Queen Anne's Revenge

Conservation Laboratory Report, August 2004

UAB Conservation Laboratory, Greenville
Sarah Watkins-Kenny, *QAR* Project Conservator Eric Nordgren, Project Assistant Conservator
Wendy Welsh, *QAR* Laboratory Manager

As summer passes by, the *QAR* staff has been working with specialists to identify the fibers and woods that artifacts such as rope, fabric, and the ship's timbers are made of. Conservation of cannon progresses and our August volunteer, Sharon Penton was a great help with many tasks around the lab.

Fibers Identified By Textile Experts

Artifacts made of fiber include rope, fabric, wads from the cannons and hair used in caulking the ship's timbers. Dr Runying Chen, a professor of textiles at East Carolina University has been involved with *QAR* project for several years, identifying and studying the various fibers used to make these artifacts.

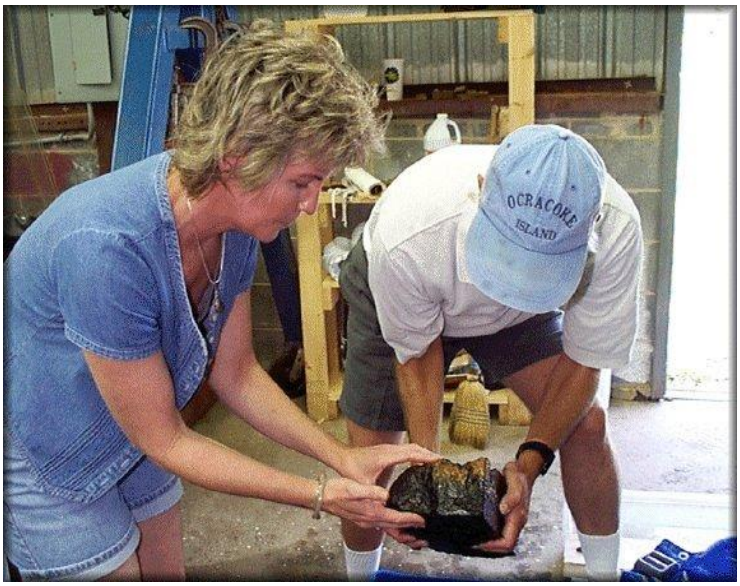
In 2001 Dr Chen and Wayne Lusardi (the previous *QAR* Project Conservator) published their study of wads that had been removed from the bores of cannons C-4, C-19 and C-21. The main focus of this study was to identify the types of fibers used for making the wads, assess the degradation, and elemental analysis of the material deposited on the wads. Three different types of fibers were noted; hemp, nettle fibers and another that needed further study for specific identification. Most all wads were heavily contaminated with iron and sulfide, which is to be expected considering the corroding cast iron environment they were in for almost 300 years. The details and conclusions of this study are described in a paper entitled `*Identification and degradation analysis of textiles recovered from the Queen Anne's Revenge Shipwreck*', published in a conference postprint by the Textile Specialty Group 2001 Volume 11, American Institute of Conservation (AIC) 29th Annual Meeting, Dallas, Texas.

Fiber identification studies such as these assist conservators in determining an

appropriate conservation process for each. For example objects made of plant fibers (cellulose) will require different treatment to those made of animal fibers (proteins). During August, Dr. Chen visited the *QAR* lab to examine more recent finds, such as the wads recovered from Cannon 3, various rope, canvas and hair. Dr. Chen's visits are of the utmost help in determining the identity of the materials objects are made of. This not only helps with the conservation, but also provides information for the archaeologists to put these object in context.

Species of QAR Wood Artifacts Identified by Wood Specialists

In our February and March 2004 Lab Reports, we described various factors that are considered when selecting a conservation treatment for wood artifacts. Another key factor is identifying the wood (oak, pine etc) that the object is made of. Different woods can decay in different ways, for example in decayed oak there is usually a hard less decayed core while the outer layers are softer and more decayed. Pine usually decays more evenly throughout. Thus knowing the species of wood can give us another indication of its likely condition and hence help determine an appropriate treatment.



Accurately identifying the wood species also provides the archaeologists with important information about construction and origins of the ships timbers and other wood artifacts. While the non-specialist can observe some characteristics of wood, a positive species identification requires a wood anatomist with extensive knowledge of wood species and experience in studying samples at the microscopic level This is particularly important as the subtle differences between wood species are often very difficult to detect. We are very fortunate to have two such specialists working with the *QAR* Project. Dr. Lee Newsom, now at Pennsylvania State University, has led the analysis of the *QAR* wood since 1997. Dr. Regis Miller of the U.S. Forest Products Laboratory, Madison, Wisconsin has helped with wood identifications since 1998. To date the species of more than 60 wood objects and fragments of ship's architecture have been identified, including the ship's frames and hull planks, (Quercus sp. White Oak), and the sacrificial sheathing (Pinus sp. sylvestris European Red Pine). A group of 20 smaller pieces of *QAR* wood have been analyzed this August by Dr. Newsom. We would like to thank Dr. Newsom and Dr. Miller for their important contributions to the project and look forward to an ongoing collaboration with them.

(continued on the next page)

QAR Cannon 3 & 4 Progress

Cannon 3 (C-3) and Cannon 4(C-4) were recovered in 1997 and 1998 respectively. Each was covered in a layer of concretion at least 2 inches thick over the whole surface. Within a few months of recovery the bulk of the concretion on each was cleaned off leaving just a thin layer, at most a quarter of an inch thick, over most of the surface of each gun. The main tool used to remove concretion to this level was a hammer and chisel. Places that could possibly contain identifying marks, i.e. trunnions and the topside of the barrel were thoroughly assessed and examined before proceeding with cleaning in these areas.

In our April 2004 report we described the importance of desalination - removing soluble salts, particularly chlorides from archaeological objects recovered from marine environments. Metal objects, particularly those made of iron, are very susceptible to corrosion promoted by the presence of chlorides. To desalinate iron objects the technique of electrolytic reduction is used at the QAR lab. The iron artifacts are kept immersed in a 2.5% solution of sodium carbonate, initially in tap water (which contains some chlorides) and then in purified water (which contains no chlorides). The sodium carbonate solution functions both as an electrolyte and a corrosion inhibitor, due to it's elevated pH. The object is connected in an electric circuit as the cathode (negatively charged) between two mild steel anodes (positively charged). As the electrolysis treatment progresses, chlorides (negatively charged) are drawn away from the metal object towards the positively charged anodes (opposite charges attract) and into the electrolyte solution. Progress is monitored by regularly measuring the chloride concentration in the solution. Extraction of chlorides by this method is subject to the laws of diffusion. As long as there are less chlorides in the solution than in the object chlorides will move from the object into the solution. When the chloride concentration remains constant over several weeks this indicates that the concentration in the solution is in equilibrium with that in the object. To continue to extract chlorides the electrolyte solution in the treatment tank is replaced with a fresh solution of sodium carbonate.

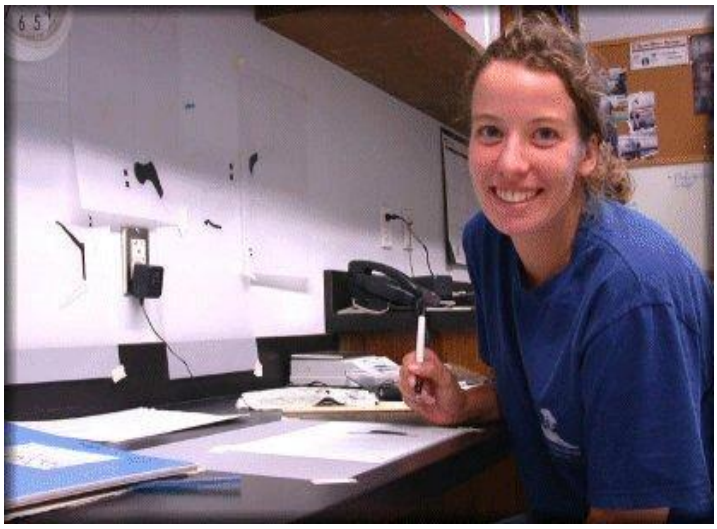
Removing chlorides using electrolytic reduction treatment takes time. Desalination of C-3 and C-4 began within a few months of their recovery from the shipwreck. Initially chloride concentrations in the solution would quickly reach a concentration of over 1000 ppm (parts per million). Chloride concentrations in the solutions are now reaching levels of less than 30 ppm. Treatment will continue until no more chlorides are being extracted from the object - we have almost reached this point!

As the cannons approach the end of the desalination process a priority this summer has been to remove the remaining thin layer of concretion, from C-3 and C-4. This concretion not only

obscures the surface of the cannon but could also be inhibiting removal of chlorides. Air scribes and small hand tools (eg dental picks) were used to remove this concretion.

Once desalination is complete, the electrolytic reduction treatment will finish. The next step will be to thoroughly rinse all traces of the sodium carbonate solution from the cannon before drying them. If any sodium carbonate remains it could leave a white deposit over the surface of the object as it dries. Once the cannons are completely dry the surfaces will be coated to consolidate and protect them. You will be able to see these and the other 3 cannon soon on display at the North Carolina Maritime Museum.

Volunteer Corner



Experienced field archaeologist, Sharon Penton, traveled from Raleigh to volunteer at the *QAR* Lab during the month of August. Relatively new to North Carolina, Sharon found out about us by volunteering at the State Archaeology lab in Raleigh and wanted to experience work done in a conservation lab. Sharon helped with taking the final measurements of the cask hoops, including determining approximate diameters of complete hoops from single surviving fragments. These measurements will help us to determine how many hoops the fragments we have represent, how large the hoops were and hence an indication of the size of the casks they fitted around. She also rendered superb ceramic profile drawings and on her last day she experienced the joy of cleaning out a cannon electrolysis tank. Sharon's experience at the lab made her realize that her interest in archaeological conservation was something she would like to pursue even further and she is considering applying for a Masters course in Archaeological Conservation. The *QAR* lab is grateful that Sharon decided to volunteer with us and we wish her well on her path to a career in conservation.