

**A BRIEF OVERVIEW OF ARCHAOMETRIC
STUDIES IN HISTORICAL MARITIME
ARCHAEOLOGY: SOME CONTRIBUTIONS
FROM ARGENTINA**

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This note is an introduction to a new topic in the *SAS Bulletin* focused on archaeometric research in the fields of historical and maritime archaeology. The importance of these studies has increased during the last decades and is what motivates us to inaugurate a new section in order to communicate developments in these areas through upcoming conferences, courses and fieldwork; published journals and papers; book reviews; recent thesis; innovative methods and techniques; and ongoing investigations.

Archaeometry and Maritime Archaeology

Archaeometry could be broadly defined as the interdisciplinary field where knowledge and analytical methods and techniques from natural and applied sciences have enhanced research carried out in humanities and the social sciences, primarily, but non-exclusively, in the fields of archaeology and art history. The key issue has been to combine different sources of information, with the aim to have a more comprehensive and detailed picture of the themes under examination.

The studies undertaken in this research area have provided a wide range of physicochemical information about different kinds of artifacts and other archaeological remains. Until two decades ago, they were focused on answering questions mainly related to dating, exploration, artifact function and use, materials sourcing, and manufacture methods. Since then, the research topics and materials considered have expanded to include diet and health, movement of artifacts, authentication, site formation process, and paleoenvironmental reconstructions, among others. The scale of analysis was amplified, some analytical means became more complex, and some additional ones were incorporated.

Over time it was possible to achieve an increasingly better understanding of social knowledge, behaviors, technologies and other non-technological aspects, as well as the environments—and interactions between those domains—from ancient periods to modern times. This allowed going beyond the particularistic approaches associated with analysis focused on events, such as ships (Gould 2011).

Based on the broad range of available means for artifact analysis (Edwards and Vandenabeele 2012), and the fact that presently more and more works integrate several of these methods and techniques to solve research problems, the scope of archaeometry exhibits ever increasing distant boundaries. Proofs of this are the international meetings, symposiums and publications. Likewise, it seems to have no well-defined frontiers due to its overlap with other disciplines or specialties which can benefit from the characterization results of cultural heritage objects, such as the conservation and restoration of works.

On the other side, maritime archaeology deals with the study of human activities associated with water scenarios—seas, rivers and lakes, maritime navigation and as land operations related to them—through their surviving remains. In the case of historical sites, documentary sources have played an integral role in the archaeological investigations (Flatman and Staniforth 2006). The research in this field covers a diverse spectrum of sites worldwide. Maritime archaeology is now a “confident and maturing field that seeks to expand its horizons into areas for which methods and concepts are only just being addressed” (Catsambis et al. 2011: xiii).

The latter is especially patent in the case of archaeometry and its many applications to the sites under study—mainly shipwrecks of different periods, but also harbors, dockyards, military batteries, and coastal cities. Some of the advances made so far in some areas (e.g. artifact recognition, identification of materials and manufacture methods, dating, provenance, *in situ* and laboratory conservation, exploration and survey), can be highlighted. There are numerous scientific means of analyses for materials characterization and techniques available for field-related activities, post-excavation stabilization and conservation of artifacts. Most of them were not developed originally for this particular purpose (e.g. remote-sensing equipment, positioning and computer systems, Catsambis et al. 2011: Appendix). In addition, many have also been widely implemented for the study of artifacts recovered from terrestrial sites. The study and preservation of materials from underwater sites, however, has created special challenges.

Some Research Experiences in Argentina

In Argentina, archaeometric research has gained an outstanding place since the new century, partially due to a greater dialog between specialists from different fields. This is reflected in the increasing number of published studies and conferences, such as the *Congreso Argentino de Arqueometría* and *Jornadas Nacionales para el Estudio de Bienes Culturales*, allowing for a deeper approach and greater understanding of the issues

discussed. Interdisciplinary studies of remains recovered from historical ships have not been left out of this trend. Maritime archaeology was established as a scientific specialty in Argentina during the second half of 1990, being one of the countries in South America that has been extensively focused on research on historical shipwrecks (Elkin 2011). Since then, archaeometric analyses on artifacts from XVIIIth to XXth c. shipwrecks were progressively introduced, particularly related to projects conducted by the *Underwater Archaeology Programme* (PROAS) of the National Institute of Anthropology (INAPL), under the direction of Dolores Elkin, Ph.D. Those dedicated to investigations based on metal and wooden remains played a significant role (Elkin 2007; Elkin et al. 2012; Murray et al. 2007).

It is worth noting that a particular site has attracted the greatest attention in regard to the archaeometric analysis of shipwrecks: the HMS *Swift* (1770), a British sloop-of-war commissioned to the Malvinas / Falkland Islands, which sunk in Puerto Deseado (Santa Cruz province) (fig. 1). The remains, undergoing archeological investigations since 1997 by PROAS-INAPL staff, were subjected to several different analyses (Elkin et al. 2007, 2011).



Figure 1. Excavation of a wooden compartmented case located at the midships area of the *Swift* site. The contents of some glass and ceramic containers found were analyzed (Elkin et al. 2012). Photo: by Uriel Sokolowicz 2010.

Analyses of wooden remains have focused on the identification of species by anatomical and structural characterization, which in some cases has specified the possible regional distribution of the wood. This information, together with other sources of data, was mainly used to study the ship's architecture and construction, through the different structural components, and to identify the possible place of origin / shipbuilding (Marconetto et al. 2007; Murray et al. 2009), as well as the personal possessions and other items carried on board (Grosso 2013). These results also shed light on refitting

activities during service and navigation routes (Castro y Aldazabal 2007). Dendrochronology analyses have recently been incorporated as a valuable tool for dating wood from shipwrecks (Mundo 2013).

Pioneering work in Latin American maritime archaeology was in the study of natural site formation processes. The focus has been on the identification and behavior of biofouling communities and wood-boring organisms which includes *in situ* experimental analysis and the characterization of sediments. This research was conducted with the aim of evaluating the physical and chemical effects of these natural agents upon the sites—especially in the case of the HMS *Swift*—with regards to the differential conservation and spatial distribution of the remains (Bastida et al. 2008; Grosso 2008). Through these kinds of studies, it is possible to have a better comprehension of both postdepositional agents and the processes that shaped underwater sites, thus enabling more accuracy in archaeological interpretations (Grosso et al. 2013).

Archaeometallurgy is one of the main areas in which analytical studies have been impacted in the region. Early in 2000, physicochemical characterization results were incorporated into the study of metal artifacts recovered from XVIIIth to XXth century shipwrecks in Argentina and other countries. This research has been undertaken mainly by the Archaeometallurgy Group (School of Engineering, University of Buenos Aires), under the direction of Horacio De Rosa, Chem. Eng. These investigations were mainly conducted hand in hand with archeologists and various specialists from other institutions. The principal analytical methods and instrumentation used so far are: light microscopy, Scanning Electron Microscopy, X-ray Radiography, Energy Dispersive X-ray Spectroscopy, Wavelength Dispersive X-ray Fluorescence, and Optical Emission Spectroscopy (fig. 2).

Let us consider a brief example (Vázquez et al. 2012). In 1999, during the excavations conducted at the stern of the *Swift*, six metallic discs—preliminarily identified as coins—were recovered. Three halfpennies of George Rex were analyzed non-destructively using SEM-EDXRS and WDXRF, on their surfaces. This allowed the alloy composition and manufacturing process to be determined and the quality of the coins to be evaluated. According to the regal standards of that time, during the reigns of George II (1727-1760) and George III (1760-1820), low value coins manufactured in Great Britain were made of laminated sheets of pure copper which were cut as discs (blanks) that were later coined. The three halfpennies have a dendritic microstructure (fig. 3), due to casting in a

mold, and a chemical composition of copper with tin, zinc, iron and lead, added in different quantities. The main conclusion was that the halfpennies were counterfeits.



Figure 2. Optical Emission Spectrometry equipment (Spectro, mod. MAXx LMF 05), during the analysis of a spike recovered from the French Navy ship *Fougueux* (1805). Photo: courtesy of ABS Corp. 2012.

More recently, other powerful analytical tools have been applied for the first time to Argentinean underwater cultural heritage, such as μ -Raman Spectrometry and Energy Dispersive X-Ray Fluorescence (Stefaniak et al. 2008); Total Reflection X-Ray Fluorescence (Vázquez et al. 2010); Raman Spectroscopy and Fourier Transform Infrared Spectroscopy (Elkin et al. 2012). These studies identified different organic and inorganic remains and, in combination with other data, their possible function and use on board. Up until now the application of these techniques has been restricted to a small number of samples, all from the HMS *Swift*, but has proven to have a promising future in the field.

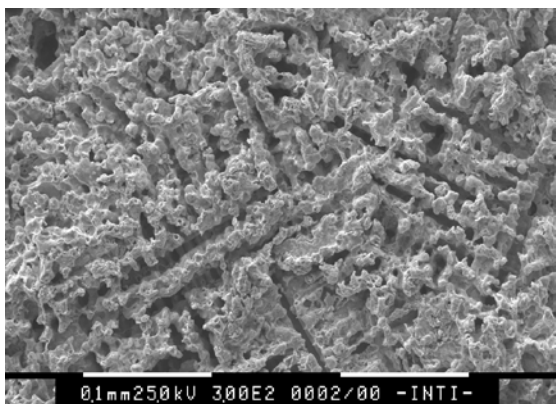


Figure 3. SEM image of a halfpenny surface, which shows a dendritic microstructure (from Vázquez et al. 2012).

The newly published book describing the results of archaeological research carried out in the HMS *Swift* (Elkin et al. 2011), compiles, in a special section, the

following studies: characterization of metal artifacts (De Rosa et al.), wood objects (Castro and Murray) and glass pieces (Lavat and Ordóñez); bioarchaeological analysis of human remains (Barrientos et al.); sedimentology and investigation of site formation process (Bastida et al.); taxonomical identification of botanical remains (Picca); and the analysis of other organic and inorganic materials (Edwards and Maier; Rodríguez; Vázquez et al.). This publication is the most comprehensive work of this kind in Latin America.

Final remarks

The state of archaeometric research on shipwrecks in Argentina, and the studies described, has proven they offer great scientific potential for the field. The analyses conducted have contributed or added to topics such as the identification of artifact function and use, technological assessment (primarily materials used and manufacture methods), exploration and survey, site formation processes, deterioration dynamics, provenance, and dating. Some of the sites and research topics addressed have increased the number of available means of analysis. The research performed on these kinds of sites has been pioneering for the region. Despite the advances made, many shipwreck sites and artifacts recovered from them still have not been studied, and there are several analytical means that should be further explored.

Gould could not be more correct when he said that “there is no final answer or ultimate level of understanding the reality of the human past (...) but only relatively better ones” (Gould 2011: 61). In this regard, archaeometric analyses conducted under a well-defined research program is an outstanding way to improve the existing picture about our history. A long and prosperous way towards scientific knowledge and preservation of maritime cultural heritage lies ahead. After having covered the first steps of it, the keys for success seem to lie in communication and inclusion among the specialists and their complementary approaches. We hope this new space will help us to keep walking in that direction.

I would like to thank Robert Tykot (President of the Society), and Vanessa Muros (Editor of the *SAS Bulletin*), for trusting me with the responsibility of this new topic for the *Bulletin*. I am also grateful to Dolores Elkin and Cristian Murray, for their constructive comments to the note. It is with great pleasure that I begin this task, hoping to have encouraged the membership to help us bring this section to life.

For further information about the section and to submit news, please contact the author at: maritime.historical.archaeol@gmail.com

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ARCHAEOLOGICAL CERAMICS

Charles C. Kolb, Associate Editor

This issue contains four topics: 1) Book Reviews on Ceramics; 2) Internet Resources; 3) Previous Professional Meetings; and 4) Future Professional Meetings.

I recently retired from the National Endowment for the Humanities but can be reached by email at CCKolb.13@gmail.com. Many thanks to our past *SAS Bulletin* editor, Jay VanderVeen, who has taken on new duties at Indiana University South Bend. He has done a splendid job of keeping the *Bulletin* on track and on time. And a warm welcome to Vanessa Muros who did admirable work on the previous issue.

An update on a promised review: The book, *Archaeological Ceramics in Thin Section: a Colour Guide*, by Patrick Sean Quinn and Peter Martin Day (New York: Springer, 2013), originally scheduled for publication in June 2012, has been delayed at least four times but apparently, according to the Springer Website, will be published “soon” only as an eBook. See <http://www.springer.com/social+sciences/anthropology+%26+archaeology/book/978-3-642-15467-6>

Book Reviews

Ceramic Petrography: The Interpretation of Archaeological Pottery & Related Artefacts in Thin Section, by Patrick Sean Quinn, Oxford: Archaeopress, 2013. v + 254 pp., 246 figures (nearly all in color), ISBN 9781905739592, £35.00/\$70.00 (paperback).

Quinn obtained a B.Sc. (Hons.) in Geology and Geography (Upper Second Class), Department of Geology, University of Keele (1993); a M.Sc. in Industrial Micropalaeontology, Earth Sciences, University College London (1995); and his Ph.D. in Archaeological Ceramic Analysis, Department of Archaeology, University of Sheffield (1999). His M.Sc. involved the paleontological study of calcareous nannofossils particularly coccolithophores which can be found in ceramics (for an explanation, see, <http://www.coccoco.ethz.ch/PSQ/Science.html>). Ceramic micropalaeontology was useful for answering archaeological questions of trade and exchange in Early Bronze Age Crete. From 2005-2010, he was Research Officer in Archaeological Ceramic Analysis, Department of Archaeology, University of Sheffield, and is currently Senior Research Associate in Ceramic Petrography, Institute of Archaeology, University College London. As a specialist in Thin Section Ceramic Petrography and Geochemistry, he has applied micropalaeontology to archaeology, and conducted research on prehistoric ceramic production and consumption and distribution in the Aegean and Eastern Mediterranean, pre-contact hunter-gatherers in southern California, and all archaeological periods in the United Kingdom. In addition, Quinn has edited *Interpreting Silent Artefacts: Petrographic Approaches to Archaeological Ceramics*, Oxford: Archaeopress (2010) (reviewed in the *SAS Bulletin* 33(3):5-9, 2010). His training and research are brought to bear in his latest book, *Ceramic Petrography*, with examples drawn from his own work. He also employs other relevant examples from around the globe: France, Sweden, Spain, Romania, Croatia, the Czech Republic, Palestine, Israel, Iran, Uzbekistan, Turkmenistan, China, South Korea, Togo, Belize, Venezuela, and Peru.

Color photomicrographs of thin sections from a diverse range of artifacts, archaeological periods, and geographic regions, are used to illustrate the spectrum of compositional and microstructural phenomena that occur within ancient ceramics under the microscope and Quinn also provides comprehensive guidelines for their study within archaeology. There is no common scale for these images, but he provides measurements for each example (the range of image widths is 1.5 to 12.5 mm). Quinn

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OBITUARY OF NORMAN A. HERZ



Professor Emeritus Norman A. Herz died on May 28, 2013 in Athens, Georgia. Herz was an early pioneer in integrating geologic practices and ways of seeing into archaeology.

Herz's first foray into archaeological geology came after he was commissioned as a 2nd lieutenant in the US Army's Corps of

Engineers and Air Force in 1945 and later earned his Ph.D. in Geology from John Hopkins University. Working in Greece in the early 1950s with W. K. Pritchett, Herz recognized that the then contemporary methods of marble identification of ancient monuments and statuary, such as hand specimens, optical petrography, etc., were too subjective and often incorrect. From this experience, he set out on a lifetime's worth of research to develop a quantitative method to distinguish between the different white marble sources from throughout the Mediterranean that were used in antiquity.

Upon returning to the United States, Herz was employed by the United States Geological Survey (USGS) as an economic geologist. Six of those years Herz spent in Brazil where he was a research scientist studying the

country's mineral deposits. Not only did he learn the Portuguese language, he made a significant impact within the Brazilian scientific community. This is reflected by his election in 1981 as a Foreign Associate of the Sao Paulo State Academy of Science followed by his election in 1991 as a Foreign Member of the Brazilian Academy of Sciences.

Upon his retirement from the USGS, Herz was hired by the University of Georgia as Head of the Geology Department, a position he held until his retirement in 1992. From the 1970s on, Herz focused on distinguishing the white marble quarries of the Mediterranean. He made numerous trips to Greece, Italy and Turkey to collect a comparative marble database of all the important ancient quarries. He subjected the samples to physiochemical analyses and found that the stable isotopes of carbon and oxygen of the complex carbonate ion provided a very good separation, in scatter plots, between many of the marble types. Likewise, using straightforward bivariate statistical methods, he was able to quantify the isotopic values and determine levels of correlation. Herz's resultant database, first published in 1985, proved very successful at answering many important questions regarding the use, trade and quarrying of this important ancient resource. Herz consulted on numerous projects including studying the marble sources of various temples and monuments at sites such as ancient Olympia, Bassai, the Athenian Agora, and Delos. He worked closely on collections from the British Museum in London, the Ny Carlsberg Glyptotek in Copenhagen, the National Gallery in Washington, DC and the Metropolitan Museum of Art in New York. He also performed critical analysis on the famous Getty Kouros. Norm's work has been published in over 200 articles.

With the growing interest in marble studies, in 1988, he almost singlehandedly established the Association for the Study of Marbles and Other Stones used in Antiquity (ASMOSIA). Along with his colleague Marc Waelkens, Norm convened a NATO-sponsored Advanced Research Workshop (ARW) in Tuscany, Italy. This was the first ARW devoted to the Archaeological Sciences in the International Scientific Programmes of NATO. ASMOSIA's success at integrating archaeologists and art historians with geologists and other physical scientists is

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