

2025

13/02

9:00-18:00

**CENTRO CONGRESSI
"LE BENEDETTINE"
PISA, ITALY**

ORGANIZED BY

Ilaria Bonaduce (University of Pisa), Francesca Pincella (Kyoto University), Diego Tamburini (British Museum), Keito Mineo (Kyoto University), Erika Forte (Kyoto University), Associazione Italiana di Archeometria

SUPPORTED BY

TOSHIBA International Foundation, International Joint usage/ Research Center (iJURC) of the Institute for Chemical Research, Kyoto University, Research Unit for Realization of Sustainable Society (RURSS), Kyoto University

PAST, PRESENT AND FUTURE OF ASIAN LACQUER

I N V I T E D S P E A K E R S

**ILARIA BONADUCE
& DIEGO TAMBURINI**

University of Pisa, Pisa
British Museum, London

MARTA BOSCOLO MARCHI

Museum of Oriental Art, Venezia

**AURORA CANEPARI
& ROSSELLA PANARELLA**

Oriental Art Museum E. Chiossone, Genova
University of Padova, Padova

KEITO MINEO & BEILING WU

Kyoto University, Kyoto

VALENTINA PINTUS

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JONAS VEENHOVEN

Royal Institute for Cultural Heritage, Bruxelles/Brussel

MASAMI YAMADA

Victoria and Albert Museum, London

KEYNOTE LECTURE AND URUSHI DEMONSTRATION

YUTARO SHIMODE

Kyoto Sangyo University, Kyoto

PAST, PRESENT AND FUTURE OF ASIAN LACQUER

I N T R O D U C T I O N

The aim of this workshop is to rediscover Asian lacquer, both as a treasured material of the past, gracing the halls of museums and private collections worldwide, and as a forward-looking medium that can contribute to a more sustainable future.

First of all, what is Asian lacquer?

Asian lacquer is a natural material obtained from the viscous sap of lacquer trees. It is historically diffused in various East-Asian countries, such as China, Korea and Japan, where *Toxicodendron vernicifluum* is the source for urushi; Vietnam, where *Toxicodendron succedaneum* is tapped to obtain lacci; and Myanmar and Thailand, where *Gluta Usitata* gives thitsi [1]. The chemical composition of the lacquer entails a water-in-oil emulsion composed of alkylcatechols (60-80%), water (10-30%), polysaccharides (3-6%) and enzymes (2-3%) [2].

Past, present and future of Asian lacquer

The use of lacquer dates back to the Neolithic. Since then, urushi has been applied for both practical and aesthetic purpose, acting as a precursor to the modern synthetic polymer technology and industry and an art form [3]. Urushi can preserve and protect the underlying material, but also allows for an artistic finish. Traditionally, the adhesive properties of liquid lacquer have also been important for its use in famous techniques such as kintsugi, gold leaf stamping and maki-e.

More recently, applications of urushi in biomedical research and electronics have been proposed and successfully demonstrated. Some recent examples of unconventional applications are in antimicrobial multilayer films [4], as dentin adhesive for dentistry applications [5], as a potential active ingredient for anticancer drugs [6], as a coating layer for do-it yourself circuit design and complex circuit patterning [7], as a functional support to build circuits for human-computer interactions and other applications [8].

Natural urushi: opportunities and challenges

Despite its many remarkable properties, currently, several limitations exist to the use of urushi, most notably its cost, and the need for highly skilled labor to manually collect the raw sap and process it. Traditionally, the lacquer tree must be at least 12 years old before the sap is collected and the harvest lasts for about 6 months, from June to November. The sap is collected by first removing the outer bark of the lacquer tree, and then making incisions in the phloem, from which the sap exudes, at 5-day intervals.

According to the Japanese Ministry of Agriculture, Forestry and Fisheries, currently only 9% (2 ton) of the urushi circulating in Japan is produced domestically, while 91% is foreign-produced, mostly originating from China. In 2015, the Agency for Cultural Affairs of Japan has required that all national treasures and important cultural properties are restored with domestically grown urushi. This became a trigger for the increase of urushi production and attention to urushi in Japan.



Figure 1 From left to right: urushi tree showing the incisions performed for urushi tapping and the tools needed to collect urushi.

The composition and polymerization of natural urushi

Urushiol, the main component of natural urushi, is a mixture of alkylcatechols with various degrees of unsaturation.

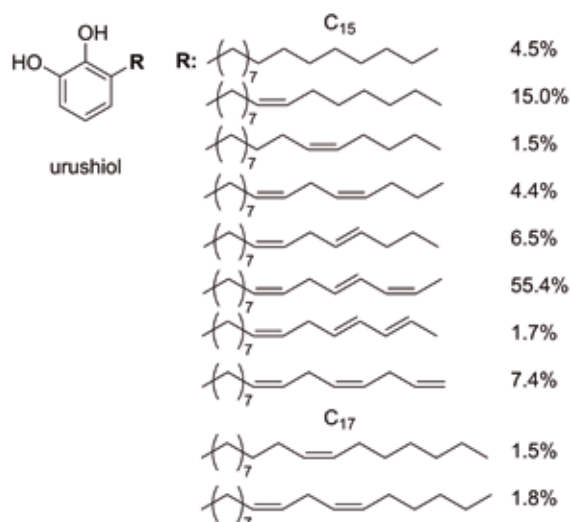


Figure 2 Molecular structure of the main components of natural Japanese urushiol. The main urushiol compounds differ for the structure of the R group (alkyl chain, shown on the right) attached to the aromatic “head” (catechol group, shown on the left). Different chain lengths (15 carbons or 17 carbons) and different number and position of the double bonds in the chain can be identified. The relative abundance of the various urushiol compounds was reported in ref. 9.

The degree of unsaturation is very important for the ability of urushiol to form a complex cross-linked material upon drying: the double bonds in the aliphatic chain participate in the polymerization of urushiol, which results in a complex three-dimensional structure that cannot be easily broken down with heat or acids or organic solvents. The resulting hardened, durable and inert film is what makes urushi so unique and long-lasting and allows us to enjoy a bounty of well-preserved ancient artifacts.

The genesis of this workshop: urushi in art, conservation and heritage science.

There are still many open questions regarding the chemistry of urushi, its polymerization and its interaction with different compounds and materials. The availability of synthetic urushi might be beneficial to deepen our understanding of the composition and chemical processes in natural urushi samples and develop new optimized urushi-based materials for novel applications.

Another challenge relates to knowledge being spread among few experts working in various different fields, from artists to archaeologists to heritage scientists to museum curators to agronomists to chemists and material scientists. Currently, the scientific community agrees that the precise reproduction of traditional lacquer formulations and development of new improved techniques is extremely difficult, mostly due to different types of knowledge, such as chemical, historical, practical, etc., needed to understand these extremely complex systems.

Therefore, our multidisciplinary effort stems from the question “how can we get together and solve some of the most urgent challenges concerning urushi?” and aim to benefit the whole urushi community and society at large.

With this question in mind, a group of researchers at the institute for Chemical Research, Kyoto University has started to reach out to several experts who work with urushi and, in addition to enthusiastic responses, we have also encountered new open questions and new challenges.

Artists and archaeologists raised limitations in analytical techniques available to analyze and identify such a complex polymerized material, especially non-destructively. Heritage scientists, especially the large community of experts based at universities and museums in Western countries, who have access to vast collections of exported urushi artefacts, identified the limited access to traditional comparative materials for their studies. Conservators expressed interest in the traditional knowledge of urushi art, which is often transferred orally from master to apprentice and is difficult to access outside of the few countries where most of the urushi artists operate.

Following the positive feedback and enthusiasm, in December 2022, a hybrid workshop titled “Past, present and future of Asian lacquer: urushi from art to electronics” was organized by the original group of researchers, with the support of the Cross-sectoral Research Platform Development Program of the Center for Promotion of

Interdisciplinary Research and Education at Kyoto University (<https://research.kyoto-u.ac.jp/workshop/w113/>). The workshop spurred an international collaboration with the aim to improve our understanding and characterization of natural urushi and synthetic lacquer-mimicking materials in artefacts by using state-of-the-art techniques available at the different laboratories. Following the first hybrid workshop, experts from Italy and the UK were invited to Kyoto, Japan to have a hand-on experience of urushi processing and application. The scientists visited a lacquer store in Kyoto, Tsutsumi Asakichi urushi shop (<https://www.tsutsumi-urushi.com/en/urushi-research>), and had the opportunity to see first-hand the refining processes that transform raw urushi into sugurome urushi and colored urushi. This brief but intense exchange cemented our belief that many heritage scientists, conservators and material scientists, especially the ones based at institutions abroad, would benefit from a direct access to traditional urushi materials and knowledge, and, at the same time, local artists and urushi producers would benefit from easy access to advanced analytical techniques available at research laboratories in Japan and abroad.

For this purpose, our team has decided to organize this workshop in Pisa, Italy on February 13 2025. The workshop will hopefully serve to gather experts from various research fields interested in the use of urushi, showcase the research happening in Europe and Japan, provide practical knowledge on urushi, and expand the community of artists, researchers and students interested in urushi. It is noteworthy that a time of heightened awareness about our environmental impact, consumption patterns, and the revival of ancient materials and traditions, interest in urushi is growing..: A different workshop and training on urushi also took place in Venezia, Italy in September 2024 (https://ivbc.it/lacca-giapponese_urushi/) organized by the Istituto Veneto per i Beni Culturali, while the Getty Conservation Institute has just completed in April 2024 a workshop at the Palace Museum in Beijing, China (<https://www.getty.edu/projects/recent-advances-characterizing-asian-lacquer/radical-workshop-2024/>) within the framework of their project “Recent Advances in Characterizing Asian Lacquer (RADICAL)” (https://www.getty.edu/conservation/our_projects/education/radical/)

Conclusion

Our team believes that there is remarkable value in better understanding and studying an ancient material such as urushi, because, as researchers, we still have a lot to learn about this durable and precious material, and as a society, we can still benefit from its exceptional properties. Furthermore, experts from different fields are required to join their forces and contribute with their efforts to the understanding of such a complex material, but this multidisciplinary effort will also have positive repercussions on many fields. Understanding our past can truly provide a new pathway for a sustainable future.

Acknowledgements

The organizing committee would like to acknowledge the gracious support of the Toshiba International foundation, iJURC, RURSS, COI-NEXT, and Toyota Riken scholar program for their support.

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P R O G R A M

OPENING REMARKS (09:00 – 09:10)

SESSION

1.

LACQUERS IN MUSEUM
COLLECTIONS
(9:10 – 10:10)

Chair: **Erika Forte**

Masami Yamada

(Victoria & Albert Museum, London): *“Collecting Contemporary Japanese Lacquer at the Victoria & Albert Museum”*

Marta Boscolo Marchi

(Musei Nazionali Veneto, Venezia, Italy): *“Lacquers at the Museum of Oriental Art in Venice: Historical Setting and Conservation Issues”*

SESSION

2.

SCIENTIFIC CHALLENGES
IN LACQUER RESEARCH
(10:30 – 12:00)

Chair: **Francesca Pincella**

Diego Tamburini (British Museum, London) and **Ilaria Bonaduce** (University of Pisa, Pisa):

“Challenges in the Identification of Asian Lacquers in Historical and Archaeological Objects”

Jonas Veenhoven (Royal Institute for Cultural Heritage, Brussels):

“Biochemical Modification of Native Polysaccharides in Cured and Aged Asian Lacquers”

Keito Mineo and Beiling Wu (Kyoto University, Japan):

“Natural and Synthetic Urushi: Present State and Future Perspectives”

SESSION

3.

MATERIAL DEGRADATION
AND CASE STUDIES
(13:15 – 14:45)

Chair: **Diego Tamburini**

Valentina Pintus (Institute of Science and Technology in Art, Academy of Fine Arts, Vienna):

“Challenges in Understanding Ageing and Degradation Phenomena of Asian Lacquers Through Scientific Methods: Current Progress”

Chiara Ricci (Centro Conservazione Restauro “La Venaria Reale,” Torino, Italy):

“Identification of Asian and European Lacquers on Cultural Heritage Objects: Case Studies from the CCR ‘La Venaria Reale’”

Aurora Canepari (Museo Chiossone, Genova) and **Rossella Panarella** (University of Padova, Padova):

“Crossing Scientific and Archaeological Data to Characterize Chinese and Japanese Lacquers from the Museum of Oriental Arts Edoardo Chiossone in Genova”

PLENARY LECTURE AND
DEMONSTRATION
(15:00 – 17:50)

Chair: **Keito Mineo**

Yutaro Shimode (Kyoto Sangyo University, Kyoto):
“Maki-e: Techniques and Historical Significance”

Language: Japanese, with English consecutive interpretation

CLOSING REMARKS (17:50 – 18:00)

Francesca Pincella and Erika Forte



ILARIA BONADUCE

Associate Professor, Department of Chemistry, University of Pisa

I am an Associate Professor in Analytical Chemistry at the Department of Chemistry of the University of Pisa and received my PhD in Chemical Sciences from the University of Pisa in 2006. My research focuses on characterization and identification of organic materials in painted samples and archaeological polychrome objects. The aim is to reconstruct painting techniques, artistic practice, and technologies of the past, and to understand the chemical and physical processes involved in paint film formation, ageing and degradation. I work mainly with mass spectrometry, chromatography and analytical pyrolysis. In close collaboration with experts of thermoanalytical techniques, atomic and molecular spectroscopies, art history and conservation, we implement methodological approaches to analyze precious samples from artworks, to produce and study materials to model paint layers, and to assist the development of conservation treatments.



DIEGO TAMBURINI

Scientist, British Museum, London

The study and identification of organic materials in culturally significant artifacts is a complex field, laden with methodological, ethical, and interpretative challenges. Among these materials, Asian lacquers stand out for their rich history, spanning over 10,000 years, during which production techniques have evolved significantly. Despite these changes, the primary component of Asian lacquer remains constant: a natural polymer derived from select trees within the Anacardiaceae family. This presentation summarises the intricate

chemistry of Asian lacquers and the analytical hurdles it poses, such as the scarcity of reliable reference materials, the need for specialised molecular databases, and the limitations of current analytical technologies. Particularly, the highly complex mixtures of natural and inorganic materials commonly found in lacquer formulations, along with the frequent presence of restoration materials, often complicate the accurate identification of Asian lacquers in museum objects. Through a series of challenging case studies centred on museum artifacts, this talk will explore these obstacles, offering insights into the enduring complexities of analysing Asian lacquer in the context of cultural heritage.



MARTA BOSCOLO MARCHI

Museum Director, Museum of Oriental Art, Venezia

Marta Boscolo Marchi has been director of the Museum of Oriental Art in Venice since 2015. A graduate from Bologna, she then obtained postgraduate and PhD degrees in medieval art history at the University of Padua. She has been working on Asian art since 2012 and has directed many conservative interventions. Her interests range from medieval art, restoration, collecting and Japanese art. During the years 2018-2021, she was an adjunct lecturer in History and Technique of Restoration at the Department of Cultural Heritage of the University of Padua. She is the author of numerous articles and an important monograph on Ferrara Cathedral in the medieval period.



AURORA CANEPARI

Head Curator, Oriental Art Museum E. Chiossone, Genova

Graduated in East Asian Languages and Cultures at Ca' Foscari University of Venice, with a specialization in Japanese language and culture. Since

2015 she has collaborated with the Museo d'Arte Orientale 'E. Chiossone' in Genoa where, since 2018, she has held the role of scientific director and curator in charge. She is involved in various curatorial projects and temporary exhibitions, both for the Chiossone Museum and for external entities, committed to the dissemination of Japanese art and culture. Among the latest exhibitions curated for the Chiossone Museum we find "Chiossone e il suo Giappone" [eng: "Chiossone and his Japan"] in 2023, "Poeti ed eroi. Dal pennello alla spada" [eng: "Poets and Heroes. From the Brush to the Sword"] in 2024, "Il Giappone Antico. L'alba del Sol Levante" [eng: "Ancient Japan. The Dawn of the Rising Sun"] in 2024. She is a member of ICOM and AISTUGIA.



ROSSELLA PANARELLA

Student, University of Padova

Rossella Panarella is an archaeologist specialized in studying contacts between Korea and Japan since Prehistory. She started investigating coastal communities and human migration in East Asia, with special focus on Korean influence and migration in Japan during the Yayoi 弥生時代 (900/600 BC-300 AD) and Kofun 古墳時代 (III-IV c. AD - VIII c. AD) Periods, using the archaeological site Aoya Kami-jichi 青谷上寺地遺跡 in Tottori Prefecture 鳥取県, on the Eastern coast of Honshū 本州 Island, as case study.

She then graduated in Applied Sciences to Cultural Heritage, materials and sites at University of Padova. Thanks to the acquired knowledge on invasive and non-invasive scientific methods, she adopted a mixed approach to investigate Bronze Protohistoric Objects and more recent Lacquerwares preserved at the Museum of Oriental Arts Edoardo Chiossone in Genoa, coupling scientific data with archaeological resources to shed light on Chinese, Korean and Japanese metallurgy and Lacquerware production.



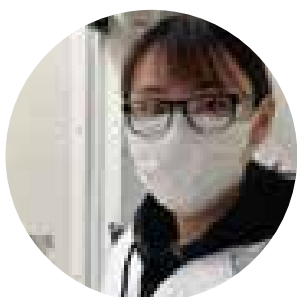
KEITO MINEO

Project-specific Assistant Professor, Institute for Chemical Research, Kyoto University

Keito Mineo is a program-specific Assistant professor at the Institute for Chemical Research at Kyoto University. He specializes in forest policy, environmental policy and cultural economics.

During his doctoral course, he researched about policy measures to sustainable supply of large-diameter timber for use in traditional wooden buildings in Japan.

At his current affiliation, he is pursuing transdisciplinary research and practice towards the realization of a "forest chemical industry", with a particular focus on sustainability transitions and forests.



BEILING WU

PhD Student Institute, Chemical Research, Kyoto University

Beiling WU is a 2nd year PhD student in the Department of Engineering in Energy and Hydrocarbon Chemistry, enrolled at the Institute for Chemical Research at Kyoto University. She specializes in organometallic reactions and chemical synthesis studies.

She is currently developing the possible new reaction for the total synthesis of urushiol, and researching the synthesis of different urushiol analogues.



VALENTINA PINTUS

Senior Conservation Scientist, Louvre Abu Dhabi

Dr. Valentina Pintus is a Senior Conservation Scientist, who has recently joined the Scientific Research Unit of the Louvre Abu Dhabi (LAD) in the UAE for the Organic Division. Before this, she worked as Senior Conservation Scientist at the Institute for Natural Sciences and Technology in the Arts and as a Senior Lecturer at the Institute for Conservation-Restoration, Modern-Contemporary Art, both at the Academy of Fine Arts Vienna, where she started her career in 2009. She is also team member of the Heritage Science Austria platform. She received her PhD in Natural Sciences (2012) at TU WIEN with previous bachelor's and master's degrees in Conservation Science at the Universities of Cagliari and Bologna, respectively. With strong expertise in natural and synthetic organic materials and with enduring collaborations with several international institutions, she has been involved in numerous national and international research projects focused on the investigation of synthetic organic polymers, as well as traditional organic materials and Asian lacquers, resulting in numerous peer-reviewed international publications. Additionally, she was a project leader on a study of the impact of LED lights on modern paints. Valentina is an Associate Editor of *Conservar Patrimonio*, a Review Editor in *Frontiers in Materials-Environmental Degradation of Materials* and guest editor of the Special Issue *Polymeric Materials in Modern-Contemporary Art of Polymers*. Languages Spoken: English, German, and Italian.



CHIARA RICCI

Scientist, Centro Conservazione e Restauro "La Venaria Reale", Torino

Conservation scientist, graduated from the University of Turin in Materials Science for Cultural Heritage. In 2020, she earned a PhD in Cultural Heritage Protection in collaboration with the University of Vigo, Spain. After graduation she stayed some months at foreign research institutions for internships, such as at the Getty Conservation Institute (Los Angeles, USA) and the Instituto del Patrimonio Cultural de España (Madrid, Spain). She currently works at the scientific laboratories of the Centro Conservazione e Restauro "La Venaria Reale," where carries out research activities and scientific investigations on several heritage materials with a multi-analytical approach.



JONAS VEENHOVEN

PhD Researcher, Royal Institute for Cultural Heritage, Bruxelles/Brussel

Jonas Veenhoven is a joint PhD candidate at the separation science group of Ghent University, the conservation and restoration research group at the University of Amsterdam and the paintings lab of the Royal institute for cultural heritage in Brussels Belgium (KIK-IRPA). He focusses on the molecular characterisation of Asian lacquer natural polymers and the evaluation of cleaning approaches on these polymers using chromatography and mass spectrometry. Currently he is also appointed as a chromatographer at the textiles lab of KIK-IRPA for the identification of natural dyes used in Baltic region as part of an EU funded project Colour4CRAFTS.



MASAMI YAMADA

Curator, Victoria and Albert Museum, London

Masami Yamada is Curator of Japanese Art in the Asia Department at the Victoria and Albert Museum,

where she oversees the museum's renowned collections of lacquerware, netsuke, ukiyo-e woodblock prints, and contemporary crafts. She contributed extensively to the exhibition "Kimono: Kyoto to Catwalk" (2020) at the V&A. She is the co-author of the book *Fashion and the Floating World: Japanese Ukiyo-e Prints* (2024) with Anna Jackson, further exploring Edo period fashion culture. More recently, she co-curated "Japan: Myths to Manga" at Young V&A (2023–24), which is currently touring the United States. Her current research focuses on the innovative use of centuries-old craft techniques in Japan, especially the production and use of urushi (lacquer). In 2022, she received the Art Fund's Sir Nicholas Goodison Award for Contemporary Craft to develop the museum's collection of 21st-century Japanese lacquer.



YUTARO SHIMODE

**Professor Emeritus,
Kyoto Sangyo University**

Yutaro Shimode is a Professor Emeritus at Kyoto Sangyo University, Kyoto, Japan and the third Head of Shimode Maki-e Shisho (Shimode Maki-e Studio).

He was born in Kyoto in 1955 and graduated from the Department of Letters, Doshisha University. He received his Ph.D degree from Kyoto Institute of Technology with the dissertation entitled "Research on the Physical Properties of Lacquer Beauty and Traditional Lacquer Painting Methods".

His works include maki-e on the rituals of the Accession to the Throne and the Daijo-sai Festival, maki-e on the treasures of the Ise Jingu Shrine, and the "Whisper of Eternity" on the decorated stand of the Kyoto State Guest House.

His research focuses on maki-e, the Japanese craft that combines lacquer and gold, and on the 9,000-year history of Japanese lacquer culture. In recent years, he has also explored new lacquer materials in cooperation with various companies. In his educational activities, he provides lectures at universities and other educational institutions, and focuses on passing on maki-e skills to the next generations.

Abstract

Maki-e is a technique in which a picture is drawn in lacquer and then sprinkled with various metal powders, such as gold or silver powder, to bring the pattern to the surface. Kyo maki-e has been refined by many craftsmen in Kyoto, the capital of Japan from the 8th to the 19th century, and has become a delicate and elegant traditional craft representative of Japan.

The beauty, technical excellence, and historical significance in both Asia and Europe of maki-e, which has been handed down from generation to generation, will be presented in the talk.

