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Editorial

This issue of BROMECC ushers in the 2008-2011 triennial period for the ICOM-CC Metal Working Group. For BROMECC, the last two triennials saw the evolution of BROMECC under the guidance of Christian Degrygn. Christian has led by example; showing how BROMECC can consistently disseminate information internationally on metal conservation research between the Metal Working Group's triennial meetings. For his role as the Editor of BROMECC, and also as the Metal WG Coordinator, I take this opportunity on behalf of the readership and National Contacts to thank Christian for committing his time and energy to the development of our profession.

Welcome to David Hallam, the new ICOM-CC Metal Working Group Coordinator and to the Assistant Coordinators, Johanna Theile Bruhns, Paul Mardikian, Jean-Bernard Memet, Emma Schmuecker, John Scott, and Robert van Langh. The 2008-2011 Metal Working Group's Research themes are a development of those from the previous triennial and include; Conservation as an interdisciplinary field; New approaches and stabilisation techniques in metal conservation; Electrochemical techniques in metal analysis and conservation; Slowing down the corrosion of metals - new approaches in preventive conservation; Study and conservation of composite artifacts; Outdoor metals and; Industrial and engineering cultural objects. For your interest, the Metals WG has recently established invaluable desktop research tools like the online metals discussion group <http://tech.groups.yahoo.com/group/Metals-WG-ICOM-CC/> and an online bibliographic database, <http://www.citeulike.org/profile/zzdhalla/groups>; both initiatives welcome your use and involvement.

In resuming the role of BROMECC's Editor, I endeavour to sustain the international development of BROMECC. The current process of appointing Co-editors fluent in French or Spanish as a native language, as well as English, is underway. The purpose of an editorial team composed of an Anglophone, a Francophone and a Hispanophone is to have a capacity to represent the three official languages of the International Council of Museums. Until now, not all BROMECC issues have been translated into French, while Spanish issues have never been prepared. From BROMECC 28 (February 2009) onwards, the Editor and Co-editors will copy-check the English version of BROMECC and the Co-editors will perform and co-ordinate the translation of the BROMECC into French and Spanish. Translators will assist Co-editors; ensuring reasonable language/technical translations of the English. Alternatively, as an option for non-Anglophone BROMECC contributors, the latter will be able to submit their abstract in French or Spanish to the respective Co-editor for translation. BROMECC's reliance on these voluntary contributions made by its active members cannot be overstated – without such support there would be no BROMECC to disseminate its wide range of information to you. The regular active input of the National Contacts, for collecting and distributing news from and to their Nation's Members is also vital to the life of the BROMECC and the larger WG. BROMECC's readership is encouraged to contribute with abstracts and comment on the development of BROMECC.

This issue sees the active contribution of Germany's new National Contact, Britta Schmutzler, PhD student at the State Academy of Art and Design Stuttgart. Britta is resuming Gerhard Eggert's role; Gerhard is working with the ICOM-CC Glass and Ceramics WG. Frank Willer reports his research in determining the fabrication methods and materials of armaments; particularly the adhesive on a silver-plated Roman helmet and the hilt on a Bronze Age-dated sword that poses a dubious fabrication date. Two investigations related to the former PROMET project have also emerged; Johanna Wolfram aims to independently assess in climatic chambers the corrosion protection performance of Poligen® ES 91009 wax with Paraloid® B-72, and other commonly used barrier systems for ferrous and cupreous metals; while in Greece, a consortium has used micro-XRF to assess laser cleaning.

Editor

James CRAWFORD

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New research project



MicroXRF spectrometry for evaluating laser cleaning procedures on ancient coins. (INP-Demokritos, NTUA & NMA)

In collaboration with the National Technical University of Athens' Physics Department, (A.A. Serafetinides and Eleni Drakaki) and the Numismatic Museum of Athens (D. Evgenidou, Eleni Kontou, Niki Katsikosta, C. Vlachou-Mogire), INP-Demokritos (Andreas Karydas and Vasiliki Kantarelou) applied a microXRF spectrometer as the main diagnostic analytical tool to evaluate and assess the performance of laser cleaning procedures on ancient coins. In particular, the micro-XRF results enabled extraction of information about the elemental composition of the surface of the objects treated with different lasers and operating conditions - thus providing interesting quantitative data regarding the effectiveness of the tested cleaning procedures.

Micro-XRF line scans provided the variation of characteristic Pb, Cu, Sn and Cl X-ray intensities from the corroded surface towards the ablated one. In particular, the Cl-K α intensity and the respective ratio between the tin low and high energy characteristic X-ray (SnL α /SnK α) served as criteria to evaluate and assess the effectiveness of the cleaning process with different lasers and operating conditions. The best results were obtained with the 532 nm Q-switched Nd:YAG laser in wet conditions without any observed additional undesirable effects.

The relevant paper, "Laser Cleaning Tests on ancient coins: laboratory investigations", was presented at the Fifteenth International School on Quantum Electronics: "Laser Physics and Applications" (15-19 September 2008), Burgas, Bulgaria and was accepted to be published in the SPIE conference proceedings volume.

Contact: A. A. Serafetinides (NTUA) (aseraf@central.ntua.gr) & Andreas Karydas (INP-Demokritos)

Funding: General Secretariat of Research and Technology of Greece, Joint Research and Technology Programmes, Greek-Italian Cooperation Program 2006-2008: "Characterization and cleaning of metal artefacts by lasers".

New research project



Evidence for Roman metal glue. (LVR RLMB)

The Rheinisches LandesMuseum Bonn owns a famous Roman cavalry helmet from Xanten which shows a silver layer made from an embossed sheet fixed on an iron base. The question, how the silver plating is attached to the iron was answered by a GC-MS analysis made at the Doerner Institute in Munich. Remains of a glue-like material, which was found underneath the silver plating of the helmet, consisted of tar made from wood (conifer), animal grease (maybe tallow), and a mineral petroleum fraction that can be found in nature.

After being buried in the ground for two millennia, the cavalry helmet's glue compound has kept almost all of its adhesive capacity. The skilled usage of the gluing technique once again documents the great abilities and knowledge of materials of the ancient artisans. Apparently, the high production requirements for helmets of this type necessitated the expert combination of different materials. This would guarantee the wearer's adequate protection and an appearance corresponding to his rank. The results of the analysis will be published in the Bonner Jahrbuch 206, 2006 [2008]. Experiments reconstructing the glue will start in 2009.

Contact: Frank Willer (LVR RLMB) (Frank.Willer@lvr.de)

Funding: no external funding

New research project



Original or fake? Investigation of a Bronze Age sword from Oedt in North-West Germany. (LVR RLMB)

The ancient production techniques of a Bronze Age sword found in the river Niers near the village of Oedt in the North-Rhine-Westphalia (close to the Dutch border) are investigated in this research project. The small ceremony sword with fire gilded hilt (a technique otherwise unknown from this age) belonging to the LVR Rhineland Museum Bonn is of particular cultural and historical value. It is one of the rare and exciting finds of this time. The sword was first examined by Driehaus (1968), who did some 2D-x-ray radiographs, but many details on the published pictures were unclear. 2D-radiographs recently made in Bonn did not show any new details, but it could be seen that the hilt of the sword was assembled from several parts.

During a new investigation at the Rheinisches LandesMuseum Bonn conservation laboratory, specialized in researching ancient production techniques, some new technical aspects could be observed. It is definite that the technique of fire gilding was not developed and used in the Bronze Age, but recent analysis of the gilded hilt by PIXE by Hans Mommsen at the University of Bonn verified the presence of mercury within the gold. New metal analysis at the Curt-Engelhorn-Centre for Archaeometry, Mannheim, revealed that the gilded hilt seems to be attached later as an addition to the probably Bronze Age-dated blade. The Bronze Age blade together with the handle yielded no intrinsic evidence to indicate that the sword could be clearly identified as a fake. On the other hand, no one would expect such a complicated construction of a faked hilt onto an original sword handle.

The 2D-x-radiographs hinted that the hilt seems to be rebuilt from several pieces. But to get a better understanding of the inner construction, high definition 3D-micro-computertomography at the Federal Institute for Materials Research and Testing Berlin and several metal analyses had to be performed. First, very promising results of the 3D-tomographic examination allowed visualizing the complex inner construction of the composed hilt. Using these pictures metal samples of the inner construction were taken specifically from localised points. These samples will be analysed by Roland Schwab and Ernst Pernicka from the Curt-Engelhorn-Centre for Archaeometry, Mannheim. The alloy composition will be determined by EDXRF analysis. In conjunction with the interpretation of the excellent micro-computertomographs these analyses should help get a better understanding of the sword's manufacturing steps. At the end we hope the question; "Original or fake?" would be clearly answered. The results of this research project will be submitted to the journal "Historical Metallurgy".

Contact: Frank Willer (LVR RLMB) (Frank.Willer@lvr.de)

Funding: no external funding

New research project



Poligen[®] ES 91009 wax – a better metal coating than Paraloid[®] B72? (StABK)

New water-dispersible polyethylene-wax coatings (Poligen[®]) for metal objects will be tested during a diploma-thesis project at the Objects Conservation programme at the State Academy of Art and Design Stuttgart (StABK) in collaboration with the Materials Science Lab of Deutsches Bergbau-Museum. The European PROMET research project (see BROMECE 12, p. 6) already found better protection of iron by a Poligen[®] ES 91009 surface coating compared with Paraloid[®] B72 (see Metal 07). Our own first preliminary results were able to independently confirm this, and overall looked very promising.

Using a systematic methodology developed in Deutsches Bergbau-Museum the new (to conservation) coating-system will now be compared with Paraloid[®] B72, Paraloid[®] B44, and Cosmoloid[®] H80 under different climatic conditions. For test coupons, iron, corroded iron, archaeological iron, bronze, and brass will be used, while different application methods for the coatings will be tested. Testing involves accelerated aging of coated and uncoated coupons in three different climatic chambers: firstly 100% RH & 40°C; secondly 100% RH & 40°C with sulphur dioxide and; lastly 90% RH & 30°C. Additional coupons have been displayed in two different exhibition rooms for one year. Results will be evaluated by weight and film thickness measurements and a visual detection software for rust. The reversibility, possibilities of retreatment of wax coated objects, and reactions with different metals will also be examined.

Contact: Johanna Wolfram (StABK) (jojo.wolfram@web.de)

Funding: Partially by Deutsches Bergbau-Museum

Abbreviations and acronyms

EDXRF : Energy Dispersive X-Ray Fluorescence
GC-MS : Gas Chromatography-Mass Spectrometry
INP : Institute of Nuclear Physics, Greece
LVR RLMB : Rheinisches LandesMuseum Bonn Landschaftsverband Rheinland, Germany
Nd:YAG : Neodymium-Doped Yttrium Aluminium Garnet
NMA : Numismatic Museum of Athens, Greece
NTUA : National Technical University of Athens, Greece
PIXE : Particle Induced X-ray Emission
StABK : State Academy of Art & Design Stuttgart, Germany
XRF : X-Ray Fluorescence

General information

Future seminars and conferences

- **TECHNART 2009** (27-30 April 2009, Athens, Greece). Non-destructive and Microanalytical Techniques in Art and Cultural Heritage Research. A scientific forum to present and promote the use of analytical spectroscopy techniques in the field of Cultural Heritage. TECHNART 2009 is organized by the Institute of Nuclear Physics at NCSR "Demokritos", Athens and the Institute of Electronic Structure and Lasers at FORTH, Heraklion, Crete (IESL-FORTH) (<http://www.inp.demokritos.gr/~technart2009>).
- **AURUM** (11-13 May 2009, Paris, France). Workshop on authentication and analysis of gold work. Organised by the French Museums' Centre for Research and Restoration (C2RMF) and supported by the 6th Framework Programme of the European Commission. For more information please contact Dr Guerra (maria.guerra@culture.gouv.fr).
- **Archaeological Iron Conservation Colloquium** (24-26 June, 2010, Stuttgart, Germany). Held at the State Academy of Art and Design Stuttgart, in collaboration with AIAE "Archaeological Iron after Excavation", sub-WG of ICOM-CC WG Metals. For more information please contact Gerhard Eggert (gerhard.eggert@abk-stuttgart.de).
- **Metal 2010: Triennial Metals Conservation Conference** (11-15 October 2010, Charleston, South Carolina, United States of America). Metals Working Group of ICOM Committee for Conservation (<http://www.icom-cc.org/52/event/?id=69>).

Websites

- **ARTECH network:** Network facilitating the access of conservation professionals to different investigation techniques for Cultural Heritage artefacts (<http://www.eu-artech.org/>).
- **BigStuff 2004:** Care of Large Technology Objects (<http://www.awm.gov.au/events/conference/bigstuff/index.asp>).
- **CAMEO:** Chemical, physical, visual, and analytical information on over 10,000 historic and contemporary materials used in the conservation, preservation, and production of artistic, architectural, and archaeological materials (<http://cameo.mfa.org/>).
- **Cost Action G8: Non-destructive analysis and testing of museum objects:** Abstracts and booklets from previous workshops, can be downloaded as well as announcements of past activities (Short Term Scientific Missions deadlines, training schools...) (<http://srs.dl.ac.uk/arch/cost-g8/>).
- **Cost Action G7: Artwork conservation by laser:** (<http://alpha1.infim.ro/cost>).
- **Cost Action D42: ENVIART:** Chemical Interactions between Cultural Artefacts and Indoor Environment. Register (free) to access all information (<http://www.echn.net/enviart/>).
- **e-Preservation Science:** Online publication of papers in conservation science (<http://www.morana-rtd.com/e-preservation-science/>).
- **European Cultural Heritage Network:** European network of professionals interested in the conservation of Cultural Heritage (<http://www.echn.net/>).
- **ICOMAM:** International Committee of Museums and Collections of Arms and Military History: (<http://www.klm-mra.be/icomam/>).
- **Industrial artifacts review:** Industrial design and the role of art and photography in promoting cultural heritage (<http://industrialartifactsreview.com/>).
- **IR and Raman for cultural heritage:** (<http://www.irug.org/default.asp>).
- **LabS-TECH network:** (<http://www.chm.unipg.it/chimgen/LabS-TECH.html>).
- **Laboratoire Pierre Sue:** LPS PhD thesis related to the alteration of archaeological artefacts can be downloaded in French. Follow the link to “Archéomatériaux et prévision de l’altération” (<http://www-drecom cea.fr/lps/>).
- **METALConsn**-info: (<http://rsc.anu.edu.au/~hallam/METALConsn-info.html>).
- **M2ADL:** Microchemistry and Microscopy Art Diagnostic Laboratory (http://www.tecore.unibo.it/html/Lab_Microscopia/M2ADL/).
- **New York Conservation Foundation:** (<http://www.nycf.org/>).

- **PROMET**: A 3.5 year European 6th Framework funded project (21 partners from 11 countries around the Mediterranean basin) that developed conservation strategies for outstanding metals collections throughout the Mediterranean (<http://www.promet.org.gr>).
- **Restauración Metal Sur America**: (<http://www.restauraciondemetales.cl/>).
- **TEL**: PhDs on line (<http://tel.ccsd.cnrs.fr/>).
- **Working Group Metals ICOM-Committee for Conservation**: (<http://www.icom-cc.org/31/working-groups/metals/>).
- **ANDRA**: Agence Nationale pour la Gestion des Déchets RadioActifs. The following documents can be ordered for free from this website: *Analogues archéologiques et corrosion* (French) and *Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems* (English)(http://www.andra.fr/interne.php3?publi=publication&id_rubrique=82&p=produit&id=5).

National Contacts for the ICOM-CC Metal WG

- Argentina**: Blanca Rosales, researcher, CIDEPINT, La Plata
- Australia**: David Hallam, senior conservator of objects at the National Museum of Australia, Canberra
- Belgium**: Annemie Adriaens, researcher and lecturer, head of the group “Electrochemistry and Surface Analysis”, Ghent University, Ghent and Gilberte Dewanckel, conservator at IRPA (Institut Royal du patrimoine artistique), Bruxelles
- Bulgaria**: Petia Penkova, conservator, National Academy of Arts, Department of conservation-restoration, Sofia
- Canada**: Judy Logan, conservator (retired), Ottawa
- Chile**: Johanna Theile, conservator and lecturer, Facultad de Arte - Universidad de Chile Las Encinas, Santiago de Chile
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- Czech Republic**: Dusan Perlik, conservator, Museum of Central Bohemia, Roztoky
- Denmark**: Karen Stemann Petersen, conservator, The National Museum of Denmark, Copenhagen
- Egypt**: Wafaa Anwar Mohamed, conservator, Giza
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Russian Federation: Andrey Chulin, conservator, the State Hermitage Museum, St Petersburg

South Africa: Jaco Boshoff, maritime archaeologist, Iziko Museums of Cape Town, South Africa

Spain: Emilio Cano, conservator, National Centre for Metallurgical Research (CENIM), Spanish Council for Scientific Research (CSIC), Madrid

Sweden: Helena Strandberg, conservator and conservation scientist, freelancer, Göteborg

Switzerland: Valentin Boissonnas, conservator and lecturer, Haute école d'arts appliqués Arc, La Chaux-de-Fonds

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United States of America: John Scott, New York Conservation Foundation, New York