

BROMECC

Abstracts per topics

(+ papers published and project of papers to publish)

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Recent bibliography on conservation of aluminium alloys artefacts (BROMECC 6)



Conservation of aluminium alloys artefacts (BROMECC 7)



Conservation of aircrafts – 2 case studies (BROMECC 9)



Corrosion study of aluminium artefacts in an aeronautic collection: analysis and identification of corrosion risks (BROMECC 16)



Aluchromy: an Art Painting Technique on Anodised Aluminium (BROMECC 17)



Preservation of a DC-3 aircraft and the use of inhibitors (BROMECC 20)

Cleaning



CO₂ cleaning method applied to metal objects from the Science Museum – XIX century Chemical Laboratory (BROMECC 17)



Artefact analogues for investigating original surface limits and corrosion product removal techniques for the ferrous armour of the Knights of St John, Palace Armoury, Malta (BROMECC 22)



Cleaning of sulphide on silver and gilt silver threads in silk textiles using laser in the UV- and visible range (BROMECC 22)



Characterization of the interaction of laser radiation with copper alloys used in outdoor sculpture in the United Kingdom (BROMECC 22)



Conservation approaches for monitoring and cleaning Ag and Ag-alloy artefacts (BROMECC 26)



Functional character and restoration criteria: comparative research of cleaning on a liturgical cross (Vado-Cervera, Palencia, Spain) (BROMECC 26)

Composites



Iron / waterlogged wood artefacts: microbiological and electrochemical study (BROMECC 3)

Publication in the next WOAM proceedings



Conservation research has started on the Civil War submarine H.L. *Hunley* (BROMECC 4)

- **González, N., de Viviés, P., Drews, M.J. and Mardikian, P.** (2003) Characterizing the chloride in the wrought iron rivets from the *Hunley*, Proceedings NACE Conference, Northern Area Eastern, Preservation of Heritage Artifacts Session. Sept 15-17, Ottawa, Canada. Proceedings on CD.

- **González, N., de Viviés, P., Drews, M.J. and Mardikian, P.** (2004) Hunting free and bound chloride in the wrought iron rivets from the American Civil War Submarine H.L. *Hunley* (1864), *Journal of the American Institute for Conservation* 43, 161:174.

- **Meier, C.K. and Mardikian, P.** (2004), When corrosion science meets an icon of maritime History, NACE Conference, March 28-April 1, New Orleans.

- **Mardikian, P.** (2004) Conservation and management strategies applied to post-recovery analysis of the American Civil War Submarine H.L. *Hunley* (1864), *The International Journal of Nautical Archaeology* 33.1, 137:148.

- **Drews, M., de Vivies, P., Gonzalves, N. & Mardikian, P.** (2004) A study of the analysis and removal of chloride in iron samples from the *Hunley*, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, D. Hallam and J. Ashton (eds), Canberra, 247-260.



Conservation issues around the Civil War Ironclad USS *Monitor* (BROMECC 5)



Corrosion Phenomena on a 17th century box of board games (BROMECC 7)

Eggert, G., Wollmann, A., Schwahn, B., Hustedt-Martens, E., Barbier, B., Euler, H. (2008) When glass and metal corrode together, 15th ICOM CC Triennial Conference, New Delhi, forthcoming



Analysis of ancient artefacts made of glass, enamel and metal (BROMECC 8)



The formation of a corrosion layer on paintings made with a copper support (BROMECC 9)

Paquette, E., (2003) The formation of a corrosion layer on paintings made with a copper support, in *Preservation of Heritage Artifacts of the NACE Northern Area Eastern Conference*, Corrosion control for enhanced reliability and safety, Ottawa, Ontario, Canada, September 15-17, 2003.




The effects of manufacturing techniques on the deterioration of paintings on copper (BROMECC 9)





The Nativity Triptych - an interdisciplinary project (BROMECC 11)




Problems in the conservation of firearms (BROMECC 11)


 Metal threads in textiles - some case studies (BROMECC 15)


 Study of the morphology and material of metal threads from Hispano-Moorish textiles (BROMECC 15)


 New French research program on very long term corrosion in concrete (BROMECC 16)


 Mercury in technical and industrial collections (BROMECC 16)

 Condition survey and diagnostic of Max Mathews' electronic violin at the Music Museum of Paris (BROMECC 20)


 Methodology of study of mineralised organic remains. Application to the buried iron artefacts of the Middle Ages tomb of Bruckmühl, Germany (BROMECC 20)

 The conservation issues of cleaning a 14th century eastern French water gilt, tin plated & silvered wooden box (BROMECC 20)


 Technical research on metallic threads from the vestments of a 19th c. statue: research on the production technology and on the state of conservation (BROMECC 26)

 Evidence for Roman metal glue (BROMECC 27)

Copper based artefacts


 Plastiline as cause of "black spots" on bronzes (BROMECC 1)

Eggert, G. (2006) Plastiline: Another Unsuspected Danger in Display Causing Black Spots on Bronzes, *Beiträge zur Erhaltung von Kunst- und Kulturgut* 2/2006, 112-116.

 Copper sulphide corrosion on copper based alloys and minerals (BROMECC 1 & 5)

Eggert, G., Weichert, M., Euler, H. & Barbier, B. (2004) Some news about "Black Spots", in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 142-148.

Weichert, M., Eggert, G., Mark Jones, A. & Ankersmit, H. (2004) Trees, bunches, cauliflowers – a closer look at sulphurous corrosion on copper alloys and minerals ("Black spots"), in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 149-159.

 Use of raman spectroscopy for the chemical identification of corrosion products produced by atmospheric corrosion of bronzes (BROMECC 1)

 Curly Malachite (BROMECC 2)

Eggert, G. (2007) The Enigma of the Curly Malachite, in: C. Degriigny et al (Eds.), Metal 07, Vol. 1: When archaeometry and conservation meet, Amsterdam 2007, 57-60.



Measurement of heavy metal run-off due to environmental corrosion (BROMECC 2)

Fitz, S. & Kucera, V. 2003 Release of Metals due to Corrosion of Materials, in the Proceedings of a UN ECE Workshop, Bulletin 109E, Korrosionsinstitutet SCI AB, Stockholm



The removal of bronze spray paint from a collection of Outdoor bronze monuments in the suburb of Athens (BROMECC 3)



Removal of chlorides from enamelled medallions (BROMECC 4)



A comparative study of protective coating systems for outdoor bronze sculpture in marine environment (BROMECC 5)

- **Letardi P.** (2004) *Laboratory and field test on patinas and protective coating systems for outdoor bronze Monuments*, in: J.Ashton, D.Hallam (Eds.), Metal2004 Proceedings of the International Conference on Metals Conservation, Canberra, 4-8 October 2004, National Museum of Australia, pp. 379-387

- **D'Ercoli G. and Marabelli M.** (2004) *La resistenza di polarizzazione: indagine non distruttiva per la caratterizzazione di patine e protettivi di un monumento bronzeo*, in P. Letardi, I. Trentin, G. Cutugno (Eds), Monumenti in bronzo all'aperto. Esperienze di conservazione a confronto, Nardini, Firenze, pp.113-118

- **Letardi, P.** (2003), Efficacia dei protettivi per i Bronzi esposti in ambiente marino: analisi di laboratorio e misure in campo, in Proc. *Lo Stato dell'Arte*, Torino, 2003, pp 354-363


- **Letardi, P. and Cozzolino, D.** (2002), Contact-Probe EIS Characterisation of Protective Coating Systems for OUTDOOR Bronze Sculpture: Atmospheric Weathering Behaviour in Marine Environment, in Proc. *15th International Corrosion Congress, Frontiers in Corrosion Science and Technology*, Granada (Spain), paper 538

- **Letardi P., Marabelli M., D'Ercoli G. and Guida G.** (2002) *Comparative study of Protective Coating Systems for OUTDOOR bronze sculpture*, in: A. Guarino (Ed.), Proceedings of 3rd International Congress on Science and Technology for the Safeguard of Cultural Heritage in the Mediterranean Basin, Alcalà, 9-14 July 2001, CNR, Rome, pp 272-275





Study of Patinas formed on Cu base alloy Monuments after Outdoor exposure in Buenos Aires City (BROMECC 6)


Crespo, M., Cicelio, G and Rosales, B. (2004) Electrochemical characterisation of patina protectiveness evolution on outdoor bronze sculptures, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 185-194

 Corrosion Phenomena on a 17th century box of board games (BROMECC 7)


Eggert, G., Wollmann, A., Schwahn, B., Hustedt-Martens, E., Barbier, B., Euler, H.
(2008) When glass and metal corrode together, 15th ICOM CC Triennial Conference, New Delhi, forthcoming


 EFESTUS: Tailored strategies for the conservation and restoration of archaeological value Cu-based artefacts from Mediterranean Countries (BROMECC 8)

 Study and conservation of a selection of copper cast artefacts (BROMECC 8)


 The thin copper-alloy fittings of small Roman and Merovingian wooden chests in the Römisch-Germanisches Museum Cologne (BROMECC 9)


 “Golden altars” in Denmark (BROMECC 10)

 Protection of copper based and common metal artwork by electropolymerisation of acrylic monomers (BROMECC 10)


 Artistic bronzes: selection of alloys, protective evaluation using conventional and advanced techniques (BROMECC 11)


 Chronopotentiometry of Archaeological Coins (BROMECC 13)


 French-Chilean cooperation project for the conservation of sculptures in Santiago de Chile (BROMECC 13)


 Patina management: the conservation and preservation of restored patina of outdoor bronze sculpture (BROMECC 13)


 Environmental consequences and protection of outdoor bronze monuments in Greece (BROMECC 14)


 Optimization of electrolytic stabilization of marine archaeological copper alloys (BROMECC 14)


 Brass memorial grave plaques from Franconia and Thuringia dating from the 15th to the 17th century – an interdisciplinary study of the monumental inventory and its endangering through environmental influences (BROMECC 15)


 Use of micro-Raman spectroscopy for the study of the atmospheric corrosion of copper alloys of cultural heritage (BROMECC 17)


 Growth and properties of oxidation layers and of patinas at the surface of copper alloy objects of archaeological or artistic interest (BROMECC 17)

 Corrosion and protection of bronzes covered with a patina: electrochemical and spectroscopic study of the surface of archaeological artefacts and synthesis of a similar patina on a commercial bronze (BROMECC 17)

 The impact of different soils on the corrosion of copper-based artefacts and methods of their conservation (BROMECC 17)


 Study of the corrosion protection of copper and its alloys applied to cultural heritage conservation (BROMECC 18)




 Relationship between the conservation state of unearthed bronze artefacts and the burial environment (BROMECC 18)


 Study of the corrosion of bronze Cu-8%Sn and the inhibiting effect of 3-phenyl-1,2,4-triazole-5-thione (BROMECC 19)


 Corrosion inhibition of bronze with *Opuntia ficus indica* stem extract (BROMECC 19)


 Late Bronze age copper ingots in the Central Mediterranean and the Lipari Hoard (BROMECC 19)


 ATENA project: Advanced analytical techniques for the conservation of archaeological metallic and ceramic artefacts and the recovery of ancient manufacturing techniques (BROMECC 20)

 /  /  EcoNET: Protection of bronze covered with patina by safe organic substances (BROMECC 20)

 Microcrystalline waxes for the protection of copper based alloys exposed outdoor (BROMECC 20)

 Restoration of two copper based basins from the Quend site (BROMECC 20)

 Mylar, reproductions of the alloy, its patination and conservation decisions (BROMECC 20)

 Electrochemical study of the influence of the Sn content on the formation of patina on Cu-Sn bronzes (BROMECC 21)



Characterization of the interaction of laser radiation with copper alloys used in outdoor sculpture in the United Kingdom (BROMECC 22)



Characterization of the alteration of copper based ethnographic artefacts (BROMECC 22)



In-situ time resolved monitoring of copper corrosion using an automated electrochemical cell (BROMECC 23)



Characterization of plating materials and techniques used in instruments of Sax factory (BROMECC 23)



Conservation and restoration of Goya's engraving copperplates (BROMECC 24)



Patination nucleation on statuary bronze and brass (BROMECC 26)



Functional character and restoration criteria: comparative research of cleaning on a liturgical cross (BROMECC 26)

Corrosion studies



Plastiline as cause of "black spots" on bronzes (BROMECC 1)

Eggert, G. (2006) Plastiline: Another Unsuspected Danger in Display Causing Black Spots on Bronzes, *Beiträge zur Erhaltung von Kunst- und Kulturgut* 2/2006, 112-116



Copper sulphide corrosion on copper based alloys and minerals (BROMECC 1 & 5)

Eggert, G., Weichert, M., Euler, H. & Barbier, B. (2004) Some news about "Black Spots", in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 142-148.


Weichert, M., Eggert, G., Mark Jones, A. & Ankersmit, H. (2004) Trees, bunches, cauliflowers – a closer look at sulphurous corrosion on copper alloys and minerals ("Black spots"), in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 149-159.




Use of raman spectroscopy for the chemical identification of corrosion products produced by atmospheric corrosion of bronzes (BROMECC 1)

- **Hayez, V.**, Raman et la corrosion, *Journal of Raman spectroscopy*, in *The International Conference on the application of Raman Spectroscopy in Art and Archaeology*, submitted


- **Hayez, V.**, Utilisation de l'XPS et la corrosion atmosphérique, *Surface and Interface Analysis*, in *ECASIA'03*, submitted

 Literature study of active corrosion phenomena on archaeological iron artefacts: definition of the active corrosion concept and characterisation of its symptoms (BROMECC 1)

Loeper, M-A., article soumis Aux Cahiers Techniques de l'Araafu, n°14, published in 2005.


 Curly Malachite (BROMECC 2)


Eggert, G. (2007) The Enigma of the Curly Malachite, in: C. Degriigny et al (Eds.), *Metal 07*, Vol. 1: When archaeometry and conservation meet, Amsterdam 2007, 57-60.

 Measurement of heavy metal run-off due to environmental corrosion (BROMECC 2)

 Corrosion Phenomena on a 17th century box of board games (BROMECC 7)


Eggert, G., Wollmann, A., Schwahn, B., Hustedt-Martens, E., Barbier, B., Euler, H. (2008) When glass and metal corrode together, 15th ICOM CC Triennial Conference, New Delhi, forthcoming

 Examination of archaeological artefacts to assess the average corrosion rates and study the long term corrosion mechanisms of low carbon steel in soils (BROMECC 8)


 Long term corrosion of iron, unalloyed or mild steel in clay soils. Physico-characterization and electrochemical study of archaeological models (BROMECC 9)


- **Pons, E.**, Corrosion à long terme du fer et des aciers non ou faiblement alliés dans les sols à dominante argileuse – Caractérisation physico-chimique et étude électrochimique d'analogues archéologiques, Université de Technologie de Compiègne, France, 2002, PhD Thesis.



- **Pons, E.** and al., Approche de la corrosion d'analogues ferreux par spectroscopie Raman, in *Le Métal, Techné*, n°18, 2003, 95-100

 Monitoring the condition of archaeological artifacts and samples of experimental modern metals (BROMECC 10)


Fell, V. and Williams J. (2004) Monitoring of archaeological and experimental iron at Fiskerton, England, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 17-27

 Artistic bronzes: selection of alloys, protective evaluation using conventional and advanced techniques (BROMECC 11)


 The introduction of bioreduction in conservation: the removal of iron corrosion with bacteria (BROMECC 13)


 /  Atmospheric corrosion : study of long term behaviour of iron through the analysis of archaeological artefacts. Part1: Role of phosphorus in the corrosion mechanisms (BROMECC 13)


Neff, D. and Balasubramaniam R., Journal of History of Science (accepted)


 Atmospheric corrosion : study of long term behaviour of iron through the analysis of archaeological artefacts. Part 2: Atmospheric corrosion mechanisms (BROMECC 13)


 Conservation, restoration and technology of medieval gilded metals (BROMECC 14)


 PROMET – Corrosion product cleaning of steel coupons: original surface conservation, aesthetic values and protective system efficiency (BROMECC 14)

 Impact of environmental conditions on the conservation of metal artefacts: an assessment based on electrochemical measurements (BROMECC 15)


 The investigation of deterioration and stabilisation of archaeological iron in the British Museum and experiments on effects of RH on corrosion of iron (BROMECC 16)


 Corrosion study of aluminium artefacts in an aeronautic collection: analysis and identification of corrosion risks (BROMECC 16)


 Corrosion characterization and treatment evaluations of iron artefacts recovered from the USS *Monitor* (BROMECC 16)


 Chlorinated phases on archaeological iron artefacts from terrestrial sites : characterization and formation mechanisms (BROMECC 16)


 New French research program on very long term corrosion in concrete (BROMECC 16)


 Mercury in technical and industrial collections (BROMECC 16)


 Use of micro-Raman spectroscopy for the study of the atmospheric corrosion of copper alloys of cultural heritage (BROMECC 17)


 Growth and properties of oxidation layers and of patinas at the surface of copper alloy objects of archaeological or artistic interest (BROMECC 17)


 Corrosion and protection of bronzes covered with a patina: electrochemical and spectroscopic study of the surface of archaeological artefacts and synthesis of a similar patina on a commercial bronze (BROMECC 17)


 The impact of different soils on the corrosion of copper-based artefacts and methods of their conservation (BROMECC 17)

 Low-oxygen and low-temperature storage of freshly excavated iron artefacts (BROMECC 17)


 Development of a method of interpretation of radiographies for the study of iron archaeological artefacts: contribution to the study of the corrosion structure and diagnosis (BROMECC 18)


 Study of the corrosion protection of copper and its alloys applied to cultural heritage conservation (BROMECC 18)


 Relationship between the conservation state of unearthed bronze artefacts and the burial environment (BROMECC 18)


 Study of the corrosion of bronze Cu-8%Sn and the inhibiting effect of 3-phenyl-1,2,4-triazole-5-thione (BROMECC 19)


 Corrosion inhibition of bronze with *Opuntia ficus indica* stem extract (BROMECC 19)




 Assessment of the environmental impact on the conservation of cultural heritage metal artefacts (BROMECC 20)

 Alteration of iron archaeomaterials: characterisation of chlorinated phases in terrestrial archaeological iron artefacts (BROMECC 20)

 Archaeological marine iron artefacts: from understanding the corrosion mechanisms to the prediction of the treatment times (BROMECC 20)


 A note on the detection of the original surface of marine wrought iron artefacts from observations made on marine crusts of the historic wreck, *Elizabeth and Mary* (1690), Anse aux Bouleaux, Québec (BROMECC 20)


 The use of sodium carboxylate as a corrosion inhibitor to protect iron artefacts (BROMECC 20)


 /  /  EcoNET: Protection of bronze covered with patina by safe organic substances (BROMECC 20)


 The maintenance of Cor-ten[®] sculptures (BROMECC 20)


Decker, P., Brüggerhoff, S., Eggert, G. (2008) To coat or not to coat? The maintenance of Cor-Ten[®] sculpture, *Materials and Corrosion* 59(3), 239-247.


 Characterisation of corrosion layers formed during long-term exposure to atmospheric corrosion: application to the study of the reinforcing chain at Amiens cathedral (BROMECC 20)


 Preservation of a DC-3 aircraft and the use of inhibitors (BROMECC 20)


 Experimental iron at Fiskerton: results after burial for 30 months (BROMECC 21)


 Deterioration of iron archaeological artefacts: local and structural investigations on Cl-containing corrosion products (BROMECC 21)

 The effect of relative humidity (RH) on archaeological iron deterioration (BROMECC 21)


 Effects of relative humidity (RH) on the corrosion of iron—an experimental view (BROMECC 21)



 Natural corrosion inhibitors for the protection of metallic cultural heritage (BROMECC 21)


 Electrochemical study of the influence of the Sn content on the formation of patina on Cu-Sn bronzes (BROMECC 21)


 Characterization of the alteration of copper based ethnographic artefacts (BROMECC 22)


 /  In-situ time resolved monitoring of copper corrosion using an automated electrochemical cell (BROMECC 23)

 Long-term corrosion behaviour of low-carbon steel in anaerobic soils (BROMECC 25)

 /  Patination nucleation on statuary bronze and brass (BROMECC 26)

 Analytical study of lead comes from historical stained glass windows of different chronology and provenance (BROMECC 26)

 Poligen® ES91009 wax – a better metal coating than Paraloid® B72? (BROMECC 27)

 Indoor atmospheric corrosion of historical ferrous alloys. System characterization (BROMECC 27)


Electrolytic techniques


 Application of pulsed currents to the stabilisation of small iron artefacts (BROMECC 1)


Student dissertation, no publication

 Electrolytic stabilisation of iron artefacts in neutral solution (BROMECC 2 & 3)

de Groot, I. & Degriigny, C. (2004) Electrolytic stabilisation of a marine composite porthole and its framework, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 427-442.

 Iron / waterlogged wood artefacts : microbiological and electrochemical study (BROMECC 3)

 Development of a course on the use of electrolytic techniques in metal conservation Iron based artefacts (BROMECC 3)

 Development of a simple non-destructive method for the chemical characterisation of metal objects through corrosion potential measurements (BROMECC 4)


Leysens, K., Adriaens, A., Pantos, E. & Degriigny, C. (2004) Study of corrosion potential measurements as a means to monitor the storage and stabilisation processes of archaeological copper artefacts, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 332-343.


Paper for the next ICOM-CC triennial meeting (the Hague)


 Comparison of galvanostatic and potentiostatic reduction for lead (BROMECC 5)

Just a proposal, no work achieved

 Conservation of lead printing letters by electrolytic reduction (BROMECC 9)

 Long term corrosion of iron, unalloyed or mild steel in clay soils. Physico-chemical characterization and electrochemical study of archaeological models (BROMECC 9)

 Protection of copper based and common metal artwork by electropolymerisation of acrylic monomers (BROMECC 10)

 The “E_{corr} -Droplet” technique: a possible spot test for metal artefacts? (BROMECC 11)

Powerpoint presentation available on the Metal homepage of the ICOM-CC website (ETIC News 4)

 Chronopotentiometry of Archaeological Coins (BROMECC 13)



The application of new technologies for the cleaning of archaeological and historical metal objects. Investigation of the possibility of applying laser technology and electrolytic methods (BROMECC 14)



Optimization of electrolytic stabilization of marine archaeological copper alloys (BROMECC 14)



Application of the EDT monitoring technique to assess the corrosion behaviour of certified copper based alloys in sodium sesquicarbonate and mineralised water (BROMECC 15)



Insights into the chemical and morphological changes of historical lead objects as a result of the use of electrolytic reduction as a stabilisation treatment (BROMECC 19)



Study of the corrosion of bronze Cu-8%Sn and the inhibiting effect of 3-phenyl-1,2,4-triazole-5-thione (BROMECC 19)



Corrosion inhibition of bronze with *Opuntia ficus indica* stem extract (BROMECC 19)



EcoNET: Protection of bronze covered with patina by safe organic substances (BROMECC 20)



In-situ electrochemical and SR-XRD time resolved study of lead carboxylate coating for the protection of cultural heritage artefacts (BROMECC 23)



In-situ time resolved monitoring of copper corrosion using an automated electrochemical cell (BROMECC 23)



SPAMT-Test: qualitative analysis of metallic elements on scientific, technical and clockmaking objects from E_{corr} versus time plots : feasibility and limits of use (BROMECC 26)



Development of electrolytic treatment protocols to guide conservator-restorer's choices (BROMECC 28)

Ethnographic objects



The conservation of historical Greek Porpi (Belt buckles) (BROMECC 3)



The conservation of ethnographic metal collections from the Eastern Mediterranean area (BROMECC 3)



Development of protection systems for ethnographic iron artifacts (BROMECC 6)

Industrial objects



Mercury in technical and industrial collections (BROMECC 16)



CONSIST: Coating Materials and Strategies for the Preservation of Iron / Steel Industrial Cultural Heritage (BROMECC 18)



Conservation issues for mercury in technical and industrial heritage collections (BROMECC 20)



Analysis and characterisation of alloys constituting the Dufaux 4 aircraft (BROMECC 26)

In-situ conservation



In-situ conservation of grey cast iron cannon (BROMECC 1, 2 & 3)



In-situ preservation of metal artefacts in a waterlogged environment (BROMECC 1)



In-situ conservation of grey cast iron cannon (BROMECC 14)



Assessment of the environmental impact on the conservation of cultural heritage metal artefacts (BROMECC 20)



Archaeological marine iron artefacts: from understanding the corrosion mechanisms to the prediction of the treatment times (BROMECC 20)

Iron based artefacts



Application of pulsed currents to the stabilisation of small iron artefacts (BROMECC 1)

No publication, student dissertation



In-situ conservation of grey cast iron cannon (BROMECC 1, 2 & 3)

No publication, student dissertation




D.C. mode hydrogen plasma treatment for archaeological iron (BROMECC 1)


Research still in progress




Investigation on the use of a Nd:YAG laser for the removal of corrosion products on archaeological iron (BROMECC 1)


J. Hildenhagen, J. Studer, M. Chapé, K. Dickmann & E. Müsch, Einsatz der Lasertechnik in der Eisenrestaurierung, "Restaurio, Zeitschrift für Kunsttechniken, Restaurierung und Museumsfragen" Nr. 3/2004

 Development of a method of interpretation of X-radiography pictures for the study of archaeological iron artefacts: contribution to the study of the corrosion layer and to the diagnosis (BROMECC 1)

 Literature study of active corrosion phenomena on archaeological iron artefacts: definition of the active corrosion concept and characterisation of its symptoms (BROMECC 1 & 4)


 Applying primer to iron objects using the vacuum painting technique (BROMECC 2)


Final year student report – unpublished

 Investigation of chemical patination of iron (BROMECC 2)


 Electrolytic stabilisation of iron artefacts in neutral solution (BROMECC 2)

de Groot, I. & Degriigny, C. (2004) Electrolytic stabilisation of a marine composite porthole and its framework, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 427-442.

 Iron / waterlogged wood artefacts : microbiological and electrochemical study (BROMECC 3)

 Protecting historical iron knives from persistent rust spots (BROMECC 3)

Presentation of a paper for the next ICOM-CC triennial meeting (the Hague)

 Iron tin-plated finds (BROMECC 3)

Leroux, M. & Lemoine S., L'étamage des objets ferreux archéologiques : une présence discrète et problématique, XIXe journées des restaurateurs en archéologie, Saint-Germain en Laye (2003), in *Conservation-Restoration des Biens Culturels* (CRBC), Paris, 20, 2004

 Conservation research has started on the Civil War submarine H.L *Hunley* (BROMECC 4)

- **González, N., de Viviés, P., Drews, M.J. and Mardikian, P.** (2003) Characterizing the chloride in the wrought iron rivets from the Hunley, Proceedings NACE Conference, Northern Area Eastern, Preservation of Heritage Artifacts Session. Sept 15-17, Ottawa, Canada. Proceedings on CD.

- **González, N., de Viviés, P., Drews, M.J. and Mardikian, P.** (2004) Hunting free and bound chloride in the wrought iron rivets from the American Civil War Submarine H.L Hunley (1864), *Journal of the American Institute for Conservation* 43, 161:174.

- **Meier, C.K. and Mardikian, P.** (2004), When corrosion science meets an icon of maritime History, NACE Conference, March 28-April 1, New Orleans.

- **Mardikian, P.** (2004) Conservation and management strategies applied to post-recovery analysis of the American Civil War Submarine H.L. Hunley (1864), *The International Journal of Nautical Archaeology* 33.1, 137:148.

- **Drews, M., de Vivies, P., Gonzalves, N. & Mardikian, P.** (2004) A study of the analysis and removal of chloride in iron samples from the Hunley, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 247-260.



Treatment of corroded painted iron surfaces with chelating reagents (BROMECC 4)



A new concept for the desalination of archaeological iron artefacts in neutral solutions (BROMECC 5)



Research into the stripping of corrosion layers on historical iron artefacts by acid under cathodic protection (BROMECC 5)



Changes occurring to archaeological iron in dry storage (BROMECC 5)

Research project that did not start



Post excavation changes to archaeological iron (BROMECC 5)

Published in the proceedings of the IRUG meeting, Florence, March 2003



Nickel enriched iron artefacts from Bohemia and Moravia (BROMECC 6)



New protection approaches for partly oxidised historic steel artefacts: Physical Vapour Deposition of inorganic and transparent films (BROMECC 6)

Presentation of a paper for the next ICOM-CC triennial meeting (the Hague)



Development of protection systems for ethnographic iron artifacts (BROMECC 6)



Conservation of burnt iron artefacts (BROMECC 6)

Research still in progress




Mass treatment of archaeological iron artefacts using alkaline sulphite (BROMECC 7)

Not published yet




Dissolution of iron corrosion layers by acid under cathodic protection (BROMECC 7)

de Groot, I., Ankersmit, H., van Langh, R., Wei, W. (2004) Corrosion layers on historic iron artefacts: cathodic protection of iron artefacts during cleaning in acid solutions, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 307-314.


 Investigation and restoration of iron sheets and decorative stars of the doors from the Pilgrimage Church of St. John of Nepomuk at Zelená Hora - Green Mountain (BROMECC 8)

- **Havlinova, A.**, Investigation and restoration of iron sheets and decorative stars on the doors from the pilgrimage Church of St. John of Nepomuk at Zelená Hora - Green Mountain, in Proceedings of the Conference on Conservation and Restoration, Brno, CzR, September 16 – 18, 2003, pp98-100 (in Czech)

 Restoration of cultural heritage: stainless steel as an alternative (BROMECC 8)

 The *Nottingham Galley* cannon collection: A proposed scientific inquiry into the reasons a conserved iron cannon dramatically cracked into pieces whilst in storage (BROMECC 8)

Carlson M.O. Bruce M.R.M. & Riess W.C., The *Nottingham Galley* cannon collection ca. 1710: A proposed scientific inquiry into the reasons a conserved iron cannon dramatically cracked into pieces in storage, in *Preservation of Heritage Artifacts of the NACE Northern Area Eastern Conference*, Corrosion Control for Enhanced Reliability and Safety, Ottawa, Ontario, Canada, September 15-17, 2003

 Examination of archaeological artefacts to assess the average corrosion rates and study the long term corrosion mechanisms of low carbon steel in soils (BROMECC 8)

- **Neff, D., Reguer, S., Bellot-Gurlet, L., Dillmann, P. & Bertholon, R.**, Structural characterisation of corrosion products on archaeological iron. An integrated analytical approach to establish corrosion forms, *Journal of Raman Spectrometry*, 2004. **35** (Special Issue on the application of Raman spectroscopy in art and archaeology): p. 739-745.

- **Dillmann, P., Neff, D., Mazaudier, F., Hoerlé, S., Chevallier, P. and Béranger, G.** Characterisation of iron archaeological analogues using micro diffraction under synchrotron radiation. Application to the study of long term corrosion behaviour of low alloy steels", Vol. 12, *Journal de physique IV*, pp 393-408.

- **Neff, D., Dillmann, P., Béranger, G.** An analytical study of corrosion products formed on buried ferrous archaeological artefacts, International workshop on Prediction of long term corrosion behaviour in nuclear waste systems, Cadarache (France) 26th – 29th November 2001, European Federation of Corrosion, EFC series 2003, (oral communication).


- **Neff, D., Dillmann, P. and Béranger, G.** Apport des méthodes de microdiffraction et de microfluorescence X à l'étude de la corrosion à long terme des matériaux ferreux dans les sols argileux, 33èmes journées d'étude de la cinétique hétérogène, Compiègne 28 – 29 mars 2002 (oral communication).

- **Neff, D. and Dillmann, P.** Analyses de produits de corrosion formés sur des analogues archéologiques ferreux, Gestion à long terme des déchets nucléaires conference, CEA Saclay 13 – 15 mars 2002 (poster).


- **Neff, D., Dillmann, P., Bellot-Gurlet, L. and Beranger, G.** Corrosion of iron archaeological artefacts in soil-1: characterisation of the corrosion system, Corrosion Science, Volume 47, Issue 2, February 2005, Pages 515-535.

- **Neff, D., Dillmann, P., Descostes, M. and Beranger, G.** Corrosion of iron archaeological artefacts in soil-2: phase solubility and average corrosion rates, Corrosion science, submitted

 Restoration and conservation of damascened steel weapons. A case study (BROMECC 8)


 Development of a diagnostic method and a phenomenological scenario for the alteration of cultural iron materials exposed to atmospheric corrosion (BROMECC 8)



 Thermal treatment of archaeological iron (BROMECC 8)

 Long term corrosion of iron, unalloyed or mild steel in clay soils. Physico-characterization and electrochemical study of archaeological models (BROMECC 9)


 Metallographic examination of armour artefacts – an “*in-situ*” metallographic observation method (BROMECC 10)


Vella, D., Degriigny, C., Grech, M. & Williams, A. (2004) Metallurgy of armour exhibited at the Palace Armoury, Valletta, Malta, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 215-233.


 The armours of the Palace Armoury under synchrotron investigation (BROMECC 13)

 /  Atmospheric corrosion : study of long term behaviour of iron through the analysis of archaeological artefacts. Part1: Role of phosphorus in the corrosion mechanisms (BROMECC 13)

Neff, D. and Balasubramaniam R., Journal of History of Science (accepted)

 Archaeological Heritage and conservation: application of new technological procedures to the restoration of ancient metals (BROMECC 14)

 PROMET – Corrosion product cleaning of steel coupons: original surface conservation, aesthetic values and protective system efficiency (BROMECC 14)

 The investigation of deterioration and stabilisation of archaeological iron in the British Museum and experiments on effects of RH on corrosion of iron (BROMECC 16)



Corrosion characterization and treatment evaluations of iron artefacts recovered from the USS *Monitor* (BROMECC 16)



Chlorinated phases on archaeological iron artefacts from terrestrial sites : characterization and formation mechanisms (BROMECC 16)



New French research program on very long term corrosion in concrete (BROMECC 16)



Investigations into the alkaline sulphite treatment for conservation of large quantities of archaeological iron object (BROMECC 16)

Schmutzler, B., Ebinger-Rist, N. (2008) The conservation of iron objects in archaeological preservation - Application and further development of alkaline sulphite method for conservation of large quantities of iron finds, *Materials and Corrosion* 59(3), 248-253



New approaches to iron stabilization research (BROMECC 17)



Low-oxygen and low-temperature storage of freshly excavated iron artefacts (BROMECC 17)



Development of a method of interpretation of radiographies for the study of iron archaeological artefacts: contribution to the study of the corrosion structure and diagnosis (BROMECC 18)



CONSIST: Coating Materials and Strategies for the Preservation of Iron / Steel Industrial Cultural Heritage (BROMECC 18)



The desalination of archaeological iron objects with hydroxylamine (BROMECC 18)

Wiesner, I., Schmutzler, B., Eggert, G. (2007) The Desalination of Archaeological Iron Objects with Hydroxylamine, in: C. Degryny et al (Eds.), *Metal 07*, Vol. 5: Protection of metal artefacts, Amsterdam 2007, 57-60.



Alteration of iron archaeomaterials: characterisation of chlorinated phases in terrestrial archaeological iron artefacts (BROMECC 20)




Archaeological marine iron artefacts: from understanding the corrosion mechanisms to the prediction of the treatment times (BROMECC 20)




Visualisation of tinning on archaeological iron based artefacts (BROMECC 20)




A note on the detection of the original surface of marine wrought iron artefacts from observations made on marine crusts of the historic wreck, *Elizabeth and Mary* (1690), Anse aux Bouleaux, Québec (BROMECC 20)

 Fifteen years of marine archaeological iron artefact treatments: a critical review and new developments (BROMECC 20)


 The use of sodium carboxylate as a corrosion inhibitor to protect iron artefacts (BROMECC 20)


 The maintenance of Cor-ten[®] sculptures (BROMECC 20)


Decker, P., Brüggerhoff, S., Eggert, G. (2008) To coat or not to coat? The maintenance of Cor-Ten[®] sculpture, *Materials and Corrosion* 59(3), 239-247.

 Characterisation of corrosion layers formed during long-term exposure to atmospheric corrosion: application to the study of the reinforcing chain at Amiens cathedral (BROMECC 20)


 Conservation of two libation elements from Thugny Trugny (BROMECC 20)


 Methodology of study of mineralised organic remains. Application to the buried iron artefacts of the Middle Ages tomb of Bruckmühl, Germany (BROMECC 20)


 Experimental iron at Fiskerton: results after burial for 30 months (BROMECC 21)


 Blue Iron Rust – A review on the formation and stability of vivianite (BROMECC 21)


Scott, D. A., Eggert, G. (2007) The Vicissitudes of Vivianite as Pigment and Corrosion Product, *Reviews in Conservation* 8, 3-13.

 Deterioration of iron archaeological artefacts: local and structural investigations on Cl-containing corrosion products (BROMECC 21)

 The study, stabilization, and conservation of large iron elements recovered from the American Civil War ironclad USS *Monitor* (1862) (BROMECC 21)

 The effect of relative humidity (RH) on archaeological iron deterioration (BROMECC 21)

 Effects of relative humidity (RH) on the corrosion of iron—an experimental view (BROMECC 21)

 Investigation into the potential of low-oxygen and dry/cold storage for freshly excavated iron artefacts (BROMECC 21)



Can dried out iron alloy artefacts be stabilized after 20 years of excavation? (BROMECE 21)



(Re)treatment of archaeological ironwork: necessary or just a waste of time? (BROMECE 21)



Alkaline sulfite desalination- tips and tricks (BROMECE 21)



Clemson University takes over Hunley Project (BROMECE 22)



A survey of past conservation methods on archaeological iron artefacts in Switzerland. The case study of iron objects recovered from La Tène site (NE) (BROMECE 22)



The use of iron in gothic architecture: the case of Troyes and Rouen churches (BROMECE 22)



Artefact analogues for investigating original surface limits and corrosion product removal techniques for the ferrous armour of the Knights of St John, Palace Armoury, Malta (BROMECE 22)



Programme ODéFA : Optimisation de la déchloruration des ferreux archéologiques (BROMECE 23)




Long-term corrosion behaviour of low-carbon steel in anaerobic soils (BROMECE 25)



Keep cool? Deep freeze storage of archaeological iron (BROMECE 25)



/  Ancient production techniques of Roman masked helmets from the 1st century A.D. (BROMECE 25)



Ferric surfaces of Pre-Roman weapons of the Iberian Peninsula: characterization, deterioration and treatment (BROMECE 27)



Indoor atmospheric corrosion of historical ferrous alloys. System characterization (BROMECE 27)

Laser and metal artefacts



Investigation on the use of a Nd:YAG laser for the removal of corrosion products on archaeological iron (BROMECE 1)



Use of multipulse Q- switched solid state lasers for art objects restoration (BROMECE 4)

No publication up to now

Laser Cleaning of Metal Surfaces (BROMECC 8)

Mottner, P., Wiedemann, G., Haber, G., Conrad, W. & Gervais, A., Laser cleaning of metal surface – laboratory investigations, in: Lasers in the Conservation of Artworks, Lacona V Proceedings (Osnabrueck, Germany, September 15-18, 2003; Eds.: Dickmann, K., Fotakis, C. & Asmus, J.F.), Springer Proceedings in Physics 100 (2005), p. 79-86, ISBN: 3-540-22996-5



Cleaning of metal artefacts using pulsed lasers (BROMECC 14)




The application of new technologies for the cleaning of archaeological and historical metal objects. Investigation of the possibility of applying laser technology and electrolytic methods (BROMECC 14)



Short pulse laser cleaning for heritage artefacts (BROMECC 19)



/  Characterization of the interaction of laser radiation with copper alloys used in outdoor sculpture in the United Kingdom (BROMECC 22)



Functional character and restoration criteria: comparative research of cleaning on a liturgical cross (Vado-Cervera, Palencia, Spain) (BROMECC 26)



MicroXRF spectrometry for evaluating laser cleaning procedures on ancient coins (BROMECC 27)

Lead based artefacts

Cleaning of aged protective layers covering lead artefacts damaged in corrosive organic acid vapours (BROMECC 1)

No publication. Student dissertation

Examination and stabilisation of a collection of lead medals from the National Museum of Finland (BROMECC 2 & 3)

No publication. Student dissertation

Archaeological lead artefacts: case study (BROMECC 3)



Lead roofs in Denmark (BROMECC 5)



Comparison of galvanostatic and potentiostatic reduction for lead (BROMECC 5)

No publication

The problems associated to the past use of lead solder in the repair and restoration of golden objects (BROMECC 8)



Adsorbent materials used to prevent alteration of metallic objects exposed in museums: the case of lead (BROMECC 9)



Conservation of lead printing letters by electrolytic reduction (BROMECC 9)



Insights into the chemical and morphological changes of historical lead objects as a result of the use of electrolytic reduction as a stabilisation treatment (BROMECC 19)




Investigation of corroding lead inlays on Japanese lacquer objects (BROMECC 21)



Historic printing block collection threatened by active lead corrosion (BROMECC 22)



/  In-situ electrochemical and SR-XRD time resolved study of lead carboxylate coating for the protection of cultural heritage artefacts (BROMECC 23)



Analytical study of lead comes from historical stained glass windows of different chronology and provenance (BROMECC 26)

Management of collections

Metal objects in museums: experimentation and implementation of a conservation assessment and collections condition survey data file system on the armour collection of the "Palazzo Venezia" National Museum in Rome (BROMECC 8)



Re-conservation and re-restoration of archaeological metal artefacts (BROMECC 9)



PROMET - Innovative conservation approaches for monitoring and protecting ancient and historic metals collections from the Mediterranean Basin (BROMECC 12)

Argyropoulos, V., Angelini, E. & Degriigny, C. (2004) Innovative conservation approaches for monitoring and protecting ancient and historic metals collections from the Mediterranean basin, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 43-52.



PROMET: Innovative conservation approaches for monitoring and protecting ancient and historic metal collections from the Mediterranean (BROMECC 15)



PROMET - Developing new analytical techniques and materials for monitoring and protecting metal artefacts from the Mediterranean Region (BROMECE 16)



Corrosion study of aluminium artefacts in an aeronautic collection: analysis and identification of corrosion risks (BROMECE 16)



Investigations into the alkaline sulphite treatment for conservation of large quantities of archaeological iron object (BROMECE 16)

Schmutzler, B., Ebinger-Rist, N. (2008) The conservation of iron objects in archaeological preservation - Application and further development of alkaline sulphite method for conservation of large quantities of iron finds, *Materials and Corrosion* 59(3), 248-253.



Assessment of the environmental impact on the conservation of cultural heritage metal artefacts (BROMECE 20)



Characterisation of Erard piano strings (BROMECE 23)



Cold climate conservation (BROMECE 26)



The PROMET project: development of innovative materials and techniques for the study and protection of metallic cultural heritage (BROMECE 26)



Ferric surfaces of Pre-Roman weapons of the Iberian Peninsula: characterization, deterioration and treatment (BROMECE 27)

Non-destructive analysis



Cost Action G8: Non-Destructive analysis and Testing of Museum Objects (BROMECE 7)



Original or fake? Investigation of a Bronze Age sword from Oedt in North-West Germany (BROMECE 27)

Proceedings of COST Action G8 meeting in Malta - 2005




EU-ARTECH project (BROMECE 12)





The armours of the Palace Armoury under synchrotron investigation (BROMECE 12)




Conservation, restoration and technology of medieval gilded metals (BROMECE 14)

 Development of a method of interpretation of radiographies for the study of iron archaeological artefacts: contribution to the study of the corrosion structure and diagnosis (BROMECC 18)


 Physical and chemical characterization of metal archaeological artefacts (BROMECC 19)

 Late Bronze age copper ingots in the Central Mediterranean and the Lipari Hoard (BROMECC 19)

 Characterization of plating materials and techniques used in instruments of Sax factory (BROMECC 23)


Plasma in metal conservation


 D.C. mode hydrogen plasma treatment for archaeological iron (BROMECC 1)

 Plasma reduction, its use in metals conservation (BROMECC 5)


Schmidt-Ott, K. (2004) Plasma-reduction: its potential for use in the conservation of metals, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 247-260.


 SMARTPLASMA project (BROMECC 12)

 Archaeological Heritage and conservation: application of new technological procedures to the restoration of ancient metals (BROMECC 14)

 Smartplasma project (BROMECC 21)

Sculptures

 The removal of bronze spray paint from a collection of Outdoor bronze monuments in the suburb of Athens (BROMECC 3)

 A comparative study of protective coating systems for outdoor bronze sculpture in marine environment (BROMECC 5)

- **Letardi P.** (2004) *Laboratory and field test on patinas and protective coating systems for outdoor bronze Monuments*, in: J.Ashton, D.Hallam (Eds.), *Metal2004 Proceedings of the International Conference on Metals Conservation*, Canberra, 4-8 October 2004, National Museum of Australia, pp. 379-387

- **D'Ercoli G. and Marabelli M.** (2004) *La resistenza di polarizzazione: indagine non distruttiva per la caratterizzazione di patine e protettivi di un monumento bronzeo*, in P.

Letardi, I. Trentin, G. Cutugno (Eds), *Monumenti in bronzo all'aperto. Esperienze di conservazione a confronto*, Nardini, Firenze, pp.113-118

- **Letardi, P.** (2003), Efficacia dei protettivi per i Bronzi esposti in ambiente marino: analisi di laboratorio e misure in campo, in *Proc. Lo Stato dell'Arte*, Torino, 2003, pp 354-363

- **Letardi, P. and Cozzolino, D.** (2002), Contact-Probe EIS Characterisation of Protective Coating Systems for OUTDOOR Bronze Sculpture: Atmospheric Weathering Behaviour in Marine Environment, in *Proc. 15th International Corrosion Congress, Frontiers in Corrosion Science and Technology*, Granada (Spain), 2002 - paper 538

- **Letardi P., Marabelli M., D'Ercoli G. and Guida G.** (2002) *Comparative study of Protective Coating Systems for OUTDOOR bronze sculpture*, in: A. Guarino (Ed.), *Proceedings of 3rd International Congress on Science and Technology for the Safeguard of Cultural Heritage in the Mediterranean Basin*, Alcalà, 9-14 July 2001, CNR, Rome, pp 272-275



Study of Patinas formed on Cu base alloy Monuments after Outdoor exposure in Buenos Aires City (BROMECC 6)

Crespo, M., Cicelio, G and Rosales, B. (2004) Electrochemical characterisation of patina protectiveness evolution on outdoor bronze sculptures, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 185-194



Research on the bonding of metal structures into stone bases, i.e. for metallic sculptures (BROMECC 8)



Artistic bronzes: selection of alloys, protective evaluation using conventional and advanced techniques (BROMECC 11)



French-Chilean cooperation project for the conservation of sculptures in Santiago de Chile (BROMECC 13)



Patina management: the conservation and preservation of restored patina of outdoor bronze sculpture (BROMECC 13)

No publication yet




Environmental consequences and protection of outdoor bronze monuments in Greece (BROMECC 14)



Metal sculptures in the historic centre of Madrid: a review of their conservation and restoration (BROMECC 26)

Seminars


 2002 ChimArt meetings (BROMECC 5)

 Translation of Metal 2003 abstracts (BROMECC 6)

Silver based artefacts


 The analysis of measles and a white blush on daguerreotypes (BROMECC 1)


No publication yet

 Technological investigation of a romanesque reliquary (BROMECC 1 & 5)


Grieb, H. (2004) Theophilus and the shrine of Vitus – a goldsmith's technique in the mirror of ancient references, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 443-452.

 The conservation of historical Greek Porpi (Belt buckles) (BROMECC 3)


 Embrittlement of silver by lead on archaeological artefacts (BROMECC 5)

 Research into the possibilities for the removal of tin solders on silver artefacts (BROMECC 5)

van Bellegem, M., Ankersmit, H., van Langh, R. & Wei, W. (2004) Solder on silver: historical usage and the problem of fretting, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 104-113.

 Monitoring the corrosion on museum silver and silvered artefacts (BROMECC 7)

M. Dubus and M. Aucouturier, Atmospheric corrosion monitoring of silver in museums, *Indoor Air Quality 5th International Conference*, University of East Anglia, 28-29th April 2003, <http://iaq.dk/iap.htm>

 Corrosion Phenomena on a 17th century box of board games (BROMECC 7)

Eggert, G., Wollmann, A., Schwahn, B., Hustedt-Martens, E., Barbier, B., Euler, H. (2008) When glass and metal corrode together, 15th ICOM CC Triennial Conference, New Delhi, forthcoming.

 Reduction of silver tarnishing and protection against further corrosion (BROMECC 8)

- **Trachli B., Keddou M., Srhiri A. & Takenouti H.**, *Corrosion Science.*, 44 (2002) 998

- **Evesque M., Keddani M. & Takenouti H.**, 8th International Symposium on Electrochemical Methods in Corrosion Research, May 2003, Nieupoort (Belgium)



Research into the possibilities for the removal of tin solders on silver artefacts (BROMECC 8)



Anticorrosive protection of daguerreotypes (BROMECC 9)



The influence of lead on the embrittlement of silver alloys (BROMECC 13)



The influence of different cleaning agents and cleaning methods on the tarnishing rate of silver (BROMECC 13)




The restoration of jewellery (BROMECC 15)



Cleaning of sulphide on silver and gilt silver threads in silk textiles using laser in the UV- and visible range (BROMECC 22)



/  Ancient production techniques of Roman masked helmets from the 1st century A.D. (BROMECC 25)



Conservation approaches for monitoring and cleaning Ag and Ag-alloy artifacts (BROMECC 26)

Stabilisation



Application of pulsed currents to the stabilisation of small iron artefacts (BROMECC 1)



Electrolytic stabilisation of iron artefacts in neutral solution (BROMECC 2 & 3)



D.C. mode hydrogen plasma treatment for archaeological iron (BROMECC 1)



Electrolytic stabilisation of iron artefacts in neutral solution (BROMECC 2)



Comparison of quantitative methods of chloride measurement for metal conservation and desalination (BROMECC 4)



Conservation research has started on the Civil War submarine H.L. *Hunley* (BROMECC 4)


- **González, N., de Viviés, P., Drews, M.J. and Mardikian, P.** (2003) Characterizing the chloride in the wrought iron rivets from the *Hunley*, Proceedings NACE Conference, Northern Area Eastern, Preservation of Heritage Artifacts Session. Sept 15-17, Ottawa, Canada. Proceedings on CD.


- **González, N., de Viviés, P., Drews, M.J. and Mardikian, P.** (2004) Hunting free and


bound chloride in the wrought iron rivets from the American Civil War Submarine H.L. Hunley (1864), *Journal of the American Institute for Conservation* 43, 161:174.


- **Mardikian, P.** (2004) Conservation and management strategies applied to post-recovery analysis of the American Civil War Submarine H.L. Hunley (1864), *The International Journal of Nautical Archaeology* 33.1, 137:148.


- **Drews, M., de Vivies, P., Gonzalves, N. & Mardikian, P.** (2004) A study of the analysis and removal of chloride in iron samples from the Hunley, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 247-260.


 Removal of chlorides from enamelled medallions (BROMECC 4)

 A new concept for the desalination of archaeological iron artefacts in neutral solutions (BROMECC 5)


 The *Nottingham Galley* cannon collection: A proposed scientific inquiry into the reasons a conserved iron cannon dramatically cracked into pieces whilst in storage (BROMECC 8)

 The investigation of deterioration and stabilisation of archaeological iron in the British Museum and experiments on effects of RH on corrosion of iron (BROMECC 16)

 Corrosion characterization and treatment evaluations of iron artefacts recovered from the USS *Monitor* (BROMECC 16)


 Investigations into the alkaline sulphite treatment for conservation of large quantities of archaeological iron object (BROMECC 16)


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
 New approaches to iron stabilization research (BROMECC 17)


 The desalination of archaeological iron objects with hydroxylamine (BROMECC 18)


Wiesner, I., Schmutzler, B., Eggert, G. (2007) The Desalination of Archaeological Iron Objects with Hydroxylamine, in: C. Degryny et al (Eds.), *Metal 07*, Vol. 5: Protection of metal artefacts, Amsterdam 2007, 57-60.

 Insights into the chemical and morphological changes of historical lead objects as a result of the use of electrolytic reduction as a stabilisation treatment (BROMECC 19)


 Conservation issues for mercury in technical and industrial heritage collections (BROMECC 20)

 Fifteen years of marine archaeological iron artefact treatments: a critical review and new developments (BROMECC 20)


 Alkaline sulfite desalination- tips and tricks (BROMECC 21)


 Clemson University takes over Hunley Project (BROMECC 22)

 Historic printing block collection threatened by active lead corrosion (BROMECC 22)


 Programme ODéFA : Optimisation de la déchloruration des ferreux archéologiques (BROMECC 23)

Tin based artefacts


 Investigation of the composition of tin spoons found in Amsterdam (BROMECC 1)


 COLLAPSE - Corrosion of Lead and Lead-Tin Alloys of Organ Pipes in Europe (BROMECC 5)

Niklasson, A., Johansson, L-G & Svensson, J-E (2004) Atmospheric corrosion of historical organ pipes: influence of acetic and formic acid vapour and water leaching on lead, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 273-280.

 Research into the possibilities for the removal of tin solders on silver artefacts (BROMECC 8)

van Bellegem, M., Ankersmit, H., van Langh, R. & Wei, W. (2004) Solder on silver: historical usage and the problem of fretting, in proceedings of the ICOM-CC Metal WG interim meeting, *METAL 04*, Canberra, 104-113.

 Restoration of a 17th century tin coffin (BROMECC 10)

 Pewter objects in decorative arts – damages and their restoration (BROMECC 10)

 Visualisation of tinning on archaeological iron based artefacts (BROMECC 20)