French-Japanese Workshop

“Science for Conservation of Cultural Heritage”

Thursday 4 & Friday 5 November, 2010

Auditorium Marie Curie du CNRS,
3 rue Michel-Ange - 75794 Paris

Science for Conservation of Cultural Heritage is organized by:

French Ministry of Culture and Communication, CNRS and JSPS

Scientific Organizers : Nobuyuki KAMBA , Michel MENU

Organizers : Gilberte CHAMBAUD, Christophe DESSAUX, Yoichi NAKATANI
Monique BENOIT, Pascal BREUILLES, Daisuke KITOBA, Satoko TADA

Secretariat : Naoto HAMADA, Laure FOUBERT

Video of the forum is available on Canal U, the web-TV of French Ministry of Higher Education and Research: http://www.canalc2.tv/

PROGRAM

1st Day (Thursday, 4 November)

8:30- **Registration**

9:00-9:30 **Welcome remarks**

Chairpersons: Yoichi Nakatani, Minh-Hà Pham-Delègue

- Kazuya OGAWA	Minister of Embassy of Japan in France
- Jean-Luc CLEMENT	Adviser on Research Affairs, Office for European and International Relations and Cooperation, French Ministry of Higher Education and Research
- Donatienne HISSARD	Deputy director, Department of Mobility Policy and Attractiveness, French Ministry of Foreign and European Affairs
- Christophe DESSAUX	Director of the Department of Research, French Ministry of Culture and Communication
- Gilberte CHAMBAUD	Director of Institute of Chemistry, Centre national de la recherche scientifique (CNRS)
- Takayoshi SEIKI	Executive Director, Japan Society for the Promotion of Science (JSPS)

9:30-11:00 **1st Session – General overview**

Chairperson: Christine Shimizu

- Nobuyuki KAMBA: "Primary care and practice of conservation"
- Michel MENU: "Non invasive methods to the examination and analysis of paintings: Recent developments and restrictions"

11:00-11:30 **Coffee Break**

11:30-13:00 **2nd Session**

Chairperson: Jacques Lafait

- Mikio TAKANO: "Science in the reddish Hidasuki pattern of the Bizen potter"
- Joseph GRIL & Misao YOKOYAMA: "Contribution of mechanical engineering to wood conservation"

13:00-14:30 **Lunch time**

14:30-16:00 **3rd Session**

Chairperson: Jacques Lafait

- Kaori FUKUNAGA: "Terahertz technology applied to art conservation science"
- Albert Claude BOCCARA: "Optical slicing of paints by light computed tomography"

16:00-16:30 Coffee Break

16:30-18:00 4th Session
Chairperson: Jacques Lafait
- Ari IDE: "Development of digital image scanners and spectroscopic analysis of Asian paintings"
- Serge BERTHIER: "Nano photonic in nature and art: a brief overview"

2nd Day (Friday, 5 November)

8:30- Registration

9:00-10:30 5th Session
Chairperson: Jacques Castaing
- Yoshihiko YAMASHITA: "An interdisciplinary project for conservation of Mazarin chest"
- Anne-Solenn LE HÔ: "Museum Asian lacquerware: chemical biomarkers of origin and alteration"

10:30-11:00 Coffee Break

11:00-12:30 6th Session
Chairperson: Jacques Castaing
- Yuko TSUCHIYA: "Development of oil painting in Japan and its conservation"
- Aurélia CHEVALIER: "Laser assisted removal of lining glues from easel paintings"

12:30-14:30 Lunch time

14:30-16:00 7th Session
Chairperson: Jacques Castaing
- Naoko SONODA: "Preventive conservation for museum collection"
- Bertrand LAVEDRINE: "Researches on paper and ink at the CRCC"

16:00-16:15 Closing Remarks
- Nobuyuki KAMBA Head of Conservation, Tokyo National Museum
- Michel MENU Head of Research Department, C2RMF, Paris
- Yoichi NAKATANI Director of JSPS Strasbourg Office

FORUM ABSTRACTS

1st Session

Primary care and practice of conservation

Nobuyuki KAMBA
Tokyo National Museum, Japan

A total of some 15 specialists, comprising full-time, part-time, and also external contract professionals, are assigned in the Conservation Division of Tokyo National Museum, and are engaged in conservation projects with the goal of securing the safety of works and of ensuring that these works are handed over to the future generations. In the division, in liaison with other projects of the museum, we provide skills and knowledge in the process of adjusting projects to a safe level for the museum collection and borrowing objects, and also in stabilizing the conditions of them, specifically through dealing with visible risks such as treating damaged works, and through preventing invisible risks such as securing safe transportation.

While the science on deterioration phenomena and the science on materials and techniques have the mission of conducting research, Primary Care has the mission of performing management of conservation and utilization of cultural properties in deteriorated conditions with high expertise. Specialists practising conservation as a science are known as conservation scientists whereas those practising primary care are called conservator. Primary care signifies conservation activities based upon the fundamental principles of effective implementation of conservation treatments in the initial stage, absolute warranty of cure as required, and conservation of cultural properties and their conservation in view of their public display. It refers to foresighted conservation as well as comprehensive conservation.

The paper introduces our recent challenges referring to 1) an investigation of a research on the concentration of indoor atmospheric contaminants in exhibition and storage rooms, 2) a measurement and analysis of global transportation environment of a packing case, 3)study on a primary care system for sustainable access and preservation of cultural heritage in museums, 4) a study of the prevention of the overturning of cultural properties as an earthquake countermeasure, 5) development of fundamental tools for remedial conservation, and 6) a new digital x-ray image processing device.

These works have been done in collaboration with Hiroshi WADA, Tominori ARAKI, Yuko TSUCHIYA, Haruhiko SUZUKI, Otoyo YONEKURA, Akiko OKIMOTO.

Nobuyuki KAMBA

Nobuyuki Kamba was born in Shimane Pref. (Japan) in 1954. He has a BS in physics at Tokyo Metropolitan University in 1977 and obtained a MA in conservation science at postgraduate course at Tokyo National University of Fine Arts and Music in 1979. He obtained his PhD based on his research into microclimate control at Tokyo National University of Fine Arts and Music in 1997 while he was working at National Museum of Japanese History as an associate professor. He started his career as a conservator of the restoration laboratory of Sokei School of Fine Art in Tokyo for five years, then became a associate research fellow of the Museum Science Department of National Museum of Japanese History in Chiba Pref. between 1984 and 1998 . Since 1998 he has been head of the conservation section at the Tokyo National Museum. He has been focusing on the introduction of preventive conservation into the museum and the establishment of practical conservation for the museum objects for twelve years. Current research fields include frequency characteristics within a packing case during transport, investigation of indoor atmospheric contaminants in exhibition and storage rooms, and establishment of primary care system for museum objects. He is one of the executive members of the Japan Society for the Conservation of Cultural Properties. Address: Tokyo National Museum, 13-9 Ueno Park, Taito-ku, Tokyo 110-8712, Japan. Email: nbd02744@nifty.com.

Non invasive methods to the examination and analysis of paintings: Recent developments and restrictions

Michel MENU
C2RMF, Palais du Louvre, France

The material analysis of works of art aims to better understand the techniques of the ancient cultures and to preserve the cultural heritage for future generations. The analysis brings to light new and unique information for authentication, for conservation and more generally in the domain of history of artistic techniques. Until now, the methods were intensively developed and adapted to the specific, precious character of the works of art. Works of art are now examined from the macro to the micro down to the nano scale.

For paintings, non invasive methods were recently developed in order to highlight some hidden aspects as well as to propose better conditions for their conservation. Multispectral imaging techniques (from X-rays to Thz), new spectrometric and vibrational analyses bring to the conservation scientists lot of information often in the form of images. They are then to be integrated to the whole documentation collected by the curators and art historians. A special effort has to be made in order to compare data which come from different academic domains: the interpretation of images is never obvious and a complete explanation needs care and expertise. No method by itself is able at present to answer to general questions concerning state of conservation, pictorial technique, and artist's intentions. Nevertheless non invasive methods appears more and more convenient to preserve the material integrity of the works, if they are developed extensively they may achieve ambiguous results on a hybrid matter with specific physical properties.

Ref.:
J.-P. Mohen, M. Menu, B. Mottin, *Au coeur de la Joconde,* Ed. Gallimard (2006).
J.B.Jackson, M.Mourou, J.F.Whitaker, I.N.Duling III, S.L.Williamson, M.Menu, G.A.Mourou, "Teraherz imaging for non-destructive evaluation of mural paintings", *Optics Communication* (2008) 527-532.
La technique picturale d'Andrea Mantegna, Technè Hors-série 2009, éd. M.Menu, E.Ravaud.
M. Menu, *"Optics and non invasive analysis of paintings: difficulties and Perspectives",* 1st International Congress –Chemistry for Cultural Heritage (ChemCH), *30 June – 3 July 2010,* University of Bologna, Ravenna (ITALY), Palazzo dei Congressi, 30 June -3 July 2010.

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Head of the research Department (Laboratory)
Centre de recherche et de restauration des musées de France
C2RMF-UMR 171 du CNRS

PHD in physics/optics (1978)
Habilitation in Physics (1992)

Since 1980 research engineer in the Research Laboratory of the French Museums. Physicist I developed several methods to understand the technical properties of the works of art as well as of archaeology and also to better conserve them inside the museum galleries. Several national and international projects enable to perform new techniques to examine works of art, combining a traditional, historical method based mainly on documentation research and the method of materials science looking at the technical know how which produced the work. The main issue is the collaborative research undertaken by curators/art historians, , archaeologists, conservators and scientists in order to elaborate a common approach for the comprehension and for the conservation of museum artefacts. During time, I am specialised in the study of painting materials and of the colour. As head of the laboratory of the C2RMF, composed by 50 permanent scientists of various specialities, I act as promoter of a comprehensive scientific art history.

French coordinator of the Integrated Infractrusture Initiative (I3) from the EEC, after Eu-Artech (http://www.eu-artech.org/) CHARISMA, from 2009, October 1, http://www.charismaproject.eu

Chief Editor of TECHNE
Member of editorial board of Applied Physics A
Organiser during EMRS spring conferences in Strasbourg of symposia devoted to the analysis and conservation of Cultural Heritage (2003, 2005, 2007, 2009)
Member of the scientific committee of the Lascaux Cave.

192 publications in scientific journals:

Au cœur de la Joconde, J.P.Mohen, M.Menu, B.Mottin, Ed Gallimard, Paris (2006).
Analyse de la palette des couleurs du Retable d'Issenheim peint par Matthias Grünewald, Michel Menu et coll., Actes du colloque de Colmar : La technique pictrale de Grünewald et de ses contemporains, édité par P.de Paepe et M.Menu, Musée Unterlinden, C2RMF (2007) 49-60.
Heating effect on manganese oxihydroxides used as black Palaeolithic pigment, E.Chalmin, C.Vignaud, F.Farges, M.Menu, Phase transitions 81, n°2-3 (2008) 179-203.

2nd Session

Science in the reddish *Hidasuki* pattern of the Bizen potter

Yoshihiro Kusano and #Mikio Takano
Dept. of Fine and Applied Arts, Kurashiki University of Science and the Arts, Japan,
#Institute for Integrated Cell-Material Sciences, Kyoto University, Japan

Bizen stoneware, with the characteristic reddish *hidasuki* or "fire-marked" pattern, is one of Japan's best known traditional ceramic works of art. Over a thirty year study, Prof. A. Doi's group has investigated the microstructure and color-formation process in Bizen stoneware, and discovered that the *hidasuki* pattern resulted from the precipitation of corundum (α-Al_2O_3) and the subsequent epitaxial growth of hematite (α-Fe_2O_3) around it in a ~50 μm-thick liquid specifically formed in the ceramic surface. The epitaxial composites include hexagonal plate-like α-Fe_2O_3/α-Al_2O_3/α-Fe_2O_3 sandwiched particles and also surprisingly beautiful flower-like crystals centered by hexagonal corundum crystals and decorated by several hexagonal hematite petal crystals.

Bizen stoneware is produced from a unique clay that can only be mined from the Bizen area of Okayama Prefecture, Japan. The clay has an unusually high Fe content. Prior to firing, the Bizen works are wrapped in rice straw that is used originally as a separator to prevent adhesion. The *hidasuki* pattern only appears where the rice straw is in direct contact with the clay because the rice straw supplies potassium that reduces the melting point of the ceramic surface and thereby converts the contact area into a site for the interesting reactions to take place. The effect is produced without the aid of any artificial glazing and enameling.

It has also been found that an unexpected variety of substances including metallic iron coated by graphite, Fe_3P, and ε-Fe_2O_3 appear at low oxygen partial pressures.

This work has been done in collaboration with M. Fukuhara, J. Takada, Akira Doi, and Y. Ikeda.

Y. Kusano, M. Fukuhara, J. Takada, Akira Doi, Y. Ikeda, and M. Takano, Accounts of Chemical Research, in press.

Mikio TAKANO

Mikio Takano, born in 1944, received his Ph.D. at Kyoto University in 1973 in the field of Chemistry. After having served in Konan University, he moved to the Institute for Chemical Research (ICR), Kyoto University in 1983, where he served as the director for three years of 2002-2005. Since November, 2007 he has been a professor of the Institute for Integrated Cell-Material Sciences (iCeMS) of the same university. He served also as a visiting (associate) professor of Université de Bordeaux I (1983, 1999) and Université de Grenoble (1998).

He has been engaged in solid state chemistry of 3d transition metal oxides mainly. His systematic study on peculiar electronic states in perovskites containing iron in an unusually high oxidation state like $CaFe^{4+}O_3$ and $SrFe^{4+}O_3$ has been very well-known. Moreover, he discovered new interesting materials like an oxychloride superconductor, $(Ca,Na)_2CuO_2Cl_2$, a pair of spin ladder phases, $SrCu_2O_3$ (two-legged) and $S_2rCu_3O_5$ (three-legged), a ferroelectric ferromagnet, Bi_2MnNiO_6. He was awarded The 8th Gold Prize of the L'Oreal Art and Science of Color Prize (2005, L'Oreal Art and Science Foundation) for the study of "MICROSTRUCTURE AND FORMATION PROCESS OF THE CHARACTERISTIC REDDISH COLOR PATTERN *HIDASUKI* ON BIZEN STONEWARE: REACTIONS INVOLVING RICE STRAW".

He authored and co-authored more than 400 research articles and letters. He served as the Asian editor of Solid State Sciences and also has served as a member of the editorial board for J. Solid State Chem., Progress in Solid State Chem., Mater. Res. Bulletin.

In 2006 he and his colleagues organized an international conference named "Kyoto Conference on Solid State Chemistry –Transition Metal Oxides: Past, Present and Future-" (Kyoto, Nov. '06) which was the very first international conference on solid state chemistry held in Japan.

Contribution of mechanical engineering to wood conservation

Joseph GRIL *(Laboratory of Mechanics and Civil Engineering, CNRS, University Montpellier 2, France)*
Misao YOKOYAMA *(Research Institute for Sustainable Humanosphere, Kyoto University, Japan)*

Wood has been widely used in the constitution of historical objects, thanks to its capability to hold a loading for very long times. Mechanical engineers can contribute in many ways to the conservation of these wooden cultural heritage objects. This will be illustrated with two contrasting applications: panels used to support a painting, and beams from old Japanese temples.

(1) Painted panels.

Increased attention is given to the material supports of paintings, such as wooden panels, as not only their condition must be preserved but also they reveal the process of artwork production while often possessing intrinsic historical value. To complement and support the action of restorers, with restricted access to the objects mechanical engineers rely on computer modeling to simulate the consequences of any event that the object could endure, either voluntarily like a moving or change of frame, or accidentally like a breakdown of microclimate control. To produce reliable predictions, models must be fed with good input data and thoroughly validated by comparison between simulations and observations.

A painted wooden panel usually exhibits permanent curvatures as a result of the asymmetric moisture exchanges on both faces. The mechanical interaction with the frame or reinforcements may have caused cracks in the wood. The paint layer, a complex composite of gesso and paints, is checked due to combined effect of its own aging and the underlying movements of the wood. Can these typical features be explained by models suggesting realistic scenarios, starting from the initially flat panel covered by an unchecked paint layer later submitted to centuries of microclimatic fluctuations? Are the same models able to predict the present behavior of the panel subjected to monitored hygromechanical loading? How much of the aging process of the wood itself should be taken into account in the analysis? These questions, that address either the present *condition* or present *behavior* of the object, are closely linked to each other and cannot be easily separated. They will be illustrated by a few case studies on historical painted panels, including the famous Mona Lisa that has been studied extensively at the occasion of its moving to a new room in 2005 which initiated a renewed interest in the subject among European scientists.

(2) The aging of Japanese cypress

In a country like Japan where some wooden buildings have been standing for considerable durations with no or partial replacement of members, a concern may arise regarding their safety in the absence of any visible damage. Even in the absence of weathering or bio-degradation, a slow oxidation process, referred to as natural ageing, may induce changes of properties. RISH in Kyoto University is presently collecting samples from Japanese temples and other historical buildings in order to evaluate their condition.

The mechanical properties of hinoki (*Chamaecyparis obtusa*) wood from this collection have been compared to those of a similar modern wood subjected to a mild thermal treatment, supposed to accelerate the aging and help to elucidate the processes involved. In both cases, little change occurred along the fibers while a drastic drop of transverse breaking energy was observed. This suggest that in normal use the beams are perfectly safe, but cautions are required for any action that would load the material transversally to the fibers, like at the level of connections.

This research has been done in collaboration with several research groups including that of professor Luca Uzielli from Florence University and head of the COST action IE0601 “Wood science for the conservation of cultural heritage” (2007-2011).

J.-P. MOHEN, M. MENU, B. MOTTIN, Mona Lisa: Inside the Painting, (eds), Abrams, New-York (2006)

GRIL J., RAVAUD E., UZIELLI L., DUPRÉ J.C., PERRÉ P., DUREISSEIX D., ARNOULD O., DIONICI VICI P., JAUNARD D., MANDRON P., Mona Lisa saved by Griffith theory: assessing the crack propagation risk in the wooden support of a panel painting, International conference on integrated approach to wood structure, behaviour and application, joint meeting of ESWM and COST Action E35, Florence, Italy, 15-17.5.06, M. Fioravanti, N. Macchioni (eds), 109-114, (2006).

YOKOYAMA M, GRIL J, MATSUO M, YANO H, SUGIYAMA J, CLAIR B, KUBODERA S, MISTUTANI T, SAKAMOTO M, OZAKI H, IMAMURA M, KAWAI S, Mechanical characteristics of aged Hinoki wood from Japanese historical buildings, C. R. Physique 10 (2009)

Joseph GRIL

Joseph Gril was born in Créteil (France) in 1958. He was a student at *Ecole Polytechnique* and *Ecole Nationale du Génie Rural, des Eaux et des Forêts*. He obtained his PhD from University Paris VI in 1988, after long-duration stays in Kyoto University. A specialist of rheological modelling and structure/properties relationships in wood, since 1989 he held successive CNRS positions in the Laboratory of Mechanics and Civil Engineering of Montpellier University II, and since 2004 led a group devoted to basic and applied knowledge on wood as a material, tree biomechanics, support of research in developing countries, introduction of wood culture in the university curricula. He contributed to the progress of wood mechanics in Europe by an active networking activity through the COST system. He established collaborations with wood scientists in Europe, Japan, China, Morocco, Iran, etc. where he usually contributed through data analysis and modelling. He maintained strong connections with research teams in Kyoto and Nagoya through post-docs and various exchange programs of JSPS and was hired as invited professor by Research Institute for Sustainable Humanosphere of Kyoto University during 5 months in 2009. He got the silver medal of CNRS in 2003. He has published 62 papers.

Misao YOKOYAMA

Misao YOKOYAMA was born in Kyoto Pref. (Japan) in 1970. She has a BS in agriculture at Kyoto prefectural University in 1994 and obtained a MA in wood science at postgraduate course at Kyoto University in 1996. She obtained her PhD based on her research into dielectric and mechanical properties of wood at Kyoto University in 2000 while she was working at Kyoto University of Art and Design as a part-time lecturer. She started her career as a wood science researcher of National research institute of Nagoya (National Institute of Advanced Industrial Science and Technology) for two years, and then she became a post doctoral fellow of Kyoto University since 2001. (She has been work as a JSPS postdoctoral research fellow for 2003-2005, 2007-2009 and 2010-2011.) She has been focusing on the application of wood physicality into the preservation and restoration of cultural wooden assets for more than 10 years. Current research fields include evaluation of the wood aging and investigation of wood types and material selection for Japanese historical buildings.

She is one of the members of the Japan Society for the Conservation of Cultural Properties. Address: Research Institute for Sustainable Humanosphare, Kyoto University, Gokasyo Uji-shi, Kyoto 611-0011, Japan. Email: myokoyama@rish.kyoto-u.ac.jp.

3rd Session

Terahertz technology applied to art conservation science

Kaori FUKUNAGA
National Institute of Information and Communications Technology

Terahertz (THz) spectroscopy and imaging techniques have been progressed in these ten years, and are expected to have great potential as non-invasive analysis method of artworks. THz waves can penetrate opaque materials, and most of art materials have fingerprint spectra in THz region. The time domain reflection imaging, in particular, uses THz pulses that act as a probe and propagate through the artworks, to obtain its internal structure non-invasively, without contact. Not only a cross-section, but also the material map at the layer of interest can be obtained, resulting in full three dimensional observation of the works of art. Such information cannot be obtained by other conventional well-established methods. In addition, the energy of THz waves is sufficiently low to be considered as perfectly non-invasive. Several promising experimental results have been reported by using model specimens in reflection and/or in transmission mode. Labaune et al. successfully observed texts on each page in a piled papyrus document, for example.

National Institute of Information and Communications Technology has established the THz spectral database (http://www.thzdb.org) which contains more than 200 spectra of art materials, and performed various cultural heritage objects, including a tempera masterpiece Polittico di Badia by Giotto (Uffizi Gallery), pillars of a pagoda of Kiyomizu-dera in Japan, and a fragment of wall paintings from Dazhao Monastrey in China. The results prove that THz technology should become a useful tool not only for academic research but also practical conservation activities.

This work has been done in collaboration with I. Hosako, Y. Kohdzuma, Y. Fujii, T. Ikari, M. Picollo, I. N. Dulling.

I. HOSAKO et al., At the Dawn of a New Era in Terahertz Technology, Proceedings of IEEE, 95 (2007), pp. 1611-1623.
K. FUKUNAFA, Innovative Terahertz Spectroscopy and Imaging Technique for Art Conservation Science, e-Conservation magazine, 10 (2009) pp. 30-42.

Kaori FUKUNAGA

Kaori Fukunaga was born in Tokyo (Japan) in 1963. She obtained her PhD from Tokyo Denki University in 1993, while she was working at Fujikura Ltd as a research engineer for reliabilty test and ageing diagnosis of high voltage insulation systems. She joined Communications Research Laoratory under Ministry of Posts and Telecommunications (since 2004, National Institute of Information and Communications Technology, NICT), and involved in material characterisation at high frequency region as well as space charge analysis in polymeric materials. From 1996 to 2005, she was also involved in development of tisssue equivalent liquids for mobile phone safety tests, and the recipe is introduced in IEC Standard 62209. She was invited as a visiting researcher by Leicester University in the UK for technology transfer of space charge measurement method, for one year in1999, followed by the Laboratoire de Génie Electrique de Toulouse for 3 months in 2000. Since 2006, she started constructing terahertz spectral database using pigments and binders. She is a Research Manager since 2008 in Applied Electromagnetic Research Centre, the Project Leader of Robust ICT Infrastructure, and a member of the cross departmental THz Project at NICT. Current research fields include, deterioration analysis and test procedures of printed circuit boards, high frequency characteristics of dielectric materials, applications of millimetre wave and terahertz technologies. She is a memebr of Telecommunication Council of the Ministry of Internal Affairs and Telecommunicatios, Commitee member of Standards at Japanese Electronics Packaging and Circuit Association. More than 60 peer reviewed papers published in international journals.

Optical slicing of paints by light computed tomography

Albert Claude BOCCARA
INSTITUT LANGEVIN, ESPCI-ParisTech, F rance

A number of optical methods, such as confocal microscopy, non-linear microscopy and more recently optical coherence tomography (OCT), allow a virtual, non-destructive slicing of structures.
Among these methods OCT was found to reach the better penetration (here the number of photons scattering events), nevertheless in its general form the sectioning ability is larger than the various layers thicknesses involved in a typical painting.

Thinner sections have been obtained by using sophisticated femtosecond lasers or more simply by using white light full field interferometry. We have called this approach Full Field OCT that has evolved into Light-CT by adding real time corrections to the image acquisition procedure: the axial (sectioning) and transverse resolutions are about 1 micrometer.

We will describe this approach and show images obtained through various paints and varnish layers.

Albert Claude BOCCARA

Professor A. Claude Boccara was Dean of Research at ESPCI-ParisTech up to January 2009* with Pierre-Gilles de Gennes and Jacques Prost. He has been involved in light-condensed matter interactions for both basic and applied purposes. He introduced new instruments and methods mostly limited in their performances by physical limits.

Spectroscopic polarisation based approaches for condensed materials have been developed and the associated instrumentation (dichrometers and polarimeters) is still produced by industrial partners. Then, both for spectroscopic application in "exotic" cases (strongly or very weekly absorbing samples) and local thermal characterisation of materials (down to the micron scale) he developed a full range of photothermal approaches ("Mirage", Photothermal Microscope, Interferometers, IR Microscope…). This technique has been successfully applied to pollution monitoring as well as to ceramics characterisation.

Among these methods new kind of microscopies have been developed to increase depth and lateral resolution much below subwavelength limits (picometers in depth and nanometers in lateral) so, understanding the physics of small objects has been one of his goals.

Recently, optical approaches to ultimate measurements have found new fields of application going from optical detection of gravitational waves (VIRGO project) to 3-D imaging though scattering media (like biological tissues and paints).

A.C. Boccara has published more than 270 scientific articles (*ISI/ Boccara A* or Boccara C*) in international journals.

In 2007 he founded the start-up LLTech devoted to medical imaging and diagnostics.

**ESPCI stands for Ecole Supérieure de Physique et Chimie de la Ville de Paris, an internationally recognized Research Institute awarded 5 times for the Nobel Price in Physics*

4th Session

Development of digital image scanners and spectroscopic analysis of Asian paintings

Ari IDE-Ektessabi
Graduate School of Engineering, Kyoto University, Kyoto, Japan

In this talk we present our recent research results on digitizing, analyses, and displaying of cultural heritage assets. The three basic components of this system are various non-contact digitizers, software for analysis of Japanese pigments, and a viewer for displaying the large files.

1. Content Digitization

The digitizers (scanners) produce high resolution, good color quality digital images of large artworks. The prime aim of these systems is to extract data from digitized material, and add information on painting techniques and historical facts/aspects of cultural heritage assets using the images with microscopic precision (about 10 micrometer).

The system can digitize large (two-dimensional) art objects. Already eleven such systems have been designed and manufactured, and are used on site for various projects for digitizing Japanese and Koreans most important cultural heritage, by museums and temples.

The systems utilize a near-field light, producing extremely uniform light intensity focused on small area of the surface being digitized. The art object is exposed to a total amount of the light equal to a few hours up to a few days of normal museum exhibition conditions, offering the lowest radiation of any method of photography/digitization.

2. Content Analysis

Three color (RGB) digitization, eight color (multi-band) digitization, infrared (IR) imaging are possible while cutting the UV region of visible light, to minimize any possible damage to the artwork. Polarized light imaging, allowing golden and metallic surfaces to be accurately scanned.

By using simulation software on the digital image files, colorimetric curves in micrometer spots can be obtained. The colorimetric information will provide museums and researchers with rich and crucial information on historical degradation of colors, and the possible solutions for conservation and restoration of art objects.

In cases of pigments used in ancient Japanese artworks, for example, a database with more than 1000 hues was developed, as a model to be used with the colorimetric information, allowing researchers to estimate the materials used in such paintings. By continuously adding new data, the system can be expanded and developed into an international database for the analysis of ancient art, covering Egyptian, Roman, Greek, Persian, Indian, and Chinese or other world heritage art assets.

3. Content Display

The digital image files produced by the high-resolution scanners have sizes between 20GB and 200 GB, depending on image parameters. These immense files can be displayed using viewer software, allowing for detailed viewing in very high-resolution, on computers and work-stations.

* This work has been based on two projects supported by Japan Science and Technology Agency (between 2004-2008), one project supported by Ministry of Education(2009-2010), and a current project (2009-2012) supported by Japan Council of Science and Technology Policy.

Ari IDE-Ektessabi

Ari Ide-Ektessabi was born in Rasht (Iran) in 1952. He was a student in Faculty of Electronics Engineering, Kyoto University, Japan between 1973-1983, and obtained his PhD in electronics engineering. His field of research was designing systems for charged particle beams for fabrication and analysis of surfaces and materials. He joined Kyoto University as an associate professor from 1991 and as a professor from 2001. He was the leader of four major projects related to the application of advanced technology in art and cultural heritage as follows:

1. Development of High-resolution Large Flatbed Scanner for Digitizing Large Artworks and Non-Destructive Pigment Estimation

Japan Science and Technology Agency, Comprehensive Support Program for Creation of Regional Innovation: Key Seed Projects for Regional R&D, FY 2004-2007

2. An Integrated System for Secure and Dynamic Display of Cultural Heritage

Japan Science and Technology Agency, Comprehensive Support Program for Creation of Regional Innovation: Regional R&D Resources Utilization, FY 2006-2008

3. Developing the Technical Foundation for International Digital Museum,

The Feasibility Study Program 2009, Ministry of Education, Culture, Sports, Science and Technology (MEXT)

Realization of the System and Basic Technical Elements of Digital Museum

4. International Joint Research on High Resolution Digitization of Asian World Heritage

Japan Special Coordination Funds for Promotion of Science and Technology, Asia-Africa Science and Technology Strategic Cooperation Promotion Program, FY 2009-2011

He published more than 200 papers in material processing, analytical techniques using accelerators, charged particle beams and synchrotron radiation and a book on application of synchrotron radiation (Springer 2007). His current interest is focused on “Science and Technology for Art” the topic of 10 symposia that he organized during the last 5 years.

Nano photonic in nature and art: a brief overview

Serge BERTHIER
Université Paris Diderot
Institut des NanoSciences de Paris (CNRS – Université Paris 6), France

Photonic structures provide some of the most beautiful colours in the living world and have consequently been widely used by the artist from a very long time. Since the appearance of the vision, colour becomes an important inter and intra specific component of the animal communication and every chemical or physical process that leads to a coloured effect has been used and optimised thanks to the natural selection process. Photonic structures give rise to a large variety of coloured effects often characterized by a great purity, spatial variations (iridescence) or even other variations, according to various outer conditions (X-chromy) as the temperature, the hygrometry…

In this presentation we will present in a first part the various ways to create colour without pigments – the so called "physical colours" – generated by plasmon absorption onb the one hand, and structures on the other. This part will end with a non exhaustive panorama of the various kinds of photonic structures encountered in nature,

The second part will present some examples of direct or bio inspired applications of these properties by artists of various periods in their works.

Serge BERTHIER

Serge Berthier is born in Paris (France) in 1952. He obtained his Phd from Université Pierre et Marie Curie (Paris -) in 1986.

He first became professor of physics at Université Pascal Paoli, Corte (France) where he spent 7 years, between 1981 and 1988. In 1988 he moved to Université Paris Diderot where he has created a new master dedicated to the optical properties of solids. He is actually director of the CNRS GDR "Couleur et matériaux à effets visuels", and invited professor at the Faculté Universitaire Notre Dame de la Paix à Namur (Belgique).

He undertook theoretical researches on the optical phase transition in disordered media, and proposed a model based on the real space renormalization theory that precisely predicate the conduction and polarization critical exponents of the percolation transition (until 1995).

Afterwards and still until today, he is specialised on the study, the characterization and the modelling of natural photonic structures, found for example in the butterflies wing scales, coleopteran elytrons, bird feathers… considered as models for bio inspired devices.

He has published more than 100 papers and reviews, a book (in French) on the optical properties of inhomogeneous media and 3 books, translated in English on the photonic structures and the physical colours of insects.

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5th Session

An interdisciplinary project for conservation of Mazarin chest

Yoshihiko YAMASHITA
Private Conservator of Lacquer Ware, Japan

Urushi (lacquer), whose history goes back several thousand years, has been instrumental in the formation of unique cultures throughout the Asian countries. In modern Japan, a great number of urushi objects made to meet the taste of the Western people traveled across the seas, and many are stored at palaces and museums in Europe even today. Urushi objects, however, are seriously influenced by various environmental factors such as humidity and light, and damaged urushi objects have been passed down to this generation by undergoing repeated restorations.

Concept regarding conservation of urushi objects differs between the West and Japan. In the West, methods using reversible synthetic resins are selected, making it possible for retreatment; in Japan, conservation using organic materials like urushi and animal glue is chosen so as not to change the texture of the original materials. For many years, even at international symposiums, there have been differences of opinion concerning the concept of conservation of urushi objects and the choice of conservation materials. Thus, in 2004 the Victoria & Albert Museum embarked on the Mazarin Chest Project, a joint collaborative conservation project between Japan and England that was supported by the Getty Foundation and the Toshiba International Foundation. The Mazarin Chest in the collection of the Victoria & Albert Museum is one of the masterpieces of export lacquer that was made between the late 1630s and the early 1640s. It is so named because it is accompanied by a key bearing the crest of the Mazarin-La Meilleraye family.

The Mazarin Chest Project was carried out with the participation of curators, conservators and scientists from not only England and Japan but also from Germany and Poland. The purpose of the project was to establish a new conservation methodology, taking into consideration both the Western and Japanese concepts of conservation, and to conserve the Mazarin Chest. As a result of study based on scientific investigation of manufacturing methods and materials as well as damage and conservation techniques, we were able to re-acknowledge both Western and Japanese conservation materials and techniques. The conservation of the Mazarin Chest was conducted in London from 2004 to 2008, with Shayne Rivers (V&A conservator) and Yoshihiko Yamashita in charge. As a result, it became possible to exhibit the Chest, and a total of approximately 210,000 people visited its exhibition at Japan and USA.

It is natural for there to be differences among countries in matters related to conservation. However, time has come to consider beyond national differences what is desirable for a given object.

Yoshihiko YAMASHITA

Yoshihiko Yamashita was born in Yamato-city (Japan) in 1960. He obtained his MA from the Tokyo National University of Arts and Music in 1986. He studied urushi (lacquer) technique and conservation from Yoshikuni Taguchi who was a living-national treasuer of *makie* technique and conservation of urushi objects. He completed the Specialist Training Course for the Conservation of Designated Cultural Properties offered by the Agency for Cultural Affairs. Basically he is a freelance conservator of urushi, focusing on research of urushi materials and establishment of original urushi conservation techniques, but his work covers a wide range materials because urushi objects are made not only of wood but also bamboo, paper, leather, cloth, ceramic, metal, shell and other materials. He has worked in The Cooperative Program for the Conservation Japanese Art Objects Overseas of the National Research Institute of Cultural Properties, Tokyo in 1997-2004 and 2007-present. He joined the Mazarin Chest Project as a contract conservator of the Victoria and Albert Museum in 2004-2008. He has lectured in the International Course on Conservation of Japanese Lacquer organized by ICCROM and the National Research Institute for Cultural Properties, Tokyo in 2004 and 2009. He has also given lectures overseas on urushi and urushi conservation and published more than 20 papers. Now he is a visiting lecturer at the Tokyo University of the Arts and committee member of the Japan Association of Urushi Cultural Heritage.

Museum Asian lacquerware: chemical biomarkers of origin and alteration

Anne-Solenn LE HÔ
C2RMF, Palais du Louvre, France

Oriental lacquer is used in Asian countries for thousands of years as a coating material for wood, porcelain and metal… The lacquer technique involves a multi-step process with the repeated application of many very thin layers, up to several tenths. The use of this natural polymer is related to its specific properties of beauty and gloss and its high durability due to cross-linked network. So the lacquer coating gives a tough and brilliant film which is solvent insoluble and resistent to water and alcohol. Lacquer is also an excellent adhesive. By the middle of sixteenth century, the first Asian lacquerware were imported from Far East to Europe by maritim trades

The chemical composition and the drying mechanisms of lacquer are complex. The elucidation of molecular composition of a lacquer film represents a task of high difficulty that opens up promising investigation fields to distinguish the different species of trees and thus to identify the geographical origin of lacquerwares with the aim at better understanding exchange networks and commercial routes. Unfortunately restoration treatments have been applied without any systematic control nor testing of interaction with the other materials involved in lacquerwares (wood, pigments, etc.). In addition, the occidental storage conditions are very rarely well adapted for a good conservation of lacquerwares. In Europe museums, curators often have great difficulties to preserve the initial shiny aspect of lacquerwares. Thus, the preservation of millenary objects with lacquer still remains a real scientific challenge and necessitates the development of appropriate methodology to understand the molecular structure of lacquers and their ways of alteration.

The aim of the present work is to show how it is possible to reduce the quantity of lacquer required to differentiate vegetal species of Asian lacquer. This result is of prime importance to prevent any loss of structural information and work with very small sample, necessary condition to preserve the integrity of works of art. Thanks to a detailed optimisation of analytical procedure, new accurate and sensitive criteria of molecular distinction between Asian lacquers from different sap are proposed to discriminate vegetal species and, beyond, their geographic source. In terms of sensibility, note that lacquer was clearly identified with quantity of matter of only around ten micrograms.

Furthermore a better understanding of the alteration phenomena of ancient lacquerwares has been also investigated. It will permit a better evaluation of the quality of the information that can be extracted from the investigation and observation of the objects. It will also allow the establishment of adequate conservation and restoration treatments of lacquer material which is crucially missing at the moment as a consequence of the lack of systematic studies on consolidation. The second step of this work concerned the characterization and evolution of chemical markers of lacquerware degradation, based on the use of pyrolysis-gas chromatography-mass spectrometry, method of choice for the characterization of samples issued from cultural heritage and infrared microscopy. The structural characterization of various lacquer samples such as reference polymerized films, artificially aged reference material and material sampled on archaeological artefacts or ancient lacquerware from museum collections, has been detailed.

Anne-Solenn LE HÔ

Anne-Solenn Le Hô was born in Toulon (France) in 1974. She was student at the university in Marseille and Poitiers in physics and geology. She obtained her PhD in Materials science at
the University of Poitiers in 2003. She has integrated the C2RMF as a Ministry of Culture engineer in April 2004 after a position of scientist in the research laboratory of Snecma-Services in Châtellerault in the field of aeronautics. Since 2004, her interests have shifted to cultural heritage and is in charge of the team “painting materials - analysis" since 2009 at the C2RMF.

Her research areas are:

- elucidation of molecular composition of organic matter (lacquers, terpenoid resins, waxes) to study their alteration processes and their provenance
- physico-chemical characterisation of painting materials (pigments, dyes and binders)
- developing micro- or non- destructive analytical methodologies adapted for the identification of materials preserved in archaeological contexts or in any object from cultural heritage

6th Session

Development of oil painting in Japan and its conservation

Yuko TSUCHIYA
Curator of Conservation Division, Tokyo National Museum, Japan

In Japan, oil painting became widely produced in the Meiji era (1867～1911), the period succeeding Japan's period of isolation. Thus oil painting in Japan is only 150 years long. Meiji was a time of transition where many sought to learn from the west and artists were no exception. Initially, materials and techniques for oil paintings were introduced from England. Its major transition was in 1876 when the Kôbu Art School (*Kôbu Bijutsu Gakko*) was established. It was the first government-run school of fine arts and artists from Italy were hired by the Japanese government to lay the foundation of western art education in Japan. However by 1877, growing concerns against such rapid change toward westernization gave rise to the Kokusui-shugi (nationalists). Followed by financial difficulties, the Kôbu Art School saw its closure in 1883. When a new art school was established four years later, its only painting course was in Japanese painting and it had to wait until 1896 for a Western art course to be reintroduced. Seiki Kouroda (1866-1924) was appointed as oil painting instructor. He had studied under Raphael Collin in France and today's Japanese education in western painting can be traced back to his influence in France.

The Tokyo National Museum inaugurated in 1872 as the first museum in Japan. Among early purchases included oil paintings, an item of rarity at the time. Meanwhile, the Tokyo University of the Arts in Tokyo, notable for its collection of oil paintings produced since the Meiji era, has been doing scientific research since the 1960's on techniques and materials of which results have been published. Since last year, the two institutions have joined to embark on a scientific research on early oil paintings from the museum collection. Research of oil paintings in the Meiji period is expected to be an important asset to future research in the development of oil painting in Japan. This presentation is a report showing how oil paintings in European countries gave influence to Japan.

Yuko TSUCHIYA

Yuko Tsuchiya was born in Nagano Prefecture (Japan) in 1965. She studied oil painting and graduated from Tama Art University in Tokyo. She started to study the restoration of paintings at the Tokyo University of the Arts in Tokyo. She received a Masters Degree from both the Tokyo University of the Arts in Tokyo and the Universidad Complutense de Madrid (Spain). She was an intern at the section of conservation of paintings at IPHE (Instituto del Patrimonio Histórico Español) in Madrid (1997-1999). Since July 1999, she is working at the Tokyo National Museum where her research focuses in the preservation and conservation of the museum's collection. She has published numerous papers on findings about western paintings in the museum's collection. She is a member of the Japan Society for the Conservation of Cultural Property. She is also a lecturer of the Conservation course at the Oil Painting Laboratory, Graduate Department of Conservation, Graduate School of Fine Arts, Tokyo University of the Arts since 2008.

Laser assisted removal of lining glues from easel paintings

Aurélia CHEVALIER
Painting conservator
Researcher, Arts et Métiers ParisTech, LCPI, France

Since the 17th century several methods have been developed for the lining of canvas paintings: pasta glue or *cerusa* were mainly applied until the middle of 19th century. Different researches were lead in the second half of the 20th century to achieve an alternative method: polyvinyl acetate or acrylics have been applied. As glues age, paintings need to be retreated each ca 50 years. In order to remove the adhesive, current methods are limited to the use of chemical solvents or to scratch with a scalpel which leads to obvious damage to the original work. However, removal of the lining fabric (relining) is necessary/crucial. Laser technology may be a unique tool for the gentle removal of aged glue films as the whole cleaning process is well controlled and confined. Towards this, a systematic study was undertaken on mock-ups and real paintings to choose the laser parameters for a safe and efficient removal and to establish a reliable cleaning methodology. A series of laser irradiation tests spanning from UV to IR wavelengths were performed and their cleaning result on pasta glue, *cerusa* (lead white and oil) and PVAc was assessed by microscopic observation. More, to ensure that this cleaning intervention does not affect the structure and integrity of the painting, digital holographic interferometric techniques were applied prior and after the cleaning tests. The results of this study will be discussed in detail with emphasis on the development of a safe and reliable methodology to remove past/unsuccessful lining films.

This work has been done in collaboration with K. Melessanaki, E. Bernikola, V. Tornari, P. Pouli, C. Fotakis IESL-FORTH, N. Plastira 100, Bassilika Bouton, 710 03 Heraklion, Crete, Greece.

Aurélia CHEVALIER

2010- PhD, Arts et Métiers ParisTech LCPI (supervisor Pr.Robert Duchamp
2005- Master degree in Art History, University Paris Panthéon Sorbonne, Paris 1
2003- Painting conservator-restorer Institut National du Patrimoine.

Aurélia Chevalier was born in Paris (France) in 1970. She was a student at Institut national du patrimoine, restoration department in Paris and was graduated in 2003. In 2005, she obtained a Master II degree in Art History from Paris Panthéon Sorbonne and in 2010, she obtained her PhD from Arts et Métiers ParisTech LCPI (supervisor Pr.Robert Duchamp).
Since 2003, she works as a private painting conservator for French museums such as the Louvre museum, Beaubourg, or the Decorative Arts museum in Paris and simultaneously, she pursues researches with lasers at the FORTH Institute (Heraklion, Crete, Greece), in collaboration with Pr Costas Fotakis' team, and with nanogels at the Florence University CGSI, Italy, in collaboration with Pr. Piero Baglioni's team.
As a scientist, Aurélia Chevalier-Menu develops innovative methods in order to improve restoration treatments. Her goal is linked with the comprehension of physic-chemical properties of restoration materials on paintings materials. She published several articles on the subject such as :

Restauration, dérestauration d'une œuvre de Simon Hantaï : Etude I, suite pour Pierre Reverdy (1969) [1]*,*
Dialogue avec Simon Hantaï autour de la question de l'accrochage[2]*,*
Méthodes physiques et chimiques innovantes pour l'extraction de polymères dégradés en peinture de chevalet[3].

[1] Restauration, dérestauration d'une œuvre de Simon Hantaï : *Etude I, suite pour Pierre Reverdy (1969)*, *Technè,* n° 23, 2006, p. 28-32.

[2] Dialogue avec Simon Hantaï autour de la question de l'accrochage, *Art d'aujourd'hui, Patrimoine de demain, Conservation et Restauration des Œuvres Contemporaines*, 13èmes journées d'études de la SFIIC, Paris, INP, 24-26 juin 2009, p. 159-164.

[3] Méthodes physiques et chimiques innovantes pour l'extraction de polymères dégradés en peinture de chevalet, Patrimoines, revue de l'Institut National du Patrimoine, n°5, Paris, 2009, p. 156-161.

7h Session

Preventive conservation for museum collection

Naoko SONODA
National Museum of Ethnology, Japan

The National Museum of Ethnology, Japan was established in 1974 as an inter-university research institute, and has a collection that includes not only ethnological and folklore artifacts, but also materials much like those currently used in everyday life. Considering many of these items are composed of organic materials susceptible to bio-deterioration, different initiatives have been developed and undertaken.

This paper describes preventive conservation for museum collection, referring to measures which have been taken to implement an Integrated Pest Management (IPM) such as a daily IPM inspection or a pest monitoring using insect traps. For the analysis of the trap investigations, a specially customized computer program and mapping system were introduced in 2004. Using the computer assisted analysis system, it becomes easy to compare new investigation data with those of data from the same season from previous years and the problematic areas or species in view of pest control pointed out quickly. An original mapping system based on Microsoft Excel was developed to visualize the geographic distribution and concentration of the pests. To develop safe control measures, in 2007 a new heating/freezing chamber was constructed and the existing fumigation chamber was improved by changing it into a multi-function chamber that enables non-toxic methods (anoxia with nitrogen, carbon dioxide treatment, and the eventual use of heat).

Our recent initiatives to improve the museum environment (in terms of temperature/ relative humidity management, and improvement of storage of the collection) will be also presented. A temperature/ relative humidity data analysis system has been developing since 2009 and contributes to the improvement of our understanding of the actual state of the museum environment and to find out efficiently and quickly abnormalities from the new data. On the other hand, a new attempt was made to develop a material test method using EGA, PyGC/MS and TD-GC/MS, with a double-shot pyrolyzer (PY-2020iD, Frontier Lab) and GC/MS (Agilent 6890 and 5973, EI).

This work has been done in collaboration with Shingo HIDAKA.

The first part of the paper, i.e. the implementation of IPM was first published in: N.SONODA and S.HIDAKA ‘Between Conservation and Access: Implementation of Integrated Pest Management at the National Museum of Ethnology, Osaka, Japan’, *Conservation and Access*, Contributions to the London Congress 15-19 September, The International Institute for Conservation of Historic and Artistic Works, 88-92(2008)

Naoko SONODA

Naoko Sonoda was born in Kobe (Japan). She originally obtained the MST (Maîtrise des Science et Technique de conservation et restauration des biens culturels) and then her PhD from University of Paris I in 1987. She started her career at the Laboratoire de Recherche des Musées de France (LRMF), and at the Service de Restauration des Peintures des Musées Nationaux (SRPMN, France) where she mainly performed scientific investigation of paintings, especially study of artist's modern painting materials. In 1991 she returned to Japan, to the National Museum of Japanese History and in 1993 she joined the National Museum of Ethnology, Japan. Since then, she has developed a particular interest in research relating the general care, storage, preventive conservation of the museum collection including ethnographic objects, library and archival materials. She has published near 200 papers and articles in Japanese, English and French. She is now professor at National Museum of Ethnology, Japan and at the Graduate University for Advanced Studies.

Researches on paper and ink at the CRCC

Bertrand LAVEDRINE
CRCC-Mnhn-CNRS, France

The centre de recherche sur la conservation des collections (CRCC) is carring out researches on paper for several decades to better assess the degradation mechanisms of cellulose in order to improve the conservation of paper based collections. The first objective is to acquire new knowledge on cellulosic materials, and especially understanding the physico-chemical phenomena that play a role in their deterioration. Some degradation mechanisms, such as the tidelines formation, need to be better understood. The apparition of brown lines at the wet-dry interface in cellulosic materials has been described in several publications, some of which date from as far back as 1930. This is of a great importance phenomenon is of relevance to the conservation and the treatment of cultural objects made of paper as well as to the understanding of the degradation chemistry of cellulose. In particular, local wet treatments may involve the formation of tidelines. Other degradation processes involving the ink composition, in particular the iron gall ink, are under investigation. Beside this fundamental approach of paper degradation, it is necessary to evaluate conservation treatments. In partnership with the University of Evry, the CRCC is developing a novel curative mass process for deacidification and reinforcement of archival and library materials using aminoalkylalkoxysilanes.The process under development is based on the use of aminoalkylalkoxysilanes (AAAS). The innovative aspect lies in the fact that besides deacidifying and depositing an alkaline reserve, AAAS allow a physical reinforcing of the cellulosic fibres, which translates into a significant improvement of the mechanical properties of the paper. Furthermore, the process uses chemicals which react according to green chemistry principles. While deacidification is ensured by the amine moiety of the AAAS, the reinforcing mechanism is still under study. Finally, the CRCC is willing to facilitate the access to the information about Asian paper by building a historical and technical database. The first phase of the work will focus on two countries with long-time paper production histories: Japan and Korea. Whereas preparation methods and historical evolution of paper in Europe and North America are thoroughly studied, Asian papers in western collections are often misidentified. Furthermore, technological research on Asian collections housed in the West is rare with the exception of some remarkable objects. The development of this database is made in partnership with the Conservation department, National Museum of Ethnology of Osaka (Japan), the Kochi Prefecture Paper Technology Center (Kochi) (Japan), the National Research Intitute for Conservation of Heritage (N.R.I.C.H.), Daejon (Korea), the Paper science laboratory, Kook-Min University, Seoul (Korea), the Department of wood and paper science, Chung-Buk University, Chung-Buk (Korea), the Freer and Sackler Gallery, Washington (USA), and the University Paris I, Paris (France). This work is supported, in France, by the Ministry of Foreign Affairs.

Bertrand LAVEDRINE

Bertrand Lavédrine hold a Master degree in organic chemistry and got a Ph.D in Art and Archeology. He is professor at National museum of natural history, in France, and since 1998 the director of the Centre de recherche sur la conservation des collections (CRCC): a national scientific research institute on the conservation of museum collections. He was head of the conservation training program at the Sorbonne for 4 years. He wrote numerous papers and 6 books on the preservation of photographs in French, English or Spanish. He received different awards: the European prize for innovation, the Kraszna-Krauz Photography Book Awards and Chevalier des Arts et des Lettres. He is member of the board of non profit organizations for the preservation of Cultural Heritage and was treasurer of the conservation committee of the international council of museums (ICOM-CC). He is currently coordinator of the European Commission funded project POPART: a research project for the preservation of plastic artefacts in museum collections, gathering 13 partners from 8 countries.

Chairpersons

Christine SHIMIZU

Christine Shimizu was born in France in 1950. She was graduated at the Ecole du Louvre with a specialization on Far Eastern Arts. She obtained a M.A. in Chinese Language and Civilization at the Sorbonne University, in Paris (Paris VII). She pursued her studies on Japanese art at the Kyôto National University and at the Kyôto Fine Arts University as a french governement grant holder. After being recruited by means of the national competitive entry of curators of french national museums, she started working at the National Museum of Asian Art (Guimet Museum) as the curator of the Japanese department for 15 years (1978-1993). In the meantime, she received a grant from the Tokyo National University for researching on japanese paintings and from the Nara National Museum for researching on japanese sculptures. Returning to the museum, she supported restoration of the national collections of paintings, prints and sculptures either in Japan or in France. From 1993 till nowadays, she has been a chief curator of the National Museum of Ceramics in charge of the Asian Department.

Moreover, she holds others functions as being a professor of history of Japanese Art at the Ecole du Louvre, a foreign invited professor at the Kanazawa Fine Arts and Crafts University (since 2008). She has teached at the French Institute for Conservation of Art Objects (IFROA since 1980). She organized international exhibitions as an exclusive commissionner in France and abroad (Meiji Period Art, Bizen Ceramics, Avant-Garde and tradition of Contemporary Ceramics) and she is the author of books, articles and catalogues on different aspects of Japanese Art : lacquerwares, ceramics, paintings, prints and sculptures.

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Jacques LAFAIT

Jacques LAFAIT is "Directeur de Recherche Emérite au CNRS" and works for the "Institut des Nanosciences de Paris" (INSP; Unité Mixte de Recherches n°7588, CNRS – Université Pierre et Marie Curie) located in the campus Jussieu in Paris. He is a physicist (PhD, docteur ès Sciences) specialized in optics (engineer of Institut d'Optique Graduate School).

Jacques Lafait initiated in 2003 a group of research called "Groupement pluridisciplinaire de recherches du CNRS (GDR) sur la couleur", gathering 80 teams working in the domain of colour in different public laboratories and private companies. The multidisciplinary approach of this structure covers biology (vision and cognition), physics (materials, models, optical techniques of characterization…), chemistry (materials), art and design. A particular attention is devoted to the cultural héritage via notably the non destructive identification of pigments in art works. Jacques Lafait is, for himself, involved in optics of nanostructured materials. He developed in his group at INSP, a large panel of models accounting for the optical properties (notably colour) of heterogeneous matter presenting a multiscaled structure, in the présence of disorder. He and his group applied these models to synthetic (pigments) and biological (butterflies, insects, cancer tumors…) materials.

He has been a group leader and then the head of the Laboratoire d'Optique des Solides (UMR CNRS-Université Pierre et Marie Curie) where he notably worked on nanocermets under a fundamental point of view (optical properties at percolation...) and also on the application of these materials to the photothermal conversion of solar energy.

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Jacques CASTAING

Jacques CASTAING is « Directeur de Recherches C.N.R.S. » and works for the centre de recherche et de restauration des musées de France (C2RMF; CNRS UMR 171) located in the « Palais du Louvre » in Paris. His research activity derives from his background in physics that he applies to the study of heritage objects. J. Castaing is currently investigating ancient ceramics, luminescence dating of burnt minerals, properties of gems containing hydrogen, microstructure of cosmetics in relation with powder processing. He is also involved in the development of a portable X-ray diffraction equipment dedicated to *in situ* investigation of heritage objects.

Before joining the C2RMF, J. Castaing had a varied research activity in the field of solid state physics and materials science. He obtained his doctoral degree in Physics in 1971 from the University of Orsay for his research on the electronic structure and magnetic properties of transition metal diborides. J. Castaing then joined the CNRS (Centre National de la Recherche Scientifique) in Bellevue, near Paris, to create a research group on the mechanical properties of ceramic materials, mostly oxides. Between 1979 and 1982, he spent one year in the Office of Earthquake Studies (U.S. Geological Survey, Menlo Park, California, USA) and one year in University of Seville (Spain) where he proceeded on his research on the mechanical properties. Using a high pressure testing machine, dislocation glide was induced well in the temperature range of brittleness at normal pressure, for crystals such as sapphire or silicon. During the same period, J. Castaing worked one year for Hewlett Packard (Integrated Circuit Laboratory, Palo Alto, California, USA).

On returning from these long visits abroad, J. Castaing took a number of responsibilities in the French research system, in particular, Head of the laboratory of "Physics of Materials" (CNRS UPR 1341) from january 1985 to december 1994, Advisor in the Department in charge of the R. & D. policy on materials of the "Ministère de la Recherche" from january 1986 to december 1993, project leader for the Materials Department of the University of Evry Val d'Essonne from january 1993 to july 1995. Following these activities dominated by the management of research, J. Castaing returned to scientific work thanks to long visits at the University of Seville (Spain) and the LANL (Los Alamos National Laboratory, New Mexico, USA) in 1996 and 1997. He then joined the C2RMF CNRS UMR 171 in 1998.
The contribution to science of J. Castaing is reported in about 225 publications in scientific journals, proceedings of conferences, etc. that he has signed.

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