Wet Organic Archaeological Materials

WOAM NEWSLETTER

No. 51 May 2012 ICOM-CC WORKING GROUP

CONTENTS

1. FROM THE COORDINATOR

Two major announcements –

The Proceedings of the 11th ICOM-CC Group on Wet Organic Archaeological Materials Conference, Greenville NC, 2010 has been published. For those of you who attended the conference you should already have received your copy. I would like to thank Kristiane Straetkvern and Emily Williams for their work on editing and producing this volume. It will be a valuable addition to our libraries. Further thanks are due to Emily Willliams for guiding this publication through the new and often frustrating world of on-line publishing. Her perseverance has made this book possible. I am even happier to announce that Emily has agreed to take on the publication of the next conference proceedings.

Which brings me to the second announcement - dates for the next WOAM conference have been chosen. The conference will be held May 13-17, 2013 in Istanbul Turkey. It should be an exciting conference and a chance to meet with your colleagues. The WOAM conference will be hosted by Istanbul University Letters Faculty and organized by Ufuk Kocabaş. It will be your chance to see the 27 Yenikapi ships recently conserved. The first Call for Papers and Posters is also included. I hope to see many of you there.

Further details are available in the Newsletter.
Tara Grant, Coordinator

Websites of Interest

The *Investigator* -Saga of the Northwest Passage in Archaeology Magazine
http://www.archaeology.org/1203/features/hms_investigator_shipwreck_arctic_exploration.html

The Yenikapi Byzantine Ship Replica
http://www.hurriyetdailynews.com/replica-of-byzantine-ship-to-sail-next-year-in-turkey-.aspx?pageID=238&nID=11843&NewsCatID=375

Investigation of the Effects on Reburial Artefacts
http://www9.vgregion.se/vastarvet/svk/reburial/index.htm

2. COLLEAGUE'S CORNER

Greek and Roman Boats in Treatment

ARC-Nucleart is dealing with two important projects.

The Marseille History Museum plans to reopen to the public in June 2013. New to the collection will be two Greek boats from the VI century BC and four Roman boats discovered in the ancient harbour of Marseille. Some of the boats have been conserved while others are still waterlogged and all of the boats still need to be restored. Conservators and frame welders have been working together in ARC-Nucleart's workshop since June 2011.

An underwater excavation conducted by the archaeological museum of Arles last year discovered a 31 meter long Roman boat in the Rhône River. It took 8 months for the archaeologists to retrieve the shipwreck from the water. The ship was cut into pieces and the wood was sent to Grenoble for peg and freeze drying treatment. Up to 20 freeze drying sessions will be necessary to complete the drying. Restoration and support construction are to be finished by the end of next year.

Henri Bernard-Maugiron, ARC Nucleart, Grenoble, France

1. Lifting sections of Arles shipwreck from the Rhone River

2. Impregnation of Arles shipwreck in PEG

3. Metal support for Greek shipwreck from Marseilles harbour

News from the Vasa Museum

The latest preservation research project examining the condition of Vasa wood, "A Future for Vasa" has drawn to a close, with a final evaluation undertaken in December 2011 by an international panel of experts. The panel comprised Prof. C. David Garner, Prof. Emeritus, School of Chemistry, University of Nottingham; Dr. Per Hoffmann, former Head of Conservation at the Deutsches Schiffahrtsmuseum, Bremerhaven; Prof. Bjarne Holmbom, Professor Emeritus of Wood and Paper Chemistry, Åbo Akademi University, Finland and Prof. Willem Koppenol, Professor of Bioinorganic Chemistry, The Eidgenössiche Technische Hochschule (ETH), Zurich.

The evaluation panel praised the research standards and high productivity in terms of publications, theses and presentations of the various research groups involved in the project, and recommended the following:

- Continue monitoring the strength and the chemical status of Vasa wood;
- Develop an understanding of the process(es) that consume oxygen and lead to the production of oxalic acid, linking this with studies of the rates of cellulose degradation;
- Initiate a programme to remove iron from Vasa wood, followed by PEG impregnation/freeze-drying;
- Take samples of Vasa wood periodically and store them anaerobically at liquid nitrogen temperatures as long-term references.

One of the panel's recommendations - **to ensure, beyond the introduction of new bolts, that the physical structure of Vasa is maintained and, if possible, improved by a new support structure** - has already been embraced by the Museum.

In March 2011, the Vasa Museum began a cooperative project with AB Sandvik Materials Technology, a major steel producing company in Sweden and an international leader in research and development of metal alloys. Sandvik's high quality steel will be used to replace the current mild steel bolts inserted in Vasa's hull in the 1960s, which are corroding and no longer fulfill their role in holding the structure together. The project to replace the estimated 5500 bolts in the ship is projected to take 6 years and a team of 3 ship carpenters has been engaged to undertake the work. This has generated huge interest from the visiting public as the work must be carried out during opening hours, with as little disruption to the public as possible. Progress can be followed via a blog (Skeppsbloggen) on the Museum's website www.vasamuseet.se . (Even if you don't speak Swedish, there are plenty of photos showing the work.)

Replacing the bolts is only a part of the huge challenge to improve the support cradle for the ca 900 tonne hull structure. It has been known for a while that the ship requires better structural support and the current stanchions are insufficient to take the massive loads. Therefore, the Vasa Museum is currently seeking funding for a new project – Support Vasa – in order to design a completely new support system. This is in co-operation with Professors Kristofer Gamstedt and Ingela Bjurhager, research engineers at Uppsala University. Bjurhager, in particular, has been much involved with previous Vasa research, having examined the mechanical properties of Vasa wood as part of her doctorate studies. Wood chemistry will be an integral part of this research as the rates of degradation

reactions in Vasa wood are still unclear, but at this stage it is likely that a large safety margin will have to be incorporated into any future design.

Emma Hocker, Vasa Museum, Stockholm, Sweden

Summary of a Master's Thesis: Re-Conservation of Wood from the Seventeenth-Century Swedish Warship the Vasa with Alkoxysilanes: A Re-Treatment Study Applying Thermosetting Elastomers

For his MA thesis at the Nautical Archaeology Program (NAP) at Texas A&M University (TAMU), Mr Carlos Cabrera Tejedor conducted a re-treatment study in collaboration with the Vasa Museum in Stockholm, and under the supervision of Professor Dr Donny Hamilton, Director of the Conservation Research Laboratory (CRL) at TAMU.

In the study, the feasibility of re-conserving small wood artefacts, previously conserved by total impregnation with PEG, with alkoxysilanes was tested. Besides the main focus of the experiments, the thesis also devoted other chapters to complementary topics such as: a brief history of the preservation and restoration of the Vasa, the history and use of silicone compounds in the conservation of cultural heritage, a summary of current approaches to the conservation of waterlogged wood, and a discussion about ethics in conservation such as the reversibility of materials used as consolidants.

Three different wood samples from the Vasa Museum Collection were re-conserved with three different procedures involving the use of alkoxysilanes as consolidants. Alkoxysilanes, or alkoxy-terminated siloxanes, are organosilicon compounds commonly referred to as silicones made with highly cross-linked siloxanes that irreversibly cure forming thermosetting polymers.

The chemical compounds used as consolidants were silicone oil and a crosslinker. The silicone oil used in the study was a dimethyl siloxane hydroxyl-terminated polymer, and the crosslinker was metyltrimethoxysilane (MTMS), both manufactured by Dow Corning Corporation. The three different re-conservation procedures employed were: (1) the method used by the CRL at TAMU of consolidation using a mixture of low viscosity silicone oil (~75 CST) and MTMS at 20% by volume; (2) a re-treatment developed by Dr Wayne Smith consisting of direct immersion of the PEG treated wood sample in MTMS at 70 ºC; and (3) an alternative MTMS treatment developed by the author consisting of removal of PEG from the wood sample in aqueous solution at 60 ºC, followed by solvent dehydration, and completed by consolidation with MTMS.

During a series of experiments several physical and chemical characteristics were monitored and documented for each sample before, during and after each re-conservation procedure. This information was used to evaluate and classify the results of each of the treatments applied. Among a great deal of detailed information derived from several physical and chemical analysis, the following overall results and conclusions were achieved after the completion of the study.

For the re-conservation of wood previously conserved by total impregnation with PEG, the results of this study suggested that the best way to remove PEG from an object seemed to be by reverse osmosis in aqueous solution of heated deionized water

at 60 ºC. Chemical analyses conducted in the study also indicated that the PEG could not be completely removed from the wood structure, suggesting that PEG is not a 100% reversible consolidant.

The study suggested that final results vary depending on the selection of a different viscosity alkoxysilanes (i.e. silicone oil versus MTMS). Better results appear to be obtained with lower viscosity alkoxysilanes (i.e. MTMS). As in other consolidation procedures, the selection of a specific consolidant should be ad hoc for each artefact or groups of artefacts. This selection should be largely based on the nature of the artefact, porosity of the material, and degree of preservation, among other factors.

The study indicated that better results might be obtained when lower molecular weight polymers are used as consolidants. In the study, the alternative MTMS procedure developed by the author using MTMS (1 CST) appeared to offer better results than the use of silicone oil (~75 CST) for the re-treatment of previously conserved wood artefacts by total impregnation with PEG. However, it seems probable that the use of a silicone oil with a lower molecular weight of ~75 CST would offer similar results for the same type and nature of wood samples; albeit this hypothesis was not tested in the study.

Regarding the macroscopic results, the results indicated that after re-conservation the colour acquired by the samples was considered good in all but one of the final samples. All resulting samples showed minimal shrinkage on the longitudinal, radial and tangential axis, within the average ratios expected going from swollen to natural dry wood. In regards to microscopic results, SEM analysis of the samples indicated that the amount of polymer retained in the samples was minimal. In the best cases documented in SEM micrographs, the thickness of the protective polymer film was estimated to be in the scale of micrometres. Nonetheless, the polymer film seemed to provide enough support and confer sufficient mechanical strength to sustain the conserved wood structure. Due to the extreme thinness of the polymer film, the re-conserved samples appeared to acquire physical characteristics very close to those of natural dry wood. The results also indicated that, in the case of the alternative MTMS re-treatment method, it might be possible to acquire values in weight and specific gravity very close to those of natural dry wood. The presence of the polymer after consolidation was so minimal that it allowed the microscopic identification of the diagnostic morphological characteristic of the materials; in this case, the identification of the different wood species and sub-species.

Another significant benefit to mention is that objects conserved with alkoxysilanes seem to acquire the protective qualities of the silicone polymer. Although silicone is susceptible to hydrolysis under extreme pH conditions, it is resistant to most forms of environmental attack. Consequently, objects or materials coated and consolidated with alkoxysilanes appear to become highly resistant to changes in temperature, chemical attacks from acid or bases, ultraviolet radiation, and also seem to turn into a hydrophobic material; therefore, these treated objects seem less affected by changes in surrounding environmental conditions. These newly acquired qualities are important to consider when the conserved artefacts are going to be on display to the public, during shipping or transportation, or in storage, because

preventive conservation measures can drastically be reduced.

Nevertheless, it is important to emphasize that the results obtained with the use of alkoxysilanes can be very desirable, but they are not reversible. This is derived from the fact that silicone compounds establish covalent chemical bonds with the wood structure. However, it is discussed in the thesis that in some instances reversibility could not necessarily be a drawback. In the consolidation of a material where the main goal is to confer mechanical and structural strength to the artefact (e.g. the consolidation of stone) reversibility is not necessarily a required characteristic. In these cases, strength and durability of the consolidant, and its re-treatability are more desirable qualities. If the application of alkoxysilanes as consolidant is performed properly, the amount of polymer retained by the artefact could be so minimal that the technique might be highly re-applicable (with similar compounds).

The stability of alkoxysilanes is elevated due to the industrial formulation and quality grade of the polymers. However, the life span or durability of the alkoxysilanes used as consolidants for organic materials is a point that requires further study. Academic studies suggest the use of alkoxysilanes in the conservation of stone has proven to last long enough (i.e. at least 20 years) in harsh outdoor environmental conditions to validate their widely accepted use. Therefore, the life span of small wooden artefacts previously conserved by impregnation with PEG could presumably be significantly extended by their re-conservation with alkoxysilanes. Therefore, conducting more studies about the stability of archaeological wood conserved with alkoxysilanes would be beneficial in order to provide additional valuable information about the technique.

Another advantage of the use of alkoxysilanes is that it does not require complex installations or advanced technical knowledge to apply this technique. Only the chemical compounds, basic laboratory installations, a vacuum pump and a trained conservator are essential. Conservators do not always work for important museums or research institutions with advanced technology and resources. Furthermore, heritage often comes from remote places with limited access to technology. Hence, a technique that requires minimal installations and technical knowledge is of great value for the field of conservation. In practical terms, in the world of conservation sometimes the best technique is not achievable or realistic and, thereupon, secondary procedures become better techniques than the “best ones”. This, however, always has to be observed with discretion and on a case-by-case basis.
Nevertheless, it is essential to have a profound understanding of the processes, phases, parameters and steps of the procedure using alkoxysilanes, in addition to being extremely meticulous with the execution. A careless execution could produce catastrophic results, which, as stated earlier, will not be reversible. Although the technique uses complex chemical compounds, the achievement of excellent results comes from the experience of skilled conservators, their sensibility and “know-how”.

To summarize, the study suggested that the re-conservation of small, wood artefacts, previously conserved by total impregnation with PEG with alkoxysilanes is not only a feasible approach but also seems to offer quite significant results. The re-conserved samples appeared to acquire very close

physical characteristics to those of natural wood, and seemed to obtain new added properties from the alkoxysilanes that could reduce the use of preventive conservation measures during display or storage.

Based on the results of the three re-conservation procedures tested in the study, the proposed author's alternative MTMS procedure appeared the most suitable re-conservation method for small wooden objects previously conserved by impregnation with PEG.

Nevertheless, and despite the significant results, the final responsibility in evaluating the pros and cons of using alkoxysilanes for the conservation or re-treatment of waterlogged archaeological wood lies with museum conservators and curators. They should study each particular case as a *unicum*, thoughtfully and in detail, taking into consideration the advantages and drawbacks of alkoxysilanes before applying this procedure.

The author would like to thank all of the different individuals and institutions that, through their support and generosity, made the study possible. Also, he would like to thank Ms Kristiane Straetkvern for encouraging him to write this synopsis and to Ms Tara Grant for making the publication of this summary possible.

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Website on Treatment of Small Boats

A short article on the treatment of several small boats found in Québec City in 1984-85 is now available on the web site of the Centre de conservation du Québec. Bringing together history and conservation, the article named "Le traitement de conservation des embarcations du Musée de la civilisation, Vingt ans après…" is aimed for the general public.

It can be downloaded from the web site of the Centre by following this link:

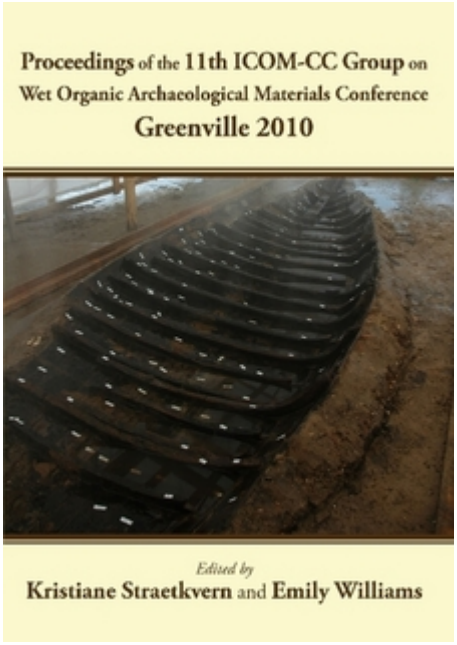
http://www.ccq.gouv.qc.ca/fileadmin/images/publications/embarcations_civilisation.pdf

Andre Bergeron, Centre de Conservation du Quebec, Quebec, Canada

Proceedings of the 11th ICOM-CC Group on Wet Organic Archaeological Materials Conference: Greenville 2010

By Emily Williams, Kristiane Straetkvern

Paperback, 667 Pages



Price: $50.70 US plus shipping

The Proceedings of the 11th ICOM-CC Group on Wet Organic Archaeological Materials Conference in Greenville, 2010 are now available. For anyone who attended the Greenville conference you will receive your free copy of the proceedings soon as part of your registration fee. If your address has changed since the conference please contact Emily Williams at ewilliams@cwf.org

If you did not attend the conference and would like to order a copy the books can be ordered through Lulu, an on-line publisher at:

http://www.lulu.com/shop/emily-williams-and-kristiane-straetkvern/proceedings-of-the-11th-icom-cc-group-on-wet-organic-archaeological-materials-conference-greenville-2010/paperback/product-20033707.html

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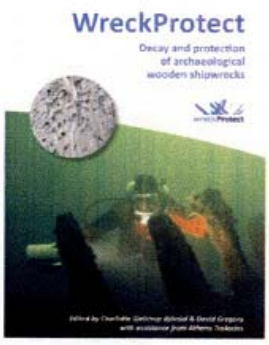
WreckProtect:
Decay and protection of archaeological wooden shipwrecks

edited by Charlotte Gjelstrup Björdal & David Gregory, with assistance from Athena Trakadas

2012. ISBN 9781905739486. £19.95. viii+154 pages,
illustrated throughout in colour. Hardback.

Publication Post Free Offer*



This book stems from the results of an interdisciplinary European Union supported research project, WreckProtect, which investigated the decay and preservation of wooden shipwrecks under water in the Baltic Sea. It is not limited to the decay of wrecks in the Baltic alone and is aimed at all stakeholders with a vested interest in the protection of the underwater cultural heritage including marine archaeologists, conservators, engineers, and students in related fields at universities around the world. The book includes chapters on the anatomy and structure of wood and the physical and biological decay of shipwrecks under water. Well-known shipwrecks in the Baltic Sea are introduced, focusing upon their state of preservation and are compared to finds typically found in the North Sea and the Mediterranean. Microbial decay processes and their identification in both sediments and the water column are also discussed and related to other natural decay processes, as well as human impacts. Finally, a summary of available methods for the in-situ protection of wrecks is presented and a cost-benefit analysis of in-situ preservation versus conventional raising and conservation is given.

Please post to: Archaeopress, 276 Banbury Road, Oxford, UK, OX2 7ED, fax: +44 (0) 1865 311914. Payments by Mastercard, Visa, or by £ cheque. (Please contact us for secure online payment method)

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*Offer expires end May 2012

The 12th ICOM-CC WOAM (Wet Organic Archaeological Materials) Conference in: Istanbul, TURKEY, May 13-17, 2013

You are kindly invited to participate in this conference which will be held in Istanbul at the University's Faculty of Letters` Conference Hall. The university campus is located in the heart of an urban area called the "historic peninsula" which once served as the capital of three former empires. The most important monuments of the city such as the Haghia Sophia, Topkapi Palace, Blue Mosque and Grand Bazaar are a short walking distance from the faculty's hall.

The conference will be hosted by Istanbul University`s Department of Conservation of Marine Archaeological Objects. The department is the only institution teaching conservation of wet organic archaeological material, with a particular focus on the conservation of waterlogged wooden artefacts, in Turkey. The department' staff is also responsible for the fieldwork and conservation of 27 shipwrecks found during salvage excavations at a metro construction site in the Yenikapi district. Excavations have yielded the world's largest group of medieval shipwrecks and thousands of wet organic artifacts.

In addition to the conference programme several activities will be organized including visits to the Yenikapi Excavation Site and to the exquisite collections of the recently rebuilt Naval Museum. A welcome reception on a boat along the Bosphorus strait, which crosses from the Asian to the European sides of the city, will follow the excursion. A guided tour of the city will also be offered to the participants on the last day of the programme.

Ufuk Kocabaş
Conference Hall Address:
Istanbul University Letters Faculty
Ordu Cad. No:196, 34459 Beyazıt
Istanbul-TURKEY

Call for Papers and Posters for the 12th ICOM-CC Wet Organic Archaeological Materials Conference (WOAM) May 13-17, 2013 in Istanbul Turkey

Aims of the Conference

-To present relevant case studies in the conservation of wet organic archaeological materials
-To disseminate scientific research results in the field of wet organic archaeological materials
-To promote the application of new materials and technologies for conservation as well as new tools for analysis and documentation
-To identify further research and to provide networking for future activities

The Wet Organic Archaeological Materials Working Group has decided to focus on the following subjects. The list is not inclusive and all topics of relevance to the analysis, treatment and care of wet organics are welcome.

- Pre-conservation storage
- In-situ preservation and reburial
- New materials for the conservation of organic materials
- Retreatment of artifacts with particular reference to alum in wood
- Acids (sulfur and iron) formation in organic materials
- Categorization of materials, wood degradation and analysis
- Post-conservation display and storage
- Review of the samples from the 1987 International Comparative Wood Treatment Study
- Reports on ongoing conservation projects and case studies

Due Dates

Sept 15, 2012: Submission of abstracts for papers or posters

- Abstracts for Peer Review papers (title, authors and text, maximum 800 words, no images or graphs)
- Abstracts for all other papers and posters (title, authors and text, maximum 400 words, no images or graphs)

Abstracts for papers or posters should be submitted by e-mail to: tara.grant@pch.gc.ca
Please indicate if Paper is for Peer Review.

Oct 15, 2012: Approval of abstracts, speakers and posters, notification of authors

Jan 15, 2013: Submission of Peer Review Papers

April 30, 2013: Submission of all other papers or posters submitted for publication.

Late acceptance of Non-peer reviewed papers may be accepted if space remains.

Publication

All presentations, received by the editors, will be published in a post-conference proceeding. A copy will be mailed to registered participants as part of their conference fee. Only contributions submitted for peer-review will be reviewed by a scientific editorial board. They will be marked as such in the publication. Papers based on Posters can be submitted for publication. All papers will undergo an editorial review process.

Presentations, Papers and Posters

Maximum paper length is 4,000 words including caption endnotes and references. A maximum of 10 graphs, diagrams or images and 5 tables will be accepted.

Papers based on a poster should have a maximum length of 3,000 words including caption, endnotes and references. A maximum of 10 graphs, diagrams or images and 5 tables will be accepted.

Further guidelines will be sent to the authors upon acceptance of their abstracts.

For more information please contact: Tara Grant tara.grant@pch.gc.ca