing” at the Queen’s Gallery, London. These 14 exhibitions have been seen by more than 1,250,000 visitors. Martin Clayton read both Natural Sciences and History of Art at Cambridge, and since 1990 he has liaised closely with conservators at Windsor in the scientific investigation of Leonardo’s drawings.
Three “preparatory cartoons” attributed to Leonardo: the “Portrait of Isabella d’Este”, the “Nude Mona Lisa” and “Head of a Child in Three-Quarter View” 

by Bruno Mottin

“Preparatory cartoons” are rather different to other old drawings. The last step completed prior to starting the final wall painting, tapestry, easel painting or stained-glass window, they were often purely utilitarian and have worn over time due to repeated use. The attribution of the three pieces studied here has as such been long debated: while the Portrait of Isabella d’Este is currently considered to be an authentic Leonardo, the Nude Mona Lisa remains controversial, and the Head of a Child in Three-Quarter View is probably the work of another artist. The debate surrounding the attribution of these artworks attests to the difficulty of studying them. This presentation will reveal how imaging and scientific analysis techniques provide a wealth of key information, allowing us to better distinguish original materials from later additions or restorations, and to identify different components.

Bruno Mottin is a curator at the Centre for Research and Restoration of the Museums of France (C2RMF). He has published numerous studies on the paintings and drawings of Leonardo da Vinci (Mona Lisa, The Virgin and Child with Saint Anne, The Virgin of the Rocks and the Annunciation) and his entourage.
11:45 A.M.

Conservation techniques and the shortcomings of literary texts: Giorgio Vasari, a case study
by Louis Frank and Leticia Leratti

The second edition of Lives, published by Vasari in 1568, continues to be reissued sacredly. Even the very worst of the copious printing mistakes have been retained devoutly, alongside the poorly inserted interpolations disrupting syntax. But why did the publishers, who in part demonstrate such blind faithfulness to the author, allow themselves to change his words as they pleased elsewhere? One example is the passage of the Life of Leonardo in which Vasari introduces the artist’s large monochrome linen Drapery Studies. Based on the semantic analysis of the body of the Lives publication, the recovered original version of this Life will be presented, offering a new understanding of the text, an interpretation to be tested by means of experimentation.

Louis Frank, an archivist-palaeographer, philologist and Italian Renaissance specialist, is a curator in the Musée du Louvre’s Department of Prints and Drawings. He is currently undertaking research into the critical edition, translation and commentary of the Life of Leonardo da Vinci: Painter and Sculptor of Florence by Giorgio Vasari. Alongside Vincent Delieuvin, he also organised the “Leonardo da Vinci” exhibition.

Leticia Leratti, a painter and sculptor, studies ancient graphic and pictorial techniques, particularly those employed by Leonardo. She authored a reconstruction of the Saint Morys Drapery medallion.
Using chemical analysis to identify the materials and techniques employed by Leonardo: lead white

by Victor Gonzalez

Historical sources record Renaissance painters producing and using a variety of pigments to achieve different pictorial results. Widely used in paintings, inorganic lead white was amongst those revered for their exceptional optical properties. However, despite noting the recipes of their preparations in painting treatises, artists never disclosed the exact quality of the pigments used.

Today, chemical analysis allows us to identify the quality of each pigment in a painting, shedding light on the craft and pictorial techniques of the great masters.

The latest research into Leonardo’s use of lead white will be discussed in this presentation; chemical findings obtained from some of the artist’s greatest works will be compared to the recipes of his time and indications he left in his notebooks.

Victor Gonzalez is a Junior Scientist at the Rijksmuseum Science Department, where he is involved in the scientific analysis of Old Masters materials and techniques, with a focus on ancient inorganic pigments. Prior to this position, he was a post-doc researcher at TU Delft, after obtaining a PhD in Chemistry from the Sorbonne-UPMC University and the Center for Research and Restoration of the Museums of France in Paris.
The comparison among the three images in InfraRed Reflectography of the *Madonna di Piazza* (by Andrea del Verrocchio), the Montecoliveto *Annunciation* (by Leonardo da Vinci), and the San Salvi *Baptism* (by Verrocchio and Leonardo), is aimed at studying the differences and the similarities that characterize Verrocchio and Leonardo da Vinci and their mutual relationship.

Usually in art history their documented attendance is interpreted as Leonardo was educated in art in Verrocchio’s workshop. More probably, considering Leonardo’s age, they were associated in the practice of art. The study of some of the paintings related to the period of their collaboration can produce some interesting results.

Cecilia Frosinini is art historian of the Ministry of Culture, since 1990 at the Opificio delle Pietre Dure, Florence as director of Easel Paintings Department, director of the Wall Paintings Department and director of Paper and Parchment Department. She authored more than 150 scholarly art historical publications and carried out researches on the artistic technique of Piero della Francesca, Masaccio and Masolino, Gentile da Fabriano, Giotto, Leonardo da Vinci, Raphael, Caravaggio. She has presented at international conferences on technical art history, artists’ techniques and conservation at numerous specialized cultural institutions, including: the Metropolitan Museum of Art, the National Gallery (London), the Courtauld Institute (London), the University of Virginia, the Yale University, the Accademia Nazionale dei Lincei, the Kunsthistorisches Institut (Florence) and the Musée du Louvre.

In her publications, she has integrated art historical and technical research with data derived from scientific analysis allowing for the understanding of historic techniques. Her expertise on Leonardo da Vinci includes, many articles and lectures on the artist, the supervision of the conservation treatment on the *Adoration of the Magi* (Uffizi Galleries, Florence) and of the monochrome mural painting in the Sala delle Asse (Castello Sforzesco, Milan). She has been also a member of the Scientific Committee of the conservation treatment of *The Saint Anne* (Louvre, Paris).
Engineering for artwork conservation: mechanical study of the Mona Lisa’s wooden support
by Joseph Gril

Since the Mona Lisa moved into the Salle des États in 2005, its poplar panel has been studied by a team of French and Italian researchers specialised in wood and solid mechanics. To evaluate the artwork’s fragility and provide advice on preventive conservation, they carry out an annual assessment based on a set of methods specially developed over the years. These include taking optical measurements of its shape and the effect of mechanical influences, using crosspieces equipped with instruments to monitor the curvature and strain across the back and measuring the pressure exerted by the rabbet of the frame. From the data collected, virtual models have been created to simulate the effects of hygro-mechanical stress on the artwork, illustrate the need to maintain stable conservation conditions to minimise the risk of damage and consider ways of making improvements to the frame. Thanks to this approach to conservation, drawing on engineering expertise and focusing on individual components, remarkable progress has been made.

Joseph Gril studied at the École Polytechnique and École Nationale du Génie Rural, des Eaux et des Forêts, completed exchanges to the University of Kyoko, and obtained his PhD from the Université Paris VI-Pierre et Marie Curie. He is specialised in rheology and structure-property relationships of wood and has worked as a researcher for the CNRS since 1989—at the Mechanics and Civil Engineering Laboratory in Montpellier up until 2017 and now at the Institut Pascal in Clermont-Ferrand. He has been involved in COST Actions on wood since 1990 and has directed the GDR research group on wood science since 2012, collaborating with partners across Europe, Africa and Asia. He has edited four books and published numerous journal chapters and articles, including 82 for the ISI. He has been a member of the International Academy of Wood Science since 2008 and collaborating member of the French Academy of Agriculture since 2019.
Leonardo da Vinci’s “Benois Madonna”: history and technical examinations
by Zoya Kuptsova

The Madonna with Flower called Madonna Benois was attributed to Leonardo in the beginning of the 20th century by the curator of Imperial Hermitage Carl Liphart. Since the 19th century, before coming in the museum from Benois collection (1914), the painting had experienced by various interventions.

The year of Leonardo is defining moment to unveil Master’s invenzione. Group of tests, provided on the base of the Hermitage Laboratory of technical examinations, demonstrate the original hand of the artist, the exceptional drawing with multitude pentimenti, which demonstrate searching of final composition for Madonna Benois.

Zoya Kuptsova is curator of the Italian Painting of the 13th-16th centuries in the Department of West-European Art of the State Hermitage Museum (Saint Petersburg).

She was the exhibition curator of “Crucifixion by Michelangelo for Vittoria Colonna” and “Noli me tangere by Federico Barocci”.

She authored articles on the works of Giulio Romano, Maso da San Friano, Cavalier d’Arpino, as well as on history of Italian art collections in Russia.

Currently she is working on projects of exhibitions in the Hermitage “Raphael’s Line” (2020-2021), “Florentine art of the XVI century” and “Follow Michelangelo”(2025).
The painting *Lady with an Ermine* is a work of art by Italian artist Leonardo da Vinci from around 1489–1490. The painting was acquired by Prince Adam Jerzy Czartoryski around 1800 in Italy. In 2012, a group of scientists working in various institutions in Poland and abroad conducted the sixth research campaign on the painting focusing on its technological and preservation aspects. The background area was repainted in black, most likely before its sale, in the 18th-century. The original background most likely consists of a preparatory layer showing slight tone modulations obtained using iron-based pigments. The absence of copper-based pigments in the background does not validate the hypothesis of an existing painting hidden under the black repainted zone. A dominance of lead white in brighter parts of the painting was noted, while tonal transitions were achieved using thin layers of an iron-based glaze, in the sfumato technique, which is commonly found in Leonardo da Vinci’s works. Physico-chemical analyses allowed to identify characteristic pigments employed by Leonardo da Vinci such as cinnabar, iron-based, lead-tin yellow, lead white, and ultramarine.

Julio M. del Hoyo-Meléndez holds a PhD in science and conservation of cultural heritage from the Department of Conservation and Restoration of Cultural Heritage of the Polytechnic University of Valencia, Spain. In 2011, he joined as a Research Scientist the Laboratory of Analysis and Non-Destructive Investigation of Heritage Objects of the National Museum in Krakow, Poland. As of January 1, 2017 he holds the position of Head of Laboratory and Head of the National Research Center for Cultural Heritage, both based at the National Museum in Krakow. He is the Editor-in-Chief of the Journal of the American Institute for Conservation since November 2014.
New insights into Leonardo’s work through scientific imaging
by Élisabeth Ravaud

Thanks to an exemplary collaboration with the Louvre Museum, the masterpieces painted by Leonardo da Vinci have benefited for many years from several scientific imaging campaigns. The last one took place in 2018 and 2019 and carried out X-ray fluorescence mapping. The most significant advances or discoveries revealed by these techniques on the process of creation or the painting technique of these paintings will be presented in this meeting on the occasion of the commemoration of the artist.

Élisabeth Ravaud works in the research department of the Centre for Research and Restoration of the Museums of France (C2RMF), coordinating studies and research into easel paintings. She is a doctor, specialist in scientific imagery and holds a master’s degree in art history. She has been studying Leonardo’s pictorial technique for many years and has published articles on several of the artist’s works.
It had already been discovered from infrared reflectography in 2005-2006, and further studies during conservation treatment in 2008-2010, that beneath the surface of the London Virgin of the Rocks a quite different version of the composition had at first been drawn. The Virgin was higher up on the panel in a different pose, looking across to the right and slightly down, with her left hand placed gracefully on her chest. There were also some other tantalizing lines that seemed to be related to this first phase of drawing, but not enough to be able to discern any further figures. In January 2019 the opportunity arose to re-examine the painting with the Gallery’s macro-X-ray fluorescence scanner and hyperspectral imaging system built in-house. Further features of the first composition, including a Christ Child and angel beneath what are now rocks and landscape at the right, were revealed with these new techniques, which remarkably were drawn with a material containing zinc. This talk will describe the new findings, placing them in the art-historical context, and discuss how they extend our knowledge of the evolution of the painting during its production.

Marika Spring is Head of Science and Head of Research at the National Gallery, London. She joined the Scientific Department there in 1992, after a first degree in Natural Sciences and a postgraduate degree in the conservation of paintings, both from Cambridge University. Her research field is the study of historical painting techniques and materials, including technical studies of specific schools of painting (particularly from the fifteenth and sixteenth century period), deterioration of historic pigments, the history and use of certain painting materials and new emerging instrumental methods for analysis or examination.
“The Madonna of the Yarnwinder – The Lansdowne Madonna”: a hypothesis of Leonardo da Vinci’s influence on the execution of the painted work

by Cinzia Pasquali

In April, 1501, Fra Pietro da Novellara, head of the Carmelites, visited Leonardo’s workshop at the bequest of Isabella d’Este, Marquise of Mantua. It is at this occasion that he saw and described a painting in progress, a Madonna of the Yarnwinder destined for Edmond Robertet, a favorite of the king of France. Since then, virtually all trace of the work has been lost. To this day, two “first versions” are known: the Madonna of the Yarnwinder belonging to the Duke of Buccleuch, and the “Lansdowne” Madonna, named after one of its owners.

From the 1930s until now, different scientific research campaigns have been carried out on the two works. Numerous publications have likewise tried to analyze, in the light of discoveries, the existence and the extent of Leonardo’s involvement and, above all, to know if one of the two works was a copy of the other or if both were copies of an original now lost.

The restoration of the Lansdowne Madonna, begun in 2016, after a long study at the Opificio delle Pietre Dure of Florence, reveals, despite the vicissitudes of the work’s original material, a technique comparable to that of Leonardo.

The intervention that took place in Paris was performed by Cinzia Pasquali, guided and directed by the Opificio delle Pietre Dure of Florence (Marco Ciatti, Cecilia Frosinini, and Roberto Bellucci) and was part of a study of the different versions of the Madonna of the Yarnwinder, organized by Vincent Delieuvin, with the participation of Mo-LAB, Iprion-CH, and the Opificio delle Pietre Dure. The first results of this research and restoration are presented here.

Graduate from the Istituto Superiore per la Conservazione ed il Restauro (ISCR) with a focus on mural, canvas, and panel paintings, stone and architectural surfaces and a Master’s degree in the Science and Techniques of the Conservation of Cultural Heritage from the Université Sorbonne Nouvelle Paris III, Cinzia Pasquali has been working in France since 1990. She has directed monument sites such as the Gallery of Apollo in the Louvre and the Hall of Mirrors at Versailles. Over the years, she has collaborated regularly with the Centre de Recherche et de Restauration des Musées de France (C2RMF), where she has restored Italian Renaissance work such as Bronzino’s Lamentation over the Dead Christ (Museum of Besançon) and Piero di Cosimo’s Portrait of Simonetta Vespuccio (Condé Museum, Chantilly). In 2010, she was charged with the restoration of Leonardo da Vinci’s The Virgin and Child with Saint Anne (Louvre Museum, Paris). Along with Roberto Bellucci, she has recently begun the restoration of Bacchus (Saint John the Baptist), attributed to the workshop of Leonardo and conserved in the Louvre Museum.
6 P.M.
ROUND TABLE

Leonardo’s art

Guests: Carmen C. Bambach, Vincent Delieuvin, Louis Frank and Michel Menu

Vincent Delieuvin is executive curator of Italian 16th-century paintings at the Louvre. He has organized several exhibitions on the Italian Renaissance: “Titian, Tintoretto, Veronese: Rivals in Renaissance Venice” in 2009, and “Late Raphael” in 2012-2013. More recently, he published several articles on Leonardo da Vinci and curated the exhibition “Saint Anne, Leonardo da Vinci’s Ultimate Masterpiece” (2012). He is currently organising the exhibition celebrating the 500th anniversary of Leonardo’s death in France.

Michel Menu holds a PhD in physics and optics from Sorbonne University and is an accredited research supervisor. He is currently the head of the research department of the Centre for Research and Restoration of the Museums of France (C2RMF) of the Ministry of Culture. His research focuses on the study of colour in artworks, looking at chemical characterisation but also physical-mechanical properties (colour, appearance, nano-indentations, rheology, etc.), which provide key information to understanding the creation process and intentions of artists in order to ensure proper conservation. He writes and works in close collaboration with a number of contemporary artists, including Sarkis, Pierre Buraglio, Marie-Ange Guilleminot, Claudie Hunzinger and Michel Paysant. He has also published over 200 scientific articles and books, including Grünewald (F.-R. Martin, M. Menu and S. Ramond, 2012, Paris), Leonardo da Vinci’s technical practice (2014, Paris), and Art et science: l’or des œuvres (2017, Fondation Calouste Gulbenkian).