Wet Organic Archaeological Materials

WOAM NEWSLETTER

ICOM-CC ICOM international council of museums – committee for conservation

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1. FROM THE COORDINATOR

WOAM 2019

I am really delighted to announce that we are working on plans to hold WOAM 2019 in Portsmouth, England. There are still a number of details to work out but the Mary Rose Trust and Historic England have proposed jointly hosting the conference. Dates are currently being pinned down but the conference will be in May of 2019. Look for additional details in the fall newsletter (see below).

Newsletter

I must admit to getting a little behind in my newsletter production. To make up for this, and because we have several articles in the pipeline, I will send out another newsletter in late September. If you do have notes, tips or articles you wish to share with colleagues please send them to me by September 15th.

ICOM-CC Triennial meeting

The ICOM-CC Triennial meeting will take place September 4-8th in Copenhagen. The program is available at: http://www.icom-cc2017.org/program.aspx. WOAM will meet on Friday the 8th. We have four really exciting papers in our session:

- **Development and use of a diver held underwater wood tester (Poul Jensen and David Gregory**)
- **Any one for a nice cup of tea? The use of bacterial cellulose for conservation of waterlogged archaeological wood (Yvonne Shashoua and David Gregory)**
- **Identifying and assessing damage by and monitoring emissions from PEG treated wood at the Mary Rose Museum (Sarah Hunt)**
- **Towards a description of the degradation of archaeological birch bark (Johanna Klugl)**

In addition to these papers, there are four great posters and a riveting business meeting to be enjoyed.

2. COLLEAGUE'S CORNER

The on-site conservation of the"Nanhai 1" shipwreck

Li Naisheng Chenyue Zhangchi Du jing Liujie (Chinese Academy of Cultural Heritage, Beijing 100029)

The "Maritime Silk Road" is an important seaway that connects the ancient China and the world, this trading route has enhanced the exchange of economic and culture between the east and the west. As a significant archaeological discovery of the "Maritime Silk Road", the "Nanhai 1" shipwreck provides a physical basis for the display of the original "Maritime Silk Road", the research of world's navigation history, shipbuilding history and East-West exchange history.

The "Naihai 1" is a Southern Song Dynasty wooden ship, which sunk about 20 sea miles south of Dongping port of Yangjiang City in China's Guangdong province. In 1987, when China and Britain cooperated in the exploration and salvage of a shipwreck from the East India Company, they accidentally found this ancient Chinese shipwreck, which was the first shipwreck site found in Chinese waters. After many underwater archaeological investigations by Chinese archaeologists, the entire shipwreck was successfully salvaged in 2007 in strict accordance with underwater archeology standards, and placed in the "Crystal Palace" of the Maritime Silk Road Museum at Hailing island of Yangjiang City in Guangdong province. At the end of 2013, the conservation and excavation phase of "Nanhai 1" was officially launched. Excavation commenced after lowering the water level in the caisson. The on-site conservation work is led by the Chinese Academy of Cultural Heritage. Up to now, the excavation depth is about 1.9 meters.

The "Nanhai 1" shipwreck has been buried in the seabed for hundreds of years. The wood of the ship is seriously degraded, the hull structure is decayed and contains lots of salt and iron sulfide, most of the artifacts in the ship are severely corroded and surrounded by solid concretion, which is tightly cemented. In general, the materials were in poorly preserved condition.

The protection of the wooden hull during the excavation was a key aspect of the whole conservation project. On the basis of the preliminary investigation and research, as well as the site conditions, instead of using the common approach, which is first excavation and conservation next, we have been actively engaged in stabilization throughout the excavation process.

Fig.1 The site of Nanhai I and spray system

In the first stages of the shipwreck excavation, the hull was less exposed and was kept moist using rice paper, non-woven fabric, and a manual atomization spray. As the excavation work progressed, these measures were no longer sufficient to keep the large ship hull and other wood components moist Relying on the existing bridge crane, we designed and built an automatic atomization spray system, so as to keep the entire site moist. At present, the deformation, cracking, color changes and degradation of the hull are maintained in a stable and controllable range.

For the hull wood microbial growth is also a serious threat. After using on-site sampling, culturing and high throughput sequencing

combined with a cloning library, we found that in the early stage of excavation, there were a large number of fusarium in the hull. Fusarium is problematic because it destroys cellulose. After a series of screening studies, we used K100 to deal with the microbes in the hull. After more than a year of use, the on-site microbial control work has been positive, lots of the fusarium has been eliminated. For now, the sterigmatocystin in the hull is the dominant microbe, this kind of microbe causes minor damage to the hull. On this basis, we upgraded the automatic spray system, and put antibacterial agents into the spraying solution, thus improve the on-site work efficiency and conservation effect.

Fig.2 Before using K100(left) and keep using K100 for 10 months(right)

In addition to the on-site conservation work, we have analyzed samples from the “Nanhai 1” hull wood, using multiple techniques such as tree species identification, analysis of water content, chemical composition and soluble and insoluble salt content. We found that there were issues with the hull wood, such as severe degradation of cellulose and high iron sulfide and soluble salt contents. In light of these problems, we researched conservation techniques for iron sulfide removal, wood filling and reinforcement.

In addition to protecting the hull wood, the on-site conservation of waterlogged objects is also important to the whole conservation project. To date, approximately 60,000-80,000 objects were excavated. These objects vary in type and material, and possess high scientific research value as well as historical value. Up to now, we have stabilized nearly 6000 objects on site, mainly irons, bronzes, lacquerwares and ceramics.

For the large number of waterlogged ceramics, desalination is the focus of the on-site temporary stability conservation. We designed and made desalination pools. The deionized water is regularly replace in the pools and the desalination is monitored using ion chromatography and by measuring conductivity. There are inscriptions in ink on some of the waterlogged porcelains from “Nanhai 1.”Most of the writing is evident prior to treatment. In order to protect these inscriptions during desalination, we use microcrystalline paraffin to seal and consolidate the text, thus effectively preventing the ink from fading, falling off or being damaged during desalination.

To date we have excavated and stabilized about 100 pieces of gold, more than 50 pieces of silver, 1100 pieces of iron and thousands of pieces of bronze. The iron is desalinated using a NaOH solution, while the bronze is treated with sodium sesquicarbonate.

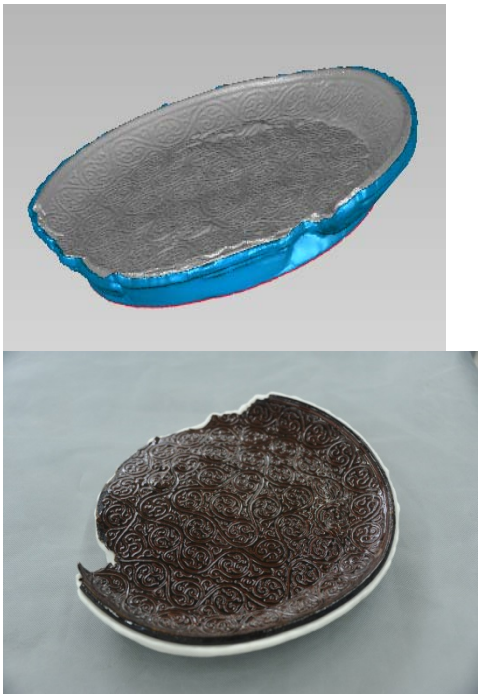

Fig.3 Support model made by 3D printing for lacquerware

During the excavation, we assisted the archaeologists in excavating about 160 pieces of lacquerware. We used gypsum bandages, gauze, plastic film and a support model made by 3D printing to reinforce the lacquerware on-site. After excavation, depending on the condition, of the lacquerware, we conserved them in a low temperature environment and regularly monitor the situation.

We have also found organic materials such as teeth, straw mats, grass ropes, bamboo strips, wood with ink text, and seeds in the "Nanhai 1" shipwreck. Supports have been used to stabilize these materials, as well as low temperature storage.

After more than 3 years of on-site conservation work, the exposed hull wood, detached wood components and artifacts have not exhibited serious shrinkage and deformation, or textural and color changes. Microbial growth has also been effectively inhibited. The objects have been stabilized by material type and some are now entering the final stages of their treatments.

As the excavation work moves deeper, our conservation work continues to be collaborative. Based on the status of the site and the excavation progress, we continue to alter the ideas and techniques underpinning the conservation plan to achieve better results and lay a solid foundation for the display of "Nanhai 1".

Acknowledgements

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Creation of a working group for conserved shipwrecks and their monitoring in France

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Wooden shipwrecks are rare and fragile archaeological artefacts. Although different treatments for wood conservation have been presented in the literature and at conferences over the years, further discussions about the preventive

conservation parameters needed to ensure their care are necessary.

A large scale study of over almost 100 shipwrecks

Shipwrecks risk being exposed to chemical and mechanical degradation as previous experiences have demonstrated (*Vasa, Batavia,* Shinan, Bremen cog etc.). Therefore, we created a specific database of archaeological shipwrecks on display to compare the exhibition parameters and the different ways of monitoring their condition over time. In some cases it was hard to determine whether a ship had been put on display or reburied from the literature, however we managed to collect general data about 93 comparable shipwrecks. The goal is to evaluate the preventive conservation parameters and determine whether a standardized protocol can be developed.

The majority of the wrecks are exhibited without display cases, consequently protection against dust and vandalism is not guaranteed, and environmental stability has to be checked both at the location of the shipwreck and generally inside the museum. Moreover, these wooden wrecks are mainly treated with hygroscopic materials, such as polyethylene glycol (PEG). Acidification processes can be activated by the presence of metallic elements and PEG can also contribute to mechanical movements. The supporting structure for the ship may not always be sufficiently resistant, flexible or accessible to accommodate the movement of the wood correctly or allow repeat assessments of the condition of the wood.

The results of the survey, made us realize how difficult it can be to learn about monitoring practices after conservation and that there was a need for more collaborative work on this topic. Consequently a group was formed to conduct a more detailed survey of shipwrecks on display in France. The group, named GEISER (Groupe d'Etude et d'Information pour le Suivi des Epaves), is a multi-disciplinary team made up of conservators, collections managers, curators and others.

While the survey provided relevant general information it is of course important to have actual cases to study. Both the *Musée d'Histoire de Marseille* and the *Musée Départemental de l'Arles antique* have recently installed ships in their galleries and they were chosen as the focal points for more in depth study.

For the Marseille and Arles shipwrecks, no monitoring plans were prepared before exhibition, but some changes were noticed in the ships related to an unstable environment, so monitoring appears to be necessary. Additionally, acidic areas on metallic parts and dust accumulations have been observed. Previous experience by staff at the C2RMF (*Centre de Recherche et de Restauration des Musées de France)* have suggested that some materials do not adapt well to air-conditioned installations and exhibition facilities. Additionally, it can be unclear who has authority for monitoring and changing environmental conditions. Is it the staff at the museum or the conservation team, which may not be directly affiliated with the museum? Consequently, GEISER intends to compare the different situations by studying the short and long-term, curatorial and preventive solutions through data collecting and by developing research projects.

Collecting data

GEISER provides a multi-disciplinary approach by comparing environmental data directly with the chemical and mechanical

reactions observed on the shipwrecks. It is essential to learn about immediate environment around the ship by comparing the different air-conditioned installations (for example, type, make and model, locality, efficiency, reliability, maintenance requirements, control frequency, etc.). The team at the C2RMF will analyze environmental data from specific sensors and point out malfunctions and limitations of the system and monitoring methods. Standardized and regular temperature and humidity measurements are required to provide feedback data in order to anticipate climatic phenomena. To better understand the climatic system and its efficiency in maintaining stable relative humidity and temperature in an open plan museum, further studies are needed, we plan to precisely map localized air flows in order to link them to local changes in the material of the shipwrecks. We are working closely with the preventive department of the C2RMF and will include engineers in the project. We are currently collecting more data about other French museums where ships are displayed in open spaces but international experiences of climatic wide studies are welcome.

Another step consists of local assessments of the different shipwrecks. As with other international wrecks, some deformations have occurred and various methods have been developed to measure them. For the Arles' wreck, fixed pins have been used as deformation references and a monitoring protocol has been initiated through an annual photographic campaign by Arc Nucleart, complemented by digital photogrammetric documentation that records any mechanical movement after the fact. Evaluation of the role of the support structure on these distortions is also in progress. Regarding the documentation of mechanical movements, digital measurements are still taking place for the Bremen Cog or the *Vasa* for instance, and it would be very interesting to link these deformations to their direct causes and assess whether the same factors influence all ships to the same extent. The Arles Museum is developing an interactive monitoring tool, which could allow both precise assessments of the ship's state but also a global vision of the whole material context of these observations. We are also interested in a wider research project including large wooden artifacts exhibited in museums.

Finally, we are trying different methods to collect chemical data to predict the behavior of the wrecks. We are taking moisture and pH measurements on the wrecks, to build a kind of sensitivity map with the goal of learning when the fluctuations in relative humidity initiate chemical reactions. This work is being spearheaded by Arc Nucleart as a member of the GEISER team. In parallel, A-Corros, a French team dedicated to the conservation of metals, is assessing the metallic components of the wrecks and any suspicious deposit is analyzed to check for evidence of pyrite evidence.

A follow up handbook for shipwrecks?

With all these data, we would like to be able to produce guidelines to help museums manage their shipwrecks and other wooden artefacts, based on on-going experiences and complemented by input from the working group. Additionally, as the Gallo-Roman museum of Lyon begins to plan a new exhibition spaces and prepare for the arrival of the Lyon Saint Georges 4 (LSG4) wreck it is hoped that the lessons we learn will help them to prepare an optimal display environment and put an effective monitoring plan in place.

Thesis Available on Line

Angeliki Zisi's thesis entitled *Relationship between wood density and ultrasound propogation velocity: a non-destructive evaluation of waterlogged archaeological wood state of preservation based on its underwater acoustic properties* is available on line. The link is https://eprints.soton.ac.uk/397418/

Susanne Grieve

Susanne Grieve has recently relocated to New Zealand. Previously she served as Director of Conservation at East Carolina University in North Carolina. She is the Principal for Global Artifact Preservation Services, LLC (US) and HPFS Solutions (NZ) and is a PhD Candidate at Victoria University, Wellington in the Museum and Heritage Studies Programme. She can be reached at susanne.grieve@vuw.ac.nz.

ICOM-CC 18th Triennial Conference in Copenhagen

4 - 8 SEPTEMBER 2017

Theme: Linking Past and Future **Website:** www.icom-cc2017.org

Welcome to ICOM-CC 2017

The 18th Triennial Conference of the International Council of Museums Committee for Conservation (ICOM-CC) will present 150 peer-reviewed papers and 100 posters in 21 working groups and international keynote speakers. The conference will offer visits to conservation workshops and invite to receptions and social events during the week for networking. We hope to see more than 800 delegates, including conservators, scientists, historians and art historians, curators, librarians, archivists, students, collection managers and directors from the world's leading cultural institutions and the private sector.

Her Majesty the Queen of Denmark has accepted the patronage of the 18th ICOM-CC Triennial Conference.

ICOM-CC will celebrate its 50th Anniversary at the 18th ICOM-CC Triennial Conference in Copenhagen.

For more information visit our website: www.icom-cc2017.org. Detailed program will be announced in late April and make sure to sign up to the conference at the "best price" before May 15, 2017.

We look forward to welcoming you to Copenhagen.

Jesper Stub Johnsen
Chair of the National Organizing Committee and
Deputy Director of the National Museum of Denmark, Conservation and Natural Sciences

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