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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 Paolo 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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demonstrated by its 10 international conferences, each producing a published volume that can be found in archaeology and Classics libraries around the world. Herz was the first President of ASMOSIA and remained at that position until he stepped down in 2000 at which time he was named Honoree President.

Recognizing a lack of academic interaction between archaeology and scientific disciplines such as chemistry, geology, etc., Herz founded the Center for Archaeological Sciences (CAS) at the University of Georgia in the mid-1980s. The Center has become a venue for collegial collaborations among UGA faculty as well as a venue for student research with CAS faculty. Herz and his fellows instituted an undergraduate certificate program that has produced nearly 100 awardees since 1992. More recently, a Student Society for Archaeological Science (SAAS) was created and cooperates with CAS.

Herz's dedication and commitment to archaeology was well recognized. In 1985, the *American Journal of Archaeology* celebrated its one hundredth anniversary. In a review of the stewardship of Ashton Sanborn as editor, only two articles were cited as "significant events". One was the aforementioned paper by Herz and Pritchett in 1953 which "raised issues that have continued to be of interest to scholars in many specialties, and only recently have sophisticated laboratory techniques begun to answer some of the vexed questions of marble identification." Four years later, in the January-February special issue of *Archaeology* dedicated to "Archaeology in the 21st Century," George F. Bass, then president of the Archaeological Institute of America, further recognized that Norm was the "first to apply his geologic knowledge to archaeological problems." Norm's international reputation was further enhanced where, in 1988, he was invited to be the keynote speaker at the 18th International Symposium of the International Association of Engineering Geology where the focus of the conference was on the engineering geology of ancient works, monuments and historical sites. In 1995 the classical archaeology community recognized Norm's contributions to archaeology by awarding him the prestigious Pomerance Award for Scientific Contributions to Archaeology of the Archaeological Institute of America. And in 2007, the Archaeological Division of the Geological Society of America awarded Herz the Rapp Award for Archaeological Geology.

In 1998, in association with his fellow UGA faculty member, Ervan Garrison, he co-authored a well-received textbook for archaeological geology, *Geological Methods for Archaeology*, published by Oxford University Press.

Herz's true nature as a Renaissance man is further exemplified by his 2005 historical book *Operation Alacrity: The Azores and the War in the Atlantic.* The book recounts the top secret operation that led to the construction of an Allied airfield in the Portuguese-controlled and therefore neutral Azores island chain that may well have changed the course of World War II. Herz took part in the operation, but until his research in writing the book he was unaware of the stakes involved with this mission.

Herz will be remembered as an excellent and caring professor and mentor who provided his students with a keen sense of how geology can contribute to our understanding of the cultural past. Herz broke down many ingrained barriers in Classical archaeology that permitted aspects of the "new" archaeology to take root in the Mediterranean. His legacy will not only be the continued application of stable isotope analysis of marble artifacts, but to the application of science in archaeology as a whole.

Written by Scott Pike (Willamette University), with assistance from Ervan Garrison (University of Georgia)

ANNOUNCEMENTS

Due to the volume of submissions for this issue of the *Bulletin*, the "Announcements" have been posted on the SAS Blog (http://socarchsci.blogspot.com/). Please use the links below to find more information on the following:

- **"Using X-rays to Analyze Cultural Heritage"-Workshop offered by the new ACS Division "Art, Archaeology and Conservation Science" (AACS)** http://socarchsci.blogspot.com/2013/07/art-archaeology-and-conservation.html
- **2014 International Symposium on Archaeometry** http://socarchsci.blogspot.com/2013/07/2014-international-symposium-on.html
- **Call for Associate Editor –Research in Archaeological Conservation** http://socarchsci.blogspot.com/2013/07/call-for-associate-editor-research-in_24.html

A Brief Overview of Archaeometric 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 XVIIth 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).

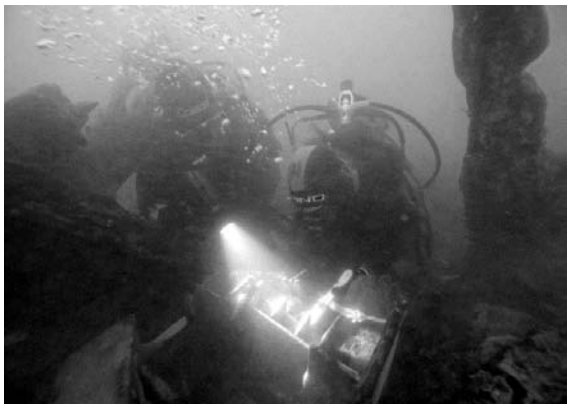

Figure 1. Excavation of a wooden compartmented case located at the midships area of the Swift site. The contents of some glass and ceramic containers found were analyzed (Elkin et al. 2012). Photo: by Uriel Sokolowicz 2010.

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 XVIIth 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.

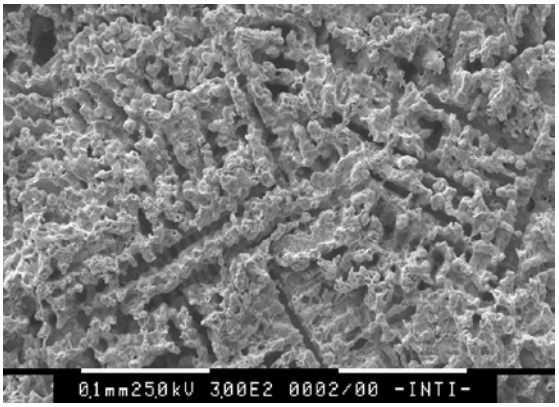

Figure 3. SEM image of a halfpenny surface, which shows a dendritic microstructure (from Vázquez et al. 2012).

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 micropaleontology 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

rightly points out that thin section ceramic petrography is "a versatile interdisciplinary analytical tool for the characterization and interpretation of archaeological pottery and related artifacts, including ceramic building materials, refractories and plaster." The book is structured according to the main steps involved in the analysis and interpretation of archaeological ceramic thin sections, including classification, characterization, provenance determination, and the reconstruction of manufacturing technology. *Ceramic Petrography* is organized into seven chapters, each of which has its own set of references titled "Further Reading" (hence, there is no common bibliography); there are no innotes or endnotes. He knows the English-language literature, so that many references are to the publications of other well-known scholars who employ thin section petrography such as Peacock, Matson, Vince, Day, Middleton, Freestone, Whitbread, and Reedy, among others. The significant thin section research undertaken at the British Museum's Department of Scientific Research, the British School at Athens and Center for Desert Archaeology is also cited.

Quinn certainly hasn't missed the monographic literature (British Archaeological Reports, for example) and the major and lesser-known journals: *American Journal of Archaeology*, *American Antiquity*, *Antiquity*, *Archaeometry*, *Bulletin of the Geological Society of America*, *Hesperia*, *Journal of Archaeological Science*, *Journal of Geology*, *Journal of Sedimentary Petrology*, *Journal of the American Institute for Conservation*, *Medieval Archaeology*, *Old Potter's Almanack*, *Oxford Journal of Archaeology*, *Proceedings of the Prehistoric Society*, etc. In the "Preface" (p. v) it states that "it is assumed that the reader has a basic knowledge of optical mineralogy and the thin section petrography of rocks" and he focuses on utilitarian, coarse, earthenware, and terracotta pottery. There is a useful double-column "Index" (pp. 245-251) that emphasizes topical entries and "Acknowledgments" (p. 253), in which he cites the sources of the illustrations and provides a dedication. Quinn indicates that he wrote the majority of the text for this volume while commuting to and from London on the new high-speed train service. I appreciate this and am envious – living in the Washington DC area, most people are unable to do that on the METRO or even the Baltimore to Washington MARC line.

In Chapter 1: "Introduction to Archaeological Ceramic Analysis & Thin Section Petrography" (pp. 1-20, 16 figures, 44 further readings), Quinn provides basic definitions of archaeological ceramics, and compositional analyses (geochemical and mineralogical approaches: INAA, XRF, ICPMS, XRD, and polarized light thin sectioning), characterizing "low technology" thin section studies, their limitations, and underutilization. He also provides a brief history of ceramic petrography and discusses major publications and academic forums. Chapter 2: "Sampling, Thin Section Preparation & Analysis" (pp. 21-38, 18 figures, 12 further readings) reviews the sampling of archaeological ceramics, the preparation of thin sections, analytical equipment, texts, and other resources. He points out problems caused by the incomplete impregnation of specimens, issues with accumulated carborundum grit/powder, and troubles using Canada balsam. Quinn also stresses the use of comparative thin sections and need for online databases. Chapter 3: "Composition of Archaeological Ceramics in Thin Section" (pp. 39-69, 44 figures, 12 further readings) documents clay matrices, fabrics and pastes, particulate inclusions, and voids. Attention is given to polyminerallic inclusions in rock fragments, synthetic aplastics (grog or chamotte) and the sources of voids (organic matter, decomposition of calcareous materials, bloating, and poor thin-section preparation) and the description of voids (sizes and shapes). Chapter 4: "Grouping & Characterization of Archaeological Ceramics in Thin Section" (pp. 71-116, 38 figures, 26 further readings) provides a lengthy discussion on visual classification (the human eye and brain as a "very powerful tool," p. 73), sorting into petrographic fabrics, groups, and classes, and the reminder that each thin section is unique. The author also proposes and discusses the rationale for a modification of Ian Whitbread's descriptive system first published in 1986 and 1989, which borrowed terms from soil micromorphology (c:f:v rations of inclusions, matrix, and voids) and from sedimentology employing "eyeballing" to derive percentage estimations. Quinn recommends switching between PPL and XP and rotating the microscope stage in low to medium magnifications or by using circular polarization (p. 81). The chapter also has reviews on the characterizations of inclusions, clay matrices, and voids, and he stresses the need for full descriptions in order to determine provenance. There are also discussions on data collection (textual and modal analyses) and quantification (point, line, area, and ribbon-counting are contrasted), the use of mechanical counters, and computerized image analysis.

Quinn's Chapter 5: "Interpreting Ceramic Raw Materials & Provenance" (pp. 117-150. 26 figures, 35 further readings) reviews thin section petrography and its goals, namely, provenance and the reconstruction of technologies. A key assumption in provenance, he notes, is that compositional studies of ancient pottery assume that potters did not travel great distances to obtain their raw materials (p. 119, see Dean Arnold 1985). Quinn

then centers on issues in interpreting ceramic raw material, differentiating primary vs. secondary clay deposits, sampling procedures, the accuracy of provenance determination, raw material prospecting and analysis, qualitative and quantitative petrographic data, and interpreting data on form, function, and sociocultural phenomena such as transport, gifting, and potter exogamy. He shows how microfossil inclusions, where present in thin sections, can aid in provenance determination. In Chapter 6: "Reconstructing Ceramic Technology" (pp. 151-212, 72 figures, 23 further readings), the author considers briefly eight primary, traditional topics in the sequential steps of production. Raw material selection; raw material processing and the preparation of paste; crushing, cleaning, sieving, and levigation); types of temper and clay mixing; aging and working; forming; finishing (e.g., surface modifications through slips, pains and glazes are minimally detailed); drying; firing; use and function; and post-depositional alteration. The importance of reconstructing firing technology is viewed as significant, and the author documents firing temperature estimation; optical and physical transformations in lime, calcite, hornblende, serpentine, biotite mica, and feldspars; atmospheres (porosity and smoking times are mentioned); and firing regime (oxidation and reduction). In post-depositional alteration, the accumulation of salts in groundwater is noted. The final chapter, Chapter 7: "Petrography of Ceramic Building Materials, Metallurgical Ceramics & Plaster" (pp. 213-236, 26 figures, 28 further readings), reminds the reader that ceramic analyses not only can be applied to pottery vessels but also to ceramic building and earthen construction materials, as well as refractory ceramics, cementitious materials, and other ceramic artifacts (smoking pipes, figurines, and clay tablets are cited as examples). Lastly, there is a much too brief and basic section on stoneware, fritware, and porcelain. There are three appendices: "Appendix: Petrographic Fabric Descriptions" (pp. 237-244, 6 figures): Unimodal Fabric Description, Bimodal Fabric Description, and Fabric Summary.

Ceramic Petrography: The Interpretation of Archaeological Pottery & Related Artefacts in Thin Section certainly can be used as a reference manual for microscope research and/or as a textbook for specialist training on thin section petrography and archaeological ceramic analysis. Two authors have published textbooks that focus exclusively on geological materials and not on ceramics. Anthony Philpotts, an igneous petrologist at the University of Connecticut, is the author of Petrography *of Igneous and Metamorphic Rocks* (Long Grove, IL: Waveland Press, 2003, 192 pp.). In this widely-used volume, he employs the classification of igneous rocks proposed by the International Union of Geological Sciences (IUGS) Subcommission of the Systematics of Igneous Rocks. A list of commonly used rock names (many not part of the IUGS classification) is keyed to this classification. In addition, the widely used Irvine-Baragar classification of volcanic rocks is included. There is an accompanying CD-ROM with color slides illustrating rock-forming minerals and the textures of rocks, many with text and audio annotations by the author; descriptions of the textures and structures of igneous and metamorphic rocks. Loren A. Raymond, now retired from Appalachian State University, has also written geology-oriented texts that are often used: *Petrology: The Study of Igneous, Sedimentary, and Metamorphic Rocks*, 2nd ed. (Long Grove, IL: Waveland Press, 2007, 736 pp.) and his newest *Petrography: Handspecimen and Thin Section Petrography* (Long Grove, IL: Waveland Press, 2010, 170 pp.).

But how does Quinn's volume compare with *Thin-Section Petrography of Stone and Ceramic Cultural Materials* by Chandra L. Reedy (London: Archaeopress, 2008) that I reviewed previously (*SAS Bulletin* 31(4):18-20, 2008)? Reedy, Professor at the University of Delaware's Center for Historic Architecture, and Design Professor of Art History and Asian Studies, is also Director of the Laboratory for Analysis of Cultural Materials. In the first two paragraphs of that assessment, I commented on the thin section literature from 1936 to 2008, so I won't repeat that here. Works by Shepard, Freestone et al., Rigby, Joyner, MacKenzie and colleagues, and Philpotts were stressed. A more recent, rather slim volume, *Thin-Section Petrography of Ceramic Materials* by Sarah E. Peterson with contributions by Philip P. Betancourt (INSTAP Archaeological Excavation Manual 2, Philadelphia: INSTAP Academic Press, 2009) (reviewed in *SAS Bulletin* 32(4):22-23, 2009) isn't recommended. Archaeopress has produced both the Reedy and Quinn volumes in well-bound paperback formats.

Reedy's book, which also details stone artifact petrography as well as pottery, is topically slightly different than Quinn's monograph in that hers has nine chapters, four of which deal with geological perspectives: volcanic igneous, plutonic igneous, sedimentary, and metamorphic. Four other chapters focus on pottery products, provenance, fabrication and deterioration, and non-pottery ceramic material. The narratives are roughly the same length (vi + 256 pp. for Reedy versus Quinn's v + 254 pp.) but her book is in a larger format. Reedy has more color figures (341 versus 246 for Quinn); however, the striking difference is that Reedy, like Philpotts, has included an accompanying CD-ROM of the illustrations (also accessible on the Internet at

http://www.udel.edu/CHAD/petrography). In the Reedy review, I concluded that: "Readers might quibble about topics that might have been included but, in sum, although this is a relatively expensive volume, it is a superb manual and well worth the expense. … Reedy's monograph is a welcome addition to the literature on thin-section petrographic studies. The illustrations in both print and digital forms are excellent, and the images in both plane polarized and crossed polarized light are to me as a contributor to ceramic thin-section studies, especially relevant and valuable resources." Quinn's modification of the Whitbread Descriptive System (pp. 80-81) is a valuable contribution to our interpretation of thin sections, while both Reedy and Quinn continue to move ahead with new methods of digital image analysis and advocate online petrographic databases. Cost is a major difference: Reedy: £70.00/$120.00; Quinn: £35.00/$70.00 (paperback; there are no hardcopy editions); both are available at lesser costs from online and discount booksellers (although one source lists Reed's volume at $249.38, accessed 7/12/2013). Both of these monographs are significant contributions to thin section petrography and both emphasize that thin sections can (if properly conserved) provide a permanent record that can be studied and restudied many times. I'm glad to have these important resources side-by-side on my bookshelf.

Temple Potters of Puri, Louise Allison Cort and Purna Chandra Mishra, Usmanpura, Ahmenabad, India: Mapin Publishing Gp Pty Ltd; Ocean Township, NJ: Grantha Corporation, Har/DVD edition (2012), (published February 16, 2013), 492 pp., 286 photographs (color and black-and-white), 30 drawings, 3 maps; DVD; ISBN-10: 0944142753, ISBN-13: 978-0944142752, $65.00/£42.00/€53.00 (hardcover).

The well-known and highly respected Asian ceramics scholar Louise Allison Cort, Curator of Ceramics at the Freer Gallery of Art and Arthur M. Sackler Gallery, Smithsonian Institution, Washington, DC, has authored books on historical and modern Japanese ceramics and Japanese baskets. These include *Shigaraki, Potters' Valley* (Tokyo: Kodansha International, 1979, reprinted 2000 and, 2006, Bangkok: Orchid Press), *Seto and Mino Ceramics* (Washington, DC: Smithsonian Institution, 1992), *A Basketmaker in Rural Japan* (coauthored with Nakamura Kenji, Boston: Shambhala Publications, 1995), and the online catalogue *Ceramics in Mainland Southeast Asia: Collections in the Freer Gallery of Art and Arthur M. Sackler Gallery* (with George Ashley Williams IV and David P. Rehfuss, 2008). Since 1989, she has worked with Leedom Lefferts in conducting long-term documentation of present-day village-based production of earthenware and stoneware ceramics in Mainland Southeast Asia; see their online publications at: http://nscarchaeologyunit.wordpress.com/2012/06/07/resource-papers-on-indigenous-southeast-asian-pottery/ Her university-educated co-author of *Temple Potters of Puri*, Purna Chandra Mishra, is an independent researcher who has collaborated with scholars from Europe and the United States in research projects relating to the religious and cultural traditions of Orissa. He lives in Puri and maintained contact with the potters since the original fieldwork.

Louise Allison Cort and Purna Chandra Mishra have authored this remarkable nearly 500-page, 5.1 pound, highly-illustrated and detailed ethnoceramic volume, the first to describe in detail a community of potters working for the Jagannatha Temple in Puri, Orissa, eastern India. As a pilgrimage center of national importance, the temple requires earthenware in massive quantities for the creation and distribution of the sacred food, an integral feature of daily ritual and pilgrimage. The authors note that "according to Hindu custom, clay cups once drunk from must be discarded, since use makes them ritually as well as physically impure" (p. 23). The temple is supported by the patronage of successive regional dynasties and by fervent popular belief. *Temple Potters of Puri* explores the role of the temple servants and how it affects the potters' understanding of their work and of themselves. Three hundred potters participate as temple servants in maintaining the temple's ritual cycle by performing their divinely assigned task. This study observes the potters' technical prowess, sustained by devotion, but also examines the tensions within their relationships to more powerful temple servants and authorities. The role of the potter as temple servant is at once glorious, as demonstrated by texts and personal interpretations of the potters' divinely-appointed service, and, at the same time, pathetic, as shown in the brutality of caste-based hierarchy and cash-based exchange penetrating the modern temple's daily operations.

From 1979 to 1981, Louise Cort lived in the town of Puri, Orissa. While there, she observed the community of potters working for the Jagannatha Temple. This group is responsible for creating unglazed red earthenware pots used to cook the daily meals presented to the gods of the temple. The potters enjoy special status as temple servants, and their community has a long, rich history. This study documents the potters' technical prowess, sustained by devotion, and the research draws upon temple records, oral tradition, and the Oriya-language *Kurala Purana*, a sacred text of the potters' community. The narrative sets out the use of the pots within the temple by the cooks, ritual officials, and other categories

of temple servants, notably their role in the production of the temple's mahaprasada.

The accompanying DVD, filmed originally in 16mm color filmstock by Cynthia Cunningham Cort (Louise's sister-in-law), shows the potters at work, the potters' working processes demonstrating their skills and products, and celebrating their annual festival, Kurala Panchami. The written narrative has clear indications where the DVD content supplements the text. In the following review, I indicate these by "(DVD)."

In the "Acknowledgements" (pp. 8-10), the authors discuss the Orissa Research Project (1969-1977), a very complex interdisciplinary endeavor with which their ethnographic work was associated. Three villages of potters were initially studied (1979-1981), and the junior author continued observations after that period. They also formed two collections of potters' tools and vessel repertories, one of which was deposited at the Anthropological Survey of India (Calcutta) and the other at the National Museum of Natural History, Smithsonian Institution (Washington, DC). There are "Notes on Orthography and the *Madala Panji*" (pp. 11-14, 8 endnotes) in which they have chosen to retain original orthographies from the period of initial research (hence, Calcutta, rather than Kolkata). The Madala Panji is the archival temple record of day-to-day activities at the Jagannatha Temple, an incredible resource since it documents activities from the year 1600 to the present. A map of the region is also included (p. 14). An "Introduction – Invisible Earthenware" (pp. 15-29, 23 illustrations, 1 footnote) provides an overview of the production of the unglazed earthenware pottery, includes a map of Puri (p. 17), describes the temple town, provides background on "meeting the potters," and outlines the structure of the book. There are three parts with a total of 12 chapters, and three appendices (all reviewed below) plus a "Glossary" (pp. 461-465) with 223 entries, a "Bibliography" (pp. 466-471) listing 22 Orissa Project Manuscripts, 137 published sources, and one film. An incredibly detailed double-column "Index" (pp. 472-491) conflates topics and proper nouns.

"Part I: Pots in the Jagannatha Temple" (two chapters, pp. 30-93): The authors review the organization of the temple, the temple servants, and the significance of pottery. "Chapter 1: The Jagannatha Temple: Pilgrims, Sacred Food, and Temple Servants" (pp. 33-59, 13 illustrations, 95 endnotes): The potters are only a single element in a network of beliefs, rituals, and duties. The authors detail the pilgrimages to Puri, sacred foods (mahaprasada), the plan of the temple complex (p. 41), temple servants consisting of Brahmin and non-Brahmin groups, the potters as temple servants, the ca. 300 temple potters (DVD), temple cooks, and the plan of the kitchen (p. 53). "Chapter 2: The Cycle of Pots in the Temple" (pp. 60-93, 3 illustrations, 144 endnotes): The chapter begins with information on the delivery of pots to the temple, the officials who receive the vessels, the recording of the receipt of pots, the division of labor among 36 temple servants in the kitchen, the menu, kitchen recipes and the uses of the vessels, the distribution of the pots among the temple servants, uses of the pottery, and the presentation of offerings to the deities. The concept of "pollution" (associations with impure people and creatures or substances such as human waste) involves both pots and food. The authors also consider "extra offerings," vessels for temple rituals, the mundane use of vessels in the temple, and the disposal of used pots which is incumbent on the user (vessels may be reused – for example, as flower pots – or thrown away as rubbish or discarded in a body of water, p. 23, 49, 89-90).

"Part II: The Potters' Community at Work, and Ritual (six chapters, pp. 94-323): The authors focus on the potters' perceptions of the village. "Chapter 3: The Village" (pp. 96-141, 29 illustrations, 24 endnotes): Topics include the structure of the village (DVD), a map of the village (p. 99) and a house plan (p. 108), space allocations, daily and seasonal changes in village life, women's clothing and tattoos, men's clothing, the kinship system, hereditary offices and special duties (sebas) performed in the temple, four village specialists (astrologer, barber, washerman, and the Brahmin). The schooling of young children by the astrologer, marital rites, funerals, annual festivals, community accord, and the Malanga Puja and Duvali festival are explained. "Chapter 4: Gifts of a God: Workshop, Kiln, Tools, and Materials" (pp. 142-187, 32 illustrations, 26 endnotes): The cyclical life of the potters, their workshops (DVD), the concept of workshops as sacred space, potters' tools (the pivoted spooked potting wheel, beating tools [paddle-and-anvil (DVD)], and scrapers), large updraft outdoor and smaller indoor kilns, and kiln repairs are documented. Also detailed are women's work in procuring the clay (an annual event involving the "sacred art" of digging the clay), negotiating payment to the landowner for the clay, and fuel procurement by the women (casuarina, an evergreen, is used as fuel). "Chapter 5: Work Processes" (pp. 188-223, 61 illustrations, 10 endnotes): The chapter focus on the preparation of the clay (DVD), throwing pottery on the wheel, (DVD), the use of the paddle-and-anvil (DVD), the beating of large vessels as men's work, the shaping of preliminary forms by women (DVD), and the final vessel shaping by women (DVD). The firing process is also elaborated, including loading and unloading the kiln,

storing finished vessels, and delivering pots to the temple (DVD).

"Chapter 6: Work Cycles and Life Cycles (pp. 224-261, 29 illustrations, 16 endnotes): The daily, weekly, and annual cycles are explained, as is production of pots for the marketplace in Puri (DVD), saving for dowries, and other sources of income (jobs outside of the village and the sale of agricultural products). The authors review the training of boys and girls as potters (DVD), the goals of the training process, the concept of a master potter, and working into old age (some potters were in their late 70s). "Chapter 7: *Kurala Purana*: Origins and Status of the Potters as an Occupational Group" (pp. 262-285, 5 illustrations, 43 endnotes): The story of the origins of the potters is related in a local text, the *Kurala Purana*. The authors also examine mythological origins, the origin of potter servants, the Puri potters' interpretations of the text, and a story about the potter and the goldsmith (Ch. 47 in the *Kurala Purana*). Social status, religious practices, the potters' Brahmin, and the production of pots for village weddings are also explained. "Chapter 8: Kurala Panchami: Makers, Tools and Processes Sanctified (pp. 286-323, 20 illustrations, 35 endnotes): The *Kurala Purana* (Chs. 14-24) could be "a model for the perfect enactment of the potters' worship" (p. 287). Shaleha Shauni (goddess of the workshop) and the observation of the Kurala Panchami, the potters' ancient ritual, as seen in 1979-1980, are documented: preparation (DVD), preparing images of worship (DVD), prohibitions, food, and several days of the festival are documented (first and second [DVD] and fifth days). The role of the Brahmin in these activities, resting and returning to work, and the Lakshimi Puja celebration are described. There is a prohibition against touching clay during the Kurala Panchami (p. 303).

"Part III: The Potters as Temple Servants" (four chapters, pp. 324-429): The authors review changes that have taken place in the relationships between the potters and the temple servants and administrators. "Chapter 9: Neli, The Potter's Wife: The Potter Servants and Their Land" (pp. 326-347, 1 illustration, 50 endnotes): The potters' role in the temple and establishment of the potter's community as recorded in the high court records, *Mandala Panji*, dates to 1211. Records from the Ganga dynasty dated to 1279 and a royal land grant of 1435 are described. Differences between recorded history and oral tradition are reviewed and the loss of the potters' lands under British administration in 1803 reviewed. The affirmation of land rights is documented more recently the *Record of Rights* (1954). "Chapter 10: Pottery Leadership, the *Tada Seba* and the Monasteries of Puri" (pp. 348-377, 6 illustrations, 67 endnotes): Tada are large clay frying pans made for the temple and delivered twice a year; Tada Seba refers to the service of making and delivering them. The authors document this service in recent times and in the past, and changes that have taken past. Other topics include offerings and the relationship to deities, the use of tadas in the temple kitchen, relationships of pots to food and to monasteries as well as arrangements made by potters with monasteries. The names of six pots used in offerings and jars for cold drinks are also discussed. "Chapter 11: The Potters and Modern Temple Servants: Duties, Rights, and Rewards" (pp. 378-397, 3 illustrations, 63 endnotes): The importance of the *Record of Rights* specifies the duties of potters and potters' rights. The authors review the rights of the early 19th century, noting gains and losses, the distribution of food and cash by the temple, the right to sell pots to the temple, and gifts for the king (dating to 1467 ff.). Punishment for disobedient temple servants, dedication ceremonies, and the honorific title-surname Bishoi for potter servants are documented. Cremation pyres for deceased servants were set ablaze with flames from the temple kitchen. "Chapter 12: Incorporating Outsiders, Debating Rights and Duties: Recent History of the Potters; Community" (pp. 398-429, 5 illustrations, 37 endnotes): Village expansion, with "outsiders" immigrating to the potters' community ca. 1750, relationships with the original families, and kinship and authority structure are discussed. The conflicts between two separate professional organizations of potters, factionalism, and clashes between the potters and temple cooks over purchasing wares from "outside" communities of potters are detailed.

There is an "Afterword" (pp. 430-432) in which the authors note changes and rising costs in the procurement of clay and fuel, problems with Indian bureaucracy, social class differences, and personal finances. Lastly, there are three appendices: "Appendix I: Technology: Terminology and Procedures (pp. 434-442, 30 illustrations), "Appendix II: Repertory of the Kumbhara Bishoi Potters" (pp. 443-450, 25 illustrations), and "Appendix III: Documents" (pp. 451-460).

This is a remarkable, comprehensive, detailed and well-documented ethnography of a single potting community and, frankly, I have not seen any publication quite like it. The illustrations are outstanding and add immensely to this splendid work and the inclusion of the DVD is significant plus. It is important to ceramic ethnoarchaeology as well as ethnography. Additional information on Puri ecology, geology, and environment would be useful to readers, especially archaeologists. For those interested in market distribution, additional information would be needed. The quantities of vessels

produced and discarded daily and annually are enormous, but unquantified. The late Carol Kramer studied potters in two cities in western India, Jodhpur and Udiapur, which occupy remarkably different ecological niches. See *Pottery in Rajasthan: Ethnoarchaeology in Two Indian Cities* by Carol Kramer; Washington and London: Smithsonian Institution Press, Smithsonian Series in Archaeological Inquiry, 1997). Reviewed by Charles C. Kolb, *H-Net REVIEWS/H-ASIA (Asian History)*, an electronic book review, 5 pp., Published on 26 March 1998 http://www.h-net.org/reviews/showrev.php?id=1812 With *Temple Potters of Puri*, we have another new landmark volume illustrating ceramic ethnology and ethnoarchaeology–one for the 21st century, demonstrating in detail these potters and their economic and sociocultural conditions.

Internet Resources

PETRODATABASE is an on-line petrographic database of archaeological thin sections: http://petrodatabase.shef.ac.uk/. The database, housed at the University of Sheffield and begun by Patrick Sean Quinn and colleagues, contains full-color polarizing light micrographs and associated data from artifact research worldwide. It addresses the need for greater comparison between thin section studies of archaeological ceramics and other materials, by providing a repository for types of petrographic data that are under-represented in the published literature. The database is free to use. Simply register to browse the range of projects, fabrics and individual thin sections. A search function enables users to query the database and display micrographs of specific petrographic compositions and microstructures. New projects and can be easily uploaded and edited on-line at any time using database files containing a range of data, including petrographic fabric descriptions of any format. Using the database, academics, consultants and students can store and disseminate petrographic data, as well as accessing vital comparative material at the touch of the button, anywhere in the world. Reducing the need to handle fragile thin sections themselves will assist in the preservation of these valuable collections, ensuring their survival for future research. The success of the database relies on regular use by the petrographic and archaeological community. Three searchable datasets are featured: 1) Southern California: Anza-Borrego Desert Late Prehistoric Ceramics, 20 thin sections from 7 sites; 2) Mediterranean: Cyclops Cave, Youra, Sporades Islands, Greece: Cyclops Cave Neolithic Ceramics, 12 thin sections from 12 caves; and 3) Mediterranean: Kommos, Crete, Greece: Kommos Transport Jars, 26 thin sections. PETRODATABASE was developed at University of Sheffield as a collaboration between the Department of Archaeology and Department of Computer Science, and funded by a grant from the University of Sheffield Faculty of Arts and Humanities. There are links to two other laboratories: Fitch Laboratory, British School at Athens: http://www.bsa.ac.uk/pages/content.php?cat_id=21 and Desert Archaeology in Tucson and Phoenix, Arizona, USA: http://www.desert.com/

The following publications are available on the Internet, gratis (verified 7/25/2013). A classic publication: Anna Osler Shepard (1985) ***Ceramics for the Archaeologist***, 5th printing. Publication 609. Washington, DC: Carnegie Institution of Washington. http://carnegiescience.edu/publications_online/Ceramics_arch.pdf

One URL leads to five volumes, some very recent: http://www.ebookweb.org/s/pottery-in-archaeology/ . 1) J. Theodore Peña (2007) ***Roman Pottery in the Archaeological Record***. Cambridge and New York: Cambridge University Press. 2) Stephen Plog (1980) ***Stylistic Variation in Prehistoric Ceramics: Design Analysis in the American Southwest***. Cambridge and New York: Cambridge University Press. 3) T. Douglas Price and James H. Burton (2011) ***An Introduction to Archaeological Chemistry***. New York: Springer. 4) Donald A. Proulx (2009) ***A Sourcebook of Nasca Ceramic Iconography Reading a Culture through Its Art***. Iowa City: University of Iowa Press. And 5) Stanley A. South (2002) ***Historical Archaeology in Wachovia : Excavating Eighteenth-century Bethabara and Moravian Pottery***. New York: Kluwer Academic/Plenum Press.

Past Professional Meetings

"Hellenistic and Roman Terracottas: Mediterranean Networks and Cyprus", an international conference, was held at the Archaeological Research Unit, University of Cyprus, Nicosia, 3-5 June 2013. Welcoming addresses were given by Demetrios Michaelides, (Director of the Archaeological Research Unit, University of Cyprus), Constantinos Christofides (Rector of the University of Cyprus), and Jaimee Uhlenbrock (President of the Association for Coroplastic Studies). The meeting included a visit to the Cyprus Museum, Nicosia. There were six sessions and 11 sets of presentations. There are plans to publish the papers.

Session 1 – The House of Orpheus Terracotta Figurines, Chairperson: Jaimee Uhlenbrock. Presentations: "Moulding Expressions of Culture: The Terracotta Figurines from the House of Orpheus in Nea Paphos" by

Giorgos Papantoniou and Demetrios Michaelides; "Quantitative vs Qualitative Data: The Application of Neutron Activation Analysis and Portable X-ray Fluorescence Spectroscopy for the Study of the Hellenistic and Roman Figurines from the House of Orpheus in Nea Paphos" by Vassilis Kilikoglou, Maria Dikomitou-Eliadou, Giorgos Papantoniou, and Demetrios Michaelides; "On Technology and Fabric Composition: Putting the pXRF Dataset into Use" Maria Dikomitou-Eliadou, Eleni Aloupi, Giorgos Papantoniou, Demetrios Michaelides; and "The Use of Information Technology Applications for Supporting the Study and Interpretation of Terracotta Figurines from the House of Orpheus in Nea Paphos" by Fernando Loizides, Andreas Lanitis, Giorgos Papantoniou and Demetrios Michaelides. Session 2a – Cyprus, Chairperson: Despo Pilides. Presentations: "Terracotta Figurines and Limestone Votaries from Late Classical to Roman times in Eastern Cyprus" by Gabriele Koiner and Nicole Reitinger; "The Terracottas from Larnaca's Salt Lake: Making New Things out of Old" by Pauline Maillard; and "The Terracotta Figurines of Hellenistic Arsinoe and its Environs" Eustathios Raptou. Session 2b–Cyprus, Chairperson: Demetrios Michaelides. Presentations: "Hellenistic Terracottas: The Evidence from Ancient Arsinoe" by Nancy Serwint; "The Terracottas of Aphrodite and Eros at Amathous: Images of a Cult Statue?" by Isabelle Tassignon; and "Underneath the Veil: Terracotta Figurines from the Eastern Necropolis of Amathous" by Elisavet Stephani. Session 2c–Cyprus, Chairperson: Arthur Muller. Presentations: "Contemplating Issues of Historical Continuity: The Case of the Erimi-Bamboula Figurines" by Polina Christofi; and "Hellenistic and Roman Terracottas in the Cypriot Collection of the Ashmolean Museum, Oxford: Contexts, Iconography, Meaning and Mediterranean Connections" by Anja Ulbrich.

Session 3a – Greece and Asia Minor, Chairperson: Maria Dikomitou-Eliadou. Presentations: "Theriomorphic Figures in Hellenistic and Roman Arcadia: A Possible Cypriot Connection" by Erin Walcek Averett; "Praxiteles and the Figurines" by Angele Rosenberg; and "Five Terracotta Ex-voto Figurines from Amarynthos, Euboea: A Case-Study in Sanctuary Deposit Practices" by Costantina Benissi. Session 3b – Greece and Asia Minor, Chairperson: Vassilis Kilikoglou. Presentations: "Production of Terracotta Figurines in the Hellenistic Period at the Ancient City of Pherae, Thessaly" by Argyroula Doulgeri-Intzesiloglou and Polyxeni Arachoviti; "Some New Observations on the Materials used for the Decoration of Hellenistic Terracotta Figurines in the Pherai Workshops, Greece" by Eleni Asderaki-Tzoumerkioti, Manos Dionysiou, Argyroula Doulgeri-Intzesiloglou, and Polyxeni Arachoviti; "Greek Terracotta Dolls: Between the Domestic and the Religious Sphere" by Frauke Gutschke; and "Tanagras in the Rituals of Death and Rebirth" by Minna Lönnqvist. Session 3c–Greece and Asia Minor, Chairperson: Rebecca Miller Ammerman. Presentations: "Terracotta Veiled Women: A Symbol of Transition from Nymphe to Gyne?" by Nathalie Martin; "Visiting Gods" Revisited: Aphrodite or Bride?" by Arthur Muller; and "Aphrodite, the Coming of Age and Marriage: Contextualisation and Reconsideration of the Nude Young Women Kneeling in a Shell" by Stéphanie Huysecom-Haxhi. Session 3d – Greece and Asia Minor, Chairperson: Stéphanie Huysecom-Haxhi. Presentations: "New Hellenistic and Roman Terracotta Figurines from Pergamon's Residential Area: On Workshops, Types and Images Related to Other Sites, and the Impact of Religions from Other Areas" by Sven Kielau; and "Transformation and Appropriation in the Coroplastic Art of Sardis; by Frances Gallart Marqués.

Session 4–Italy, Chairperson: Nancy Serwint. Presentations: "Production and Consumption of Terracottas: A Case Study at Metaponto in Southern Italy" by Rebecca Miller Ammerman; "Hellenistic Architectural Terracottas from the Insula Occidentalis of Pompeii" by Mario Grimaldi; and "The Terracottas from the Excavations at the House of Marcus Fabius Rufus in Pompeii" by Alessandro Russo. Session 5–North Africa: Tunisia and Egypt, Chairperson: Marina Solomidou-Ieronymidou. Presentations: "Terracotta Figurines in Roman Africa" by Solenn De Larminat; and "Conceptualising the Consumption of the Sacred: Mass Production vs. Handmade Figurines" by Lara Weiss. Session 6–The Levant, Chairperson: Giorgos Papantoniou. Presentations: "From Alexandria to Tyre: The Egyptian Character of the Hellenistic Figurines from Kharayeb" by Marianna Castiglione; "Levantine koine: Ties between Hellenistic Terracottas from Israel and Cyprus" by Adi Erlich; "A Syrian Tradition in the Hellenistic Terracottas at Jebel Khalid on the Euphrates: The Case of the Persian Riders" by Heather Jackson; "A Look from the Outside: Mediterranean Influences on the Terracotta Figurines from Seleucia on the Tigris" by Roberta Menegazzi; and "The Plaster Figurines from the Roman-Byzantine Khirbet es-Samrā Cemetery in Jordan" by Abdalla Nabulsi. "Summary and Conclusions of the Conference" was ably presented by Jaimee Uhlenbrock, followed by a session, "Information on the Publication and Concluding Remarks," and Farewell Dinner.

***The Third International Sevgi Gönül Byzantine Studies Symposium* [*Üçüncü Uluslararası Sevgi Gönül Bizans Araştırmaları Sempozyumu*]** was held at Koç University Research Center for Anatolian Civilizations, Istanbul,

Turkey, 24-27 June 2013. This year's theme for the symposium, which has been held every three years since 2007, was "Trade in Byzantium." The four-day-long symposium hosted 14 sessions, during which 34 papers were presented, concentrating on up-to-date findings and documents on trade in the Byzantine world in the light of recent archaeological discoveries and new interpretations of written sources. Five presentations mentioned ceramics from shipwrecks and two papers focused exclusively on pottery; the latter are:

Lale Doğer and Harun Özdaş "Adrasan: Ceramic Finds from a Byzantine Shipwreck" ["Adrasan: Bir Bizans Batığından Seramik Buluntular"], Abstract: "In 2006, a Byzantine shipwreck was discovered at Göcük Burnu near Adrasan Bay in the Finike region, and this shipwreck was re-examined in 2011. The main cargo of the wreck was ceramic tableware, bowls and plates. Adding the Adrasan shipwreck to the Cape Gelidonya and Kastellorizo Island wrecks with their ceramic cargoes, we can conclude that the Western Lycian coast of the Mediterranean has more ceramic tableware cargo wrecks than any other location. A total of 55 to 60 plates and bowls were detected on the surface of the shipwreck area. The findings were generally comprised of red clay, beige-white-slipped, monochrome-glazed, open vessels. These vessels consist of simple-rim, high-ring pedestal-base plates, and low-ring pedestal-base bowls with a vertical rim. Decorative medallions made in fine sgraffito are placed on the inner center of the plates. Palmettes and a stylized floral spiraling branch motif are scattered among the decorations. The second group of fine sgraffito underglaze painting bowls exhibits medallion-style decoration. The same kind of bowls with medallion-style decoration can be seen at Euboea (Aprati) and Korinthos. There is also a type of bead decoration lined with a classic-style, so-called rope-strip, surrounded by a thin band. The shipwreck artifacts' forms and technical characteristics are similar to those of the Alonnesos and Kastellorizo shipwrecks, which were of the Kommenos Period open-vessel typology. Therefore, the wreck has been dated to between the mid-twelfth and beginning of the thirteenth century AD. The variety of cargo found with this shipwreck brings a new perspective to the period."

Véronique François "A Distribution Atlas of Byzantine Ceramics: A New Approach for Pottery Trade in Byzantium" ["Bizans Seramiklerinin Dağılım Atlası: Bizans'ta Çömlek Ticaretine Yeni Bir Yaklaşım"], Abstract: "To illustrate the movement of Byzantine ceramics, a series of maps, established on the basis of a thorough bibliographic survey, will propose a distribution pattern of the major types of tableware produced and traded in the empire and beyond its borders, between the seventh and fifteenth centuries. These maps not only indicate these discoveries geographically, but also identify the ceramics by both type and period. In addition, the base maps depict the following elements: the territorial evolution of the Byzantine Empire and therefore the relations and balances established between neighboring states; river systems; the most densely populated areas; the major land and sea routes; and the location of cities, military bases and Italian commercial establishments in the Eastern Mediterranean. Thus, in order to understand the ceramics market in Byzantium and identify both distribution pattern and consumption, archaeological data are put into perspective in relation to geographic, economic and geopolitical data. These comparisons highlight the distribution areas of contemporary production in terms of both complementarity and competition. They contribute to the study of the traffic flow of these products on different scales: macro-regional, regional, and long-distance." The proceedings will be published; the symposium program and abstracts of all of the papers are available online: http://sgsymposium.ku.edu.tr/

Future Professional Meetings

The 12th European Meeting on Ancient Ceramics (EMAC 2012) will be held at the University of Padua, Italy (about 40 km west of Venice) 19-21 September 2013 and is co-organized by the Department of Geosciences, University of Padova; Department of Biological, Geological and Environmental Science, University of Sannio; and Institute of Inorganic Chemistry and Surfaces – CNR. The goal of this meeting, "in accordance with former edition," is the promotion of the methodological development and use of scientific techniques in the study of archaeological and historical ceramic materials for interpreting and solving issues on provenance, production, usage, conservation, age, and technological changes over times and places. Due to the interdisciplinary character of these type of studies, researchers and scholars from both human and science background will share their experience and results obtained in their most recently researches. This would encourage scientists with different expertise to join together in new research projects. Keeping the traditional themes of former meetings, the 12th EMAC will cover the following topics: 1) methodological developments; 2) dating ceramics; 3) experimental firing; 4) technology and provenance; 5) alteration and conservation; 6) glazed pottery; 7) ceramics as building materials; and 8) technical ceramics. Oral and/or poster presentations are selected by the Scientific Committee on the basis of the abstracts submitted. Each oral presentation is 15 minutes

long, including discussion and closing arguments. For further information, including registration, travel, etc., please visit the meeting website: http://emac2013.geoscienze.unipd.it , correspond via e-mail: congress.emac2013@unipd.it or Skype: emac2013unipd. The EMAC 2013 organizers are Lara Maritan, Claudio Mazzoli, Rebecca Piovesan, Celestino Grifa, Mariano Mercurio, Luca Nodari. The list of presentations selected thus far is on the Internet at: emac2013.geoscienze.unipd.it/EMAC2013_oral_presentations.pdf

Ceramic Ecology XXVII has been accepted as a volunteered symposium by the American Anthropological Association for the annual meeting in Chicago, IL, USA, 21-24 November 2013 (the actual day and time will be announced in early August). Sandra Lopez Varela and Kostalena Michelaki (aka Konstantina-Eleni Michelaki Schwartz) are the organizers and chairs. My next column in the *SAS Bulletin* will provide a list of presenters and copies of their abstracts.

ARCHAEOMETALLURGY

Thomas R. Fenn, Associate Editor

The column in this issue includes the following categories of information on archaeometallurgy: 1) New Books; 2) New Articles/Book Chapters; 3) Doctoral and Masters Theses; 4) Forthcoming Meetings; 5) Previous Meetings; and, 6) Web-Based Information.

New Books

Archaeometallurgy in Mesoamerica: Current Approaches and New Perspectives, edited by Aaron N. Shugar and Scott E. Simmons, 2013, University Press of Colorado, Boulder, xv+258 p., 36 B&W photos, 27 line illustrations, 12 maps, 15 tables ; 24 cm., includes bibliographic references and index, Language: English, ISBN: 9781607322009 (hbk.); 1607322005 (hbk.); 9781607322108 (ebook), Cost: $70.00. More information about the book and ordering information can be found at the publisher's website http://www.upcolorado.com/book/Archaeometallurgy_in_Mesoamerica_cloth.

Presenting the latest in archaeometallurgical research in a Mesoamerican context, "Archaeometallurgy in Mesoamerica" brings together up-to-date research from the most notable scholars in the field. These contributors analyze data from a variety of sites, examining current approaches to the study of archaeometallurgy in the region as well as new perspectives on the significance metallurgy and metal objects had in the lives of its ancient peoples. The chapters are organized following the cyclical nature of metals–beginning with extracting and mining ore, moving to smelting and casting of finished objects, and ending with recycling and deterioration back to the original state once the object is no longer in use. Data obtained from archaeological investigations, ethnohistoric sources, ethnographic studies, along with materials science analyses, are brought to bear on questions related to the integration of metallurgy into local and regional economies, the sacred connotations of copper objects, metallurgy as specialized crafting, and the nature of mining, alloy technology, and metal fabrication.

The nine chapters in this edited volume comprise "Archaeometallurgy in Ancient Mesoamerica" (Scott E. Simmons, Aaron N. Shugar; pp. 1-28), "An Interdisciplinary Survey of a Copper-Smelting Site in West Mexico: The Case of Jicalán et Viejo, Michoacán" (Hans Roskamp, Mario Rétiz; pp. 29-50), "Mining and Metallurgy, and the Evidence for Their Development in West Mexico" (Blanca Maldonado; pp. 51-75), "The Production of Copper at El Coyote, Honduras: Processing, Dating, and Political Economy" (Edward Schortman; pp. 77-112), "Late Prehistoric K'iche' Metalworking at Utatlán, Guatemala" (John M. Weeks; pp. 113-133), "Archaeometallurgy at Lamanai, Belize: New Discoveries and Insights from the Southern Maya Lowland Area" (Scott E. Simmons, Aaron N. Shugar; pp. 135-159), "Breaking the Mold: The Socioeconomic Significance of Metal Artifacts at Mayapán" (Elizabeth H. Paris, Carlos Peraza Lope; pp. 161-201), "How "Real" Does It Get? Portable XRF Analysis of Thin-Walled Copper Bells from the Aztec Templo Mayor, Tenochtitlan, Mexico" (Niklas Schulze; pp. 203-226), and "Mesoamerican Metallurgy Today" (Dorothy Hosler; pp. 227-245).

Anatolian Metal V, edited by Ünsal Yalçın, 2011, Der Anschnitt, Beiheft 24, Veröffentlichungen aus dem Deutschen Bergbau-Museum Bochum, Nr. 180, Deutsches Bergbau-Museum, Bochum, Germany, 258 p. : photos., illus., maps, graphs ; 30 cm, Language: German and English, ISBN: 3937203540 (hbk.); 9783937203546 (hbk.).

This book represents the proceedings of a Festschrift for Robert Maddin, one of the great contributors to the study of ancient metallurgy, particularly in the Eastern Mediterranean. Following a "Vorwort" (p. 9), and "Grußwort" (p. 11), contributions to the volume consist of "Robert Maddin and the Deutsches Bergbau-Museum Bochum" (Rainer Slotta, Andreas Hauptmann; p. 13),

"Robert Maddin: An Appreciation" (James D. Muhly; p. 17), "The Dynamics of Cultural Change in Anatolia" (Mehmet Özdoğan; p. 21), "Die Karaz-Kultur in Ostanatolien" (H. Gönül Yalçın; p. 31), "Çamlıbel Tarlası, ein metallverarbeitender Fundplatz des vierten Jahrtausends v. Chr. im nördlichen Zentralanatolien" (Ulf-Dietrich Schoop; p. 53), "Handel mit Lapislazuli, Türkis und Karneol im alten Vorderen Orient" (Horst Klengel; p. 69), "Symbol der ewigen Herrschaft: Metall als Grundlage des hethitischen Reiches" (Metin Alparslan & Meltem Doğan-Alparslan; p. 79), "Eine Archaische Schmiedewerkstatt in Klazomenai" (Ünsal Yalçın & Hüseyin Cevizoğlu; p. 85), "Der Schatz auf dem Königshügel, Kaleburnu/Galinoporni, Zypern" (Martin Bartelheim, Sonja Behrendt, Bülent Kızılduman, Uwe Müller & Ernst Pernicka; p. 91), "Ada Tepe (Ost-Rhodopen, Bulgarien): Spätbronzezeitlicher – ältereisenzeitlicher Goldbergbau" (Hristo Popov, Albrecht Jockenhövel & Christian Groer; p. 111), "Aspects of the Development of Casting and Forging Techniques from the Copper Age to the Early Bronze Age of Eastern Central Europe and the Carpathian Basin" (Tobias L. Kienlin; p. 127), "Metal in South-Eastern and Central Europe between 4500 and 2900 BCE" (Svend Hansen; p. 137), "Eurasian Steppe Belt: Radiocarbon Chronology and Metallurgical Provinces" (Evgeny N. Chernykh; p. 151), "Gold in Georgia I: Scientific Investigations into the Composition of Gold" (Andreas Hauptmann; p. 173), "Gold in Georgia II : The Oldest Gold Mine in the World" (Thomas Stöllner & Irina Gambashidze; p. 187), "Metallurgy of Prehistoric Armenia" (Khachatur Meliksetian, Steffen Kraus, Ernst Pernicka Pavel Avetissyan, Seda Devejian & Levron Petrosyan; p. 201), "Early Tin-Copper Ore from Iran, a Posssible Clue for the Enigma of Bronze Age Tin" (Nima Nezafati, Ernst Pernicka & Morteza Momenzadeh; p. 211), "Tin from Kazakhstan – Steppe Tin for the West?" (Thomas Stöllner, Zeinolla Samaschev, Sergej Berdenov, Jan Cierny, Monika Doll, Jennifer Garner, Anton Gontscharov, Alexander Gorelik, Andreas Hauptmann, Rainer Herd, Galina A. Kusch, Viktor Merz, Torsten Riese, Beate Sikorski & Benno Zickgraf; p. 231-251), and an "Autorenliste (p. 253).

Ironwork in Medieval Britain: An Archaeological Study, by Ian H. Goodall, 2011, Monograph series (Society for Medieval Archaeology) no. 31, Maney Publishing, London, xvii + 397p., 172 figs (line drawings), 295mm., Language: English, ISBN: 978-1-907975-45-5 (pbk); 1-907975-45-4 (pbk), Cost: UK £32.00 (+post); USA $64.00 (+post). More information about the book and ordering information can be found at: http://maneypublishing.com/index.php/books/sma31/?back=1

This monograph is the definitive survey of iron tools and other fittings in use during the period c1066 to 1540AD. Exceptional in a north-western European context for its range and coverage of artifacts from both rural and urban excavations, much of the material described here was recovered during 'rescue' projects in the 1960s and 1970s funded by the State through the Ministry of Public Works and Buildings and their successors. The text contains almost everything necessary to identify, date and understand medieval iron objects. In scope and detail there is still no published parallel and, as such, it will be essential for almost any archaeologist working in later medieval archaeology, particularly in the fields of excavation, finds study, museums and research. Following a chapter on "Iron smelting and smithing" (Chapter 1), the volume comprises 12 more chapters discussing medieval iron tools associated with various crafts and industries, or functions. These chapters are: "Chapter 2 Metalworking tools", "Chapter 3 Woodworking tools", "Chapter 4 Stoneworking and plastering tools", "Chapter 5 Textile manufacturing tools", "Chapter 6 Tanning and leatherworking tools", "Chapter 7 Agricultural tools", "Chapter 8 Knives, shears and scissors", "Chapter 9 Building ironwork and furniture fittings", "Chapter 10 Locks and keys", "Chapter 11 Household ironwork", "Chapter 12 Buckles and personal equipment", and "Chapter 13 Horse equipment".

New Book Chapters/Articles

A new book ***Mining and Quarrying in the Ancient Andes: Sociopolitical, Economic, and Symbolic Dimensions***, edited by Nicholas Tripcevich and Kevin J. Vaughn, 2012, Springer, New York, is now available and while much of the book focuses on non-metallurgical aspects of mining and quarrying, one section entitled "Metals" also covers topics of archaeometallurgical interest. Those chapters include "Mining under Inca Rule in North-Central Chile: The Los Infieles Mining Complex" (Gabriel E. Cantarutti; pp. 185-211), "Amalgamation and Small-Scale Gold Mining in the Ancient Andes" (William E. Brooks, Gabriela Schwörbel, Luis Enrique Castillo; pp. 213-229), "Silver Mines of the Northern Lake Titicaca Basin" (Carol A. Schultze; pp. 231-251), "Mining, Commensal Politics, and Ritual under Inca Rule in Atacama, Northern Chile" (Diego Salazar, César Borie, Camila Oñate; pp. 253-274), "Economic, Social, and Ritual Aspects of Copper Mining in Ancient Peru: An Upper Ica Valley Case Study" (Hendrik Van Gijseghem, Kevin J. Vaughn, Verity H. Whalen, Moises Linares Grados, Jorge Olano Canales; pp. 275-298), "Mining Archaeology in the Nasca and Palpa Region, South Coast of Peru" (Markus Reindel, Thomas R. Stöllner, Benedikt Gräfingholt; pp. 299-322), "Some

Thoughts on Mining and Quarrying in the Ancient Andes" (Richard L. Burger; pp. 325-334), and "Discussion: Mineral Resources and Prehispanic Mining" (Izumi Shimada; pp. 335-353).

From the book ***Ancient Kura 2010–2011: The First Two Seasons of Joint Field Work in the Southern Caucasus***, edited by Bertille Lyonnet, Farhad Guliyev, Barbara Helwing, Tevekkül Aliyev, Svend Hansen, and Guram Mirtskhulava, 2012, ***Archäologische Mitteilungen aus Iran und Turan 44***, Dietrich Reimer, Berlin, come the sections "The copper bead" (Svend Hansen; pp. 84-85) and "The metallurgical evidence at Mentesh Tepe: preliminary results of archaeometallurgical analyses" (Antoine Courcier; pp. 109-119).

From the book ***Anatolian Iron Ages 7: Proceedings of the Seventh Anatolian Iron Ages Colloquium Held at Edirne, 19-24 2010***, edited by Altan Çilingiroğlu and Antonio Sagona, 2012, ***Ancient Near Eastern Studies, Supplement 39***, comes "A Blacksmith's Workshop at Klazomenai" (Hüseyin Cevizoğlu, Ünsal Yalçın; pp. 73-97), and "Bronze Animal Figurines from Gordion" (Maya Vassileva; pp. 317-332).

From the book ***Archäometrie und Denkmalpflege 2012. Jahrestagung an der Eberhard Karls Universität Tübingen, 28. – 31. März 2012***, edited by Frank Schlütter, Susanne Greiff, and Michael Prange, 2012, ***Metalla Sonderheft 5***, comes the extended abstract "Kupfer aus Zypern, und welche Erze? Die Ochsenhautbarren von Uluburun im Vergleich zu Erzen auf Zypern auf Basis der Cu-Isotopie [=Copper from Cyprus, but Which Ores Were Used? The Oxhide Ingots of Uluburun in Comparison to Ores on the Basis of Cu Isotopy]" (Moritz Jansen, Andreas Hauptmann, Sabine Klein, Michael Seitz; pp. 118-121).

From the book ***Ηρακλεους Σωτηρος Θασιων: Studia in honorem Iliae Prokopov sexagenario ab amicis et discipulis dedicata***, edited by Evgeni Paunov and Svetoslava Filipova, 2012, Faber Publishers, Veliko Turnovo, Bulgaria, comes "The Northern 'Journey' of Late Bronze Age Copper Ingots" (Diana Doncheva; pp. 671-714).

From the ***Journal of Archaeological Science*** (2013, Vol. 40, No. 10) comes "Iron IIA slag-tempered pottery in the Negev Highlands, Israel" (Mario A. S. Martin, Adi Eliyahu-Behar, Michael Anenburg, Yuval Goren, Israel Finkelstein; pp. 3777-3792), from (2013, Vol. 40, No. 9) comes "Silver lining: evidence for Inka silver refining in northern Chile" (Colleen Zori, Peter Tropper; pp. 3282-3292), from (2013, Vol. 40, No. 7) comes "High precision isotopic analyses of lead ores from New Mexico by MC-ICP-MS: implications for tracing the production and exchange of Pueblo IV glaze-decorated pottery" (Alyson M. Thibodeau, Judith A. Habicht-Mauche, Deborah L. Huntley, John T. Chesley, Joaquin Ruiz; pp. 3067-3075), from (2013, Vol. 40, No. 6) comes "Corrigenda to "Isotopic and technological variation in prehistoric Southeast Asian primary copper production" [J. Archaeol. Sci. 38 (2011) 3309–3322]" (Thomas Oliver Pryce; p. 2783), from (2013, Vol. 40, No. 5) comes "Pre-hispanic goldwork technology. The Quimbaya Treasure, Colombia" (A. Perea, P.C. Gutiérrez-Neira, A. Climent-Font, P. Fernández-Esquivel, S. Rovira-Llorens, J.L. Ruvalcaba-Sil, A. Verde, A. Zucchiatti; pp. 2326-2334), "Microscopic study of Chinese bronze casting moulds from the Eastern Zhou period" (Siran Liu, Kai Wang, Quanfa Cai, Jianli Chen; pp. 2402-2414), and "[Review of] Bell Beaker Copper Use in Central Europe: a Distinctive Tradition?, Matthias B. Merkl, in: BAR International Series 2267. Archaeopress, Oxford (2011)" (Florence Cattin; pp. 2428-2429), from (2013, Vol. 40, No. 4) comes "The role of arsenic in Chalcolithic copper artefacts – insights from Vila Nova de São Pedro (Portugal)" (Filipa Pereira, Rui J.C. Silva, António M. Monge Soares, Maria Fátima Araújo; pp. 2045-2056), from (2013, Vol. 40, No. 2) comes "Provenance of Iron Age iron in southern Germany: a new approach" (Michael Brauns, Roland Schwab, Guntram Gassmann, Günther Wieland, Ernst Pernicka,; pp. 841-849), "Charcoal from a prehistoric copper mine in the Austrian Alps: dendrochronological and dendrological data, demand for wood and forest utilisation" (Thomas Pichler, Kurt Nicolussi, Gert Goldenberg, Klaus Hanke, Kristóf Kovács, Andrea Thurner; pp. 992-1002), "Copper production in late prehispanic northern Chile" (Colleen Zori, Peter Tropper, David Scott; pp. 1165-1175), and "17th century Huron village life: insights from the copper-based metals of the Ball site, southern Ontario, Canada" (Kostalena Michelaki, Ronald G.V. Hancock, Gary Warrick, Dean H. Knight; pp. 1250-1259), and from (2013, Vol. 40, No. 1) comes "Roman double-layered crucibles from Autun/France: a petrological and geochemical approach" (Daniela König, Vincent Serneels; pp. 156-165), "Moving metals or indigenous mining? Provenancing Scandinavian Bronze Age artefacts by lead isotopes and trace elements" (Johan Ling, Eva Hjärthner-Holdar, Lena Grandin, Kjell Billström, Per-Olof Persson; pp. 291-304), "Bronze production in Southwestern Iberian Peninsula: the Late Bronze Age metallurgical workshop from Entre Águas 5 (Portugal)" (Pedro Valério, António M. Monge Soares, Rui J. C. Silva, Maria Fátima Araújo, Paulo Rebelo, Nuno Neto, Raquel Santos, Tiago Fontes; pp. 439-451), and "Five thousand years of atmospheric Ni, Zn, As, and

Cd deposition recorded in bogs from NW Iberia: prehistoric and historic anthropogenic contributions" (Xabier Pontevedra-Pombal, Tim M. Mighall, Juan C. Nóvoa-Muñoz, Eva Peiteado-Varela,José Rodríguez-Racedo, Eduardo García-Rodeja, Antonio Martínez-Cortizas; pp. 764-777).

From ***Archaeometry*** (2013, Vol. 55, No. 4) comes "Copper alloys from the 'Enot Shuni cemetery and the origins of bronze metallurgy in the EB IV – MB II Levant" (B. Kaufman; pp. 663-690), from (2013, Vol. 55, No. 3) comes "The Tungsten and tin signature of iron ores from Elba Island (Italy): A tool for provenance studies of iron production in the Mediterranean region" (M. Benvenuti, A. Dini, M. D'Orazio, L. Chiarantini, A. Corretti, P. Costagliola,; pp. 479-506), from (2013, Vol. 55, No. 2) comes "An Archaeometrical study of 13th-century arrowheads and bolts from the crusader castle of Arsuf/Arsur" (D. Ashkenazi, O. Golan, O. Tal; pp. 235-257), and from (2013, Vol. 55, No. 1) comes "The Effects of corrosion and conservation treatments on non-destructive neutron diffraction analysis of archaeological copper alloys: preliminary results" (L. D. Frame, I. C. Freestone, Shu Yan Zhang, M. Nicholas; pp. 68-80).

From ***Historical Metallurgy*** (2011, Vol. 45, Part 2), comes "An experimental study of the welding techniques used on large Greek and Roman bronze statues" (Aurélia Azéma, Benoît Mille, Patrick Echegut, Domingos De Sousa ; pp. 71-80), "An 8th-9th century AD iron smelting workshop near Saphim village, NW Lao PDR" (Thomas Oliver Pryce, Chanthaphilith Chiemsisouraj, Valéry Zeitoun, Hubert Forestier; pp. 81-89), "Beyond Wayland – thoughts on early medieval metal workshops in Scandinavia" (Ny Björn Gustafsson; pp. 90-101), "Iron in 1790: production statistics 1787-96 and the arrival of puddling" (Peter, King; pp. 102-133), "[Review of] *Journey to the Copper Age: archaeology in the Holy Land*, by T. E. Levy. San Diego Museum of Man, San Diego, CA, 2007, and *Masters of fire: hereditary bronze casters of south India*, by T. E. Levy, A. M. Levy, D. R. Sthapathy, and D. S. Sthapathy. Deutschen Bergbau-Museums, Bochum, 2008" (Roger C. P. Doonan and Jessica Slater; pp. 134-136), and "[Review of] *Saugus Iron Works. The Roland W. Robbins Excavations, 1948-1953*, edited by William A. Griswold and Donald W. Linebaugh, US National Park Service, 2011" (Paul Belford; pp. 136-137).

From ***Mediterranean Archaeology & Archaeometry*** (2012, Vol. 12, No. 2) comes "A report on the medieval mining and ore processing complex: Zilan valley, Van, Turkey" (Yusuf Ateş, Sinan Kılıç; pp. 105-116), "Shaping bronze by heat and hammer: An experimental reproduction of Minoan copper alloy forming techniques" (Nerantzis Nerantzis; pp. 237-248), and "An Overview of Analytical Techniques and Methods for the Study and Preservation of Artistic and Archaeological Bronzes" (Rocco Mazzeo, Silvia Prati, Marta Quaranta, Giorgia Sciutto; pp. 261-271).

From ***ArchéoSciences : revue d'archéométrie*** (2013, n° 37) comes "Maya Metallurgical Technology in Late Postclassic-Spanish Colonial Times: The View from Lamanai, Belize" (Scott E. Simmons, Aaron N. Shugar; pp. 105-123), and "Analyse de l'organisation spatiale de deux sites de production du fer dans le Sud-Ouest du Niger" (Rodrigue Guillon, Christophe Petit, Jean-Louis Rajot, Vincent Bichet, David Sebag, Oumarou Amadou Ide, Zibo Garba; pp. 123-135), and from (2012, n° 36) comes "L'or de la vallée de la Somme : recherches sur le monnayage d'or ambien (IIIe-Ier siècle av. J.-C.)" (Charlotte Sillon, Sylvia Nieto-Pelletier, Bernard Gratuze; pp. 117-126), and "Étude archéométallurgique du dépôt de grands bronzes du sanctuaire gallo-romain du Vieil-Evreux (Eure)" (Aurélia Azéma, Benoît Mille, Fabien Pilon, Jean-Claude Birolleau, Laurent Guyard; pp. 153-173).

From ***The Historic Environment*** (2012, Vol. 3, No. 2) comes "Metals and Metalworking: The Changing Role of Archaeometallurgy in British Archaeological Practice" (Paul Belford; pp. 170-175), and from ***Caiete / ARA : Arhitectura, Restaurare, Arheologie*** (2012, Vol. 3) comes "Ancient Gold Mining in Transylvania: The Roşia Montană Bucium Area" (Horia Ciugudean; pp. 219-232), and from ***X-Ray Spectrometry*** (2012, Vol. 41, No. 5) comes "Indigenous silver jewellery of Northern Patagonia (19th century): a first analytical approach to composite objects" (Maria Filomena Guerra, Paz Núñez-Regueiro; pp. 342-349), while from ***The Antiquaries Journal*** (2011, Vol. 91) comes "An Iron Age Mirror from Ruxox, Maulden, Bedfordshire" (Gilbert Burleigh, Vincent Megaw; pp. 51-58).

From ***Azania: Archaeological Research in Africa*** (2013, Vol. 48, No. 1) comes "The development of iron technology in precolonial western Uganda" (Louise Iles; pp. 65-90), and "Metalworkers and Smelting Precincts: Technological Reconstructions of Second Millennium Copper Production around Phalaborwa, Northern Lowveld of South Africa [PhD abstract]" (Thomas Thondhlana; pp. 151-152), and from (2012, Vol. 47, No. 1) comes "An Archaeometallurgical Investigation of Iron Smelting Traditions in Southern Rwanda [PhD abstract]" (Jane Humphris; pp. 131-132).

From the ***Bulletin of the American Schools of Oriental Research*** (2013, No. 369) comes "Five Small Bronze Hoards from Sardis and Their Implications for Coin Circulation in the Fifth Century c.e." (Jane DeRose Evans; pp. 137-156), and from (2012, No. 368) comes "Khirbat Nuqayb al-Asaymir and Middle Islamic Metallurgy in Faynan: Surveys of Wadi al-Ghuwayb and Wadi al-Jariya in Faynan, Southern Jordan" (Ian W. N. Jones, Thomas E. Levy, Mohammad Najjar; pp. 67-102).

Doctoral & Masters Theses

A Study of Lead Ingot Cargoes from Ancient Mediterranean Shipwrecks, by Heather Gale Brown, (Master of Arts thesis, Department of Anthropology, Texas A&M University, College Station, Texas), 2011, x, 317 pages, 18 figures, 11 tables, 2 appendices. Lead is often relegated to a footnote or sidebar in the study of ancient metals. However, the hundreds of lead ingots discovered in underwater sites over the past half-century have attested to the widespread production and trade of this utilitarian metal. Shipwreck sites allow independent dating evidence not available for many land finds. They also provide information about shipment size as well as accompanying cargo which can offer clues about trade patterns and markets for lead in the ancient world. While lead was not particularly rare nor valuable, it represents small- to moderate-scale trade that bridges the gap between luxury trade and the circulation of staple agricultural products. It thus can be viewed as a proxy for the many other perishable materials that supported daily life, such as timber, cloth, cordage, leather and pigments.

Due to the abundance of lead ingot finds, published in many different languages with great variation in the details provided, it is difficult to compare all of this material. This thesis, therefore, compiles and presents data on all published lead ingots from Mediterranean and Atlantic shipwrecks through the fourth century C.E., in order to provide a framework to analyze the ancient seaborne lead trade. Sixty-eight sites containing lead ingots, lead ore or lead minerals are included in the analysis, divided into six time periods: Bronze Age, Archaic, Classical, Hellenistic, Roman Republic and Roman Empire. A typology of ingots has been developed to allow for comparison of ingots between wrecks. The uses of lead are reviewed, organized by type of use: domestic, professional, military and infrastructural. This allows insight into both the consumers in need of lead and the volume and regularity of consumption required for each use. An overview of lead production and its economic limitations further informs the discussion of the lead trade. The final analysis considers all of these factors in creating a picture of lead trade for each of the six periods, focusing on the regions of supply, the types of demand, and the dominant forces that drove the mining and production of lead. [Abstract from thesis author]

Reconstructing the Iron Production Technologies of Western Uganda: Reconciling Archaeometallurgical and Ethnoarchaeological Approaches, by Louise Elizabeth Iles (Doctor of Philosophy thesis, Institute of Archaeology, University College London, London, UK), 2011, 544 pages, 263 figures, 57 tables, 20 appendices. Accessible online at: http://discovery.ucl.ac.uk/1306719/.

The local production of iron was an important technology in eastern Africa up until the later twentieth century, when the use and reuse of imported iron overtook vernacular smelting industries and cemented their decline. Prior to this, the utilization of local ores had produced iron for agricultural implements, household tools and weapons, serving the needs of many generations of farmers and herders across the region.

The smelters of western Uganda enjoyed a particularly esteemed reputation in recent history, especially among their neighbors in Buganda, yet prior to this research little was known about the technologies upon which this reputation was fostered. This thesis presents the results of six months of fieldwork in Uganda and subsequent archaeometallurgical analysis, which together revealed the complexities of smelting in western Uganda between the fourteenth and twentieth centuries.

Exploring this new archaeometallurgical dataset has indicated that some iron producers in Mwenge (a particularly iron-rich region of western Uganda) were selecting manganese-rich ores with which to supplement the iron ores in the smelt, imparting a tangible effect on the process and outcomes of these smelting episodes, hypothetically increasing the metal yield and improving operating parameters. Although such harnessing of beneficial manganese-rich minerals was an unexpected and unusual finding, technological reconstructions of these smelts highlighted several other interesting features, including the consistent use of grog temper in technical ceramics, the occasional use of banana pseudostems, and variations in furnace style. Combining these discoveries with existing ethnoarchaeological and ethnohistorical data, and building upon social approaches to iron technologies, it was possible to explore some of the possible reasons for this variation, adding color and time-depth to the understanding of iron production within this region. [Abstract from thesis author]

Forthcoming Meetings and Conferences

The ***18. Internationaler Kongress über antike Bronzen = 18th International Congress on Ancient Bronzes*** will be held September 3-7, 2013, at the University of Zurich and the Paul Scherrer Institute in Villigen. The aim of the conference is to give an update, especially on the many issues facing bronze research, which have been employed in recent years. That is why they have invited eight internationally recognized experts for keynote speeches on specific topics, who will each give an introduction to the state of research. The following topics are intended: 1) Greek and Italian bronzes in the Iron Age in Central Europe; 2) Greek bronzes in the Mediterranean region; 3) Large bronzes; 4) Roman statuettes; 5) Roman toreutic; 6) Manufacturing technology, restoration; 7) Analytics; and, 8) Written sources. All lectures - the keynotes and the contributions of each participant – will be delivered from Wednesday, to Friday, 4-6 September. A poster session also is scheduled to complement the above mentioned thematic sessions. On Saturday, 7 September, there will be excursions to an art foundry in St. Gallen (http://www.kunstgiesserei.ch/ueber-uns/sitterwerk.html) or to Augusta Raurica (http://www.augustaraurica.ch). The abstract deadline is March 31, 2013. For more information please see the International Congress on Ancient Bronzes at:
www.prehist.uzh.ch/bronzekongress2013.

The eighth International Conference on the ***Beginnings of the Use of Metals and Alloys (BUMA VIII)*** will be held from September 10-15, 2013. The international conference on the "Beginnings of the Use of Metals and Alloys" (BUMA) is an interdisciplinary gathering of scientists, engineers, archaeologists and historians with a focus on production and use of metals, and with emphasis on cultural interactions and evolutions over time and space especially between the West and the Asian region. BUMA was founded in 1981 by two eminent archaeometallurgists Prof. Robert Maddin in Philadelphia USA and Prof Tsun Ko in Beijing, China, and strong support of late Professors Cyril Stanley Smith (MIT) and Yunoshin Imai (Tohoku University) from the second Conference on. From Beijing in 1981 BUMA has traveled to Zhengzhou, China (1986), Sanmenxia, China (1992), Matsue, Japan (1998), Gyeongju, Korea (2002), Beijing, China (2006) and Bangalore, India (2009). BUMA VIII will be held in Nara, Japan in 2013. As the ancient capital of Japan, there are many historical and cultural attractions in Nara. The great bronze statue of Buddha (Daibutsu) in the Todaiji Temple was cast using ca.500 tons of copper in AD 747-749 and marks the beginning of the new age of the metal production in Japan.

The main theme at the Nara Conference is "Cultural Interaction and the Use of Metals". The Conference will provide a forum for discussion on the effects of metals on the culture and history with a special focus on Asian materials. Comparative studies and case studies on ancient and traditional metallurgy from other regions can clarify the interactions between the Far East and the West through South Asia as well as Eurasia.

The Conference will cover the following themes:

1. Iron and Steel Technology
2. Copper and Bronze Technology
3. Precious Metals and Coinage
4. Casting Technology of Bronze and Iron
5. Swords and Iron Artifacts
6. History of Alloys (Brass, Paktong and Shiromé)
7. Ores and Metal Production
8. Illustrated Technology of Mining and Metallurgy
9. Experimental Metallurgy, Survey Methods and Conservation
10. Poster Session

They will try and avoid parallel sessions, and the poster session will allow maximum participation. Papers presented at the conference and accepted by the editorial committee will be published in the proceedings. Special attention should be given to the archaeological and historical background of the studies and to the interaction between specialized researchers. The conference language will be English. More information is available at the conference website (http://buma8.wiki.fc2.com/).

100th Anniversary of Stainless Steel, HMS Annual Conference, October 19-20, 2013, Cutlers' Hall, Sheffield, UK. On August 20, 1913, metallurgist Harry Brearley (UK) made his first arc furnace cast of stainless steel in Sheffield. Therefore to mark this occasion the Historical Metallurgy Society (HMS) 2013 Annual Meeting will be a two day conference in the Cutlers' Hall in Sheffield. There will be presentations on Saturday and field trips on Sunday. For more information please contact HMSannualconf@hist-met.org or post to Eleanor Blakelock, Conservation and Scientific Research, British Museum, Great Russell Street, London WC1B 3DG, UK. More information about the conference can be found at the HMS website: http://hist-met.org/meetings/31-hms-annual-conference-oct-2013.html.

The international symposium ***Medieval Copper, Bronze and Brass – Dinant-Namur 2014: History, Archaeology and Archaeometry of the Production of Brass, Bronze and other Copper alloy Objects in Medieval Europe (12th-16th centuries)***, will be held from May 15-17, 2014,

in Dinant and Namur, Wallonia Region, Belgium. This colloquium is organized within the framework of the year of archeology in Wallonia: Archéo2014. Organizing institutions include The Public Service of Wallonia (SPW), The French National Institute for Preventive Archaeology (INRAP), The Mosan Medieval Heritage Centre (MPMM), and the Regional Cultural Centre at Dinant (CCRD).

Copper and its alloys, bronze and brass with varying concentrations of lead, have been used for a long time for making useful and decorative objects. The steep economic and demographic growth of the Middle Ages however abruptly changed the copper-based industries and the market for their products. On the raw materials side, the search for ores intensified. Metals such as copper, tin and lead became more accessible and more affordable. Both the labor force and a strong demand for manufactured goods were concentrated in towns where guilds were being set up and trades were becoming organized. Workshops adapted to a rapidly growing market through specialization, division of work and rationalization of techniques, as well as offering cheaper goods. There was a gradual increase in the use of copper and its alloys for making everyday objects – examples include candlesticks, dress accessories such as sequins, decorative studs and belt buckles, but also domestic vessels such as, cauldrons, skillets, ewers, basins and other pots and pans for the kitchen or the dining table. In addition to these common objects, more exceptional ones testify to the diversity of the use of copper and its alloys for high class objects, both secular and liturgical. Made-to-order masterpieces included aquamanilia, candelabra for churches, lecterns or even more colossal works of art such as columns, gates, baptisteries, fountains, funeral monuments and, of course, bells. Copper is equally sought after for hand-crafted products such as boilers for baths or dyers, weighing scales and other measuring instruments. Later in the Middle Ages copper alloys were used for artillery, clock making, and also as brass wire in the paper industry. Finally, copper is a component of the main alloys used in early medieval coinage.

This symposium is organized in a town whose main medieval activity was focused on the metallurgy of copper and brass. Its aim is to present current knowledge of not only the medieval products, techniques, workshops and labor force, but also of the market and trade in these products. This symposium will present the research carried out in history and archaeology of materials and processes with, in some cases, the support of scientific studies.

The planned Thematic Sessions are:

1. Raw Materials and Supplies
   - Copper, zinc ore (calamine), tin and lead: mines and beneficiation, trade in raw materials and semi-finished products, supply to towns, economy, etc.,
   - Fuel: charcoal and coal,
   - Refractory ceramics: crucibles, molds, furnaces.
2. Craftsmen and Workshops
   - Sociology of craftsmen, crafts and documentary sources, such as workshop inventories, deeds, charters and financial accounts,
   - Topography: workshops in towns,
   - Archaeological excavations of workshops.
3. Techniques
   - Alloying, especially brass making,
   - Casting, foundry work,
   - Plastic deformation: smithing, wire drawing,
   - Smelting and melting (alloy making) furnaces,
   - Archaeological experiments.
4. Products and Trade
   - Trade in finished products,
   - Dissemination and circulation of products,
   - Chrono-typological studies (vessels, liturgical objects, dress accessories, exceptional products, artillery, etc.),
   - Relationships between foundries and their patrons,
   - Links with other materials such as ceramics and iron.

The first call for abstracts is out and the deadline for submissions is September 30, 2013. Abstracts can be written in either French or English, with a title and contact details of the main author, and should be sent by email (Word document) with 2500 characters maximum, including spaces, to laiton.mosan@gmail.com. These abstracts will be submitted to the scientific committee. Presentations may be made in either French or English; simultaneous translation will be provided at the conference. Abstracts of selected papers will be available at http://www.laitonmosan.org, as soon as the program is finalized. Proceedings will be published, in French or in English, after the symposium by the Service public de Wallonie – Département du patrimoine in the collection *Études et documents – Série archéologie*.

Previous Meetings and Conferences

The ***Historical Metallurgy Society (HMS)*** held its ***50th Anniversary Conference*** on June 14-16, 2013, at the Quakers Friends House, Euston, and the Institute of Archaeology, UCL, London, England. This international academic conference is the culmination of a series of events marking the 50th Anniversary of the Historical

Metallurgy Society and provided a high-level 'state of the art' profile of current and future developments in the various disciplines which HMS represents. The first day of the conference began with a few introductory remarks and quickly moved into oral presentations. Papers in the first thematic session, "Origin of Metallurgy", included "The emergence of archaeometallurgy through the second half of the 20th century" (Paul Craddock), "Prehistoric copper metallurgy in the Italian Eastern Alps: recent results" (Anna Addis, I. Angelini, Gilberto Artioli, P. Nimis), "The Origins of Metallurgy: a look under the microscope" (Miljana Radivojević), "Technological aspects of the earliest metallurgy in France: "Furnaces" and slags from La Capitelle du Broum (Péret)" (Paul Ambert, Marie Laroche, Valentina Figueroa, Salvador Rovira), "The beginnings of metal production in Britain: new light on the exploitation of ores, from the archaeological and dating perspective" (Simon Timberlake, Peter Marshall, Alan Williams), "Origins of Metallurgy: An Anthropological Perspective" (Ann Feuerbach), "The copper axes hoard of Khirbet al-Batrawy (Jordan), and the role of metal in the urban rise of 3rd millennium BC Jordan" (Lorenzo Nigro), "Early Copper Metallurgy and Arsenical Copper Production at Çamlibel Tarlasi, Turkey, c. 3500 BC" (Loic Boscher, Thilo Rehren, Ulf-Dietrich Schoop, Lloyd Weeks, Eddy Faber), "The origins of an origin: the development of academic interest in the question of the origins of iron technology from the 12th to 19th centuries" (Joanna Palermo), and "Between autochthony and allochthony in Southeast Asia's historical trajectory from the Terminal Neolithic to Full State Formation, c. 1000 BC to c. 500 AD" (Oli Pryce). The first day closed with the HMS general meeting, an anniversary retrospection and prospection presentation, and a wine reception.

Second day presentations, within the thematic session "The Southern Continents", included "The origins of iron production in Africa: reconsidering Meroe" (Jane Humphris, Brigitte Cech, Thilo Rehren. Dana Drake Rosenstein), "Systematic Slag Evidence for (Secondary) Carbon-rich Steel Production from Mbozi, southern Tanzania" (Edwinus Chrisantus Lyaya), "Technological expertise: fiercely protected or freely shared? Networks of knowledge in the iron industries of east Africa" (Louise Iles), "The Muslim trans-Saharan copper trade: a reappraisal based on new data" (Laurence Garenne-Marot, Benoît Mille), "Prehistoric production of Copper: a Comparative Approach between French Alps at the beginning of the Bronze Age and Atacama Desert in Chile during the Late pre-Hispanic period" (Benoit Mille, Diego Salazar, Catherine Perlès, Valentina Figueroa, Laurent Carozza, José Berenguer, David Bourgarit, Paulina Corrales, Albane Burens-Carozza, Pierre Rostan), "Archaeometallurgy of platinum-gold in Pre-Hispanic South America: sintering technologies" (Jairo Escobar, Nohora Bustamante), "Metallurgy of gold in the pre-Hispanic Quimbaya treasure" (Carolina Gutiérrez Neira, A. Perea, A. Verde, P. Fernadez Esquivel, A. Climent-Font, A. Zucchiatti, S. Rovira-Llorens, J.L. Ruvalcaba-Sil), "Reverberatory Furnaces in the Puna of Jujuy, Argentina, during colonial times (end of 16th to beginning of 19th centuries). Between Europe and America" (Carlos I. Angiorama, M. Florencia Becerra), and "The colour of wax: Technology, composition and context in Muisca goldwork (Colombia, AD 600-1800)" (Marcos Martinón-Torres, María Alicia Uribe). Also on the second day, the session "The Northern Continents" included "Session introduction" (Justine Bayley, David Bourgarit), "Mildenhall and Derrynaflan: a study in two contrasting hoards" (Janet Lang), "The Staffordshire Hoard: metal composition choices of the Anglo-Saxon goldsmith" (Eleanor Blakelock, Aude Mongiatti, Duncan Hook), "Colonization and Silver Metallurgy in Iberia during the 1st Millennium BCE" (Mercedes Murillo-Barroso, Ignacio Montero-Ruiz), "How were gold and silver smelted in the historical period of China? A case study of gold/silver smelting sites in southern China" (Siran Liu, Thilo Rehren), and "An innovative metallurgical process in Iberia: liquation as a possible process for silver production in the Phoenician period" (Martina Renzi, S. Rovira Llorens, M. Hunt Ortiz, I. Montero Ruiz).

Presentations on the final day of the conference, which continued in the thematic session from the end of day two, included "Copper ingots from the southern Levant as indicators of diverse trade networking; A study of their chemical and isotopic composition and microstructure" (Naama Yahalom-Mack, E. Galili, I. Segal, A. Eliyahu-Behar, A. Shilstein, I. Finkelstein, S. Weiner), "A new approach to the identification of inter-regional connections in the Eastern Mediterranean during the third millennium BC" (Christina Clarke), "Metal and elites in Upper Mesopotamia - uniqueness or uniformity?" (Kristina A. Franke), "Tin bronze sheets: a millennium old material - forgotten – revived" (Jean-Marie Welter), "Montreal Metal Industries 1760 to 1910 - Cradle of Canadian Industry" (Hugh J. McQueen, Larry McNally), "Cort and the Jellicoes; fact and fallacy" (Jeremy Greenwood), "Innovation and Change in the Welsh Tinplate Industry" (Keith E. Morgan), and "The Iron and Steel Industry from the Founding of HMS to the Present" (Tim Smith). Presentations in the final session of the conference, "Future of Historical and Archaeological Metallurgy", consisted of "Early Metallurgy in the Central Mediterranean: Goals for the next decade" (Andrea Dolfini), "Production and distribution of iron in Southern Germany during the Iron Age" (Michael

Brauns, G. Gassmann, R. Schwab, G. Wieland), "The Steel Age: When and where did it begin, and how did it develop before the late 1st Millennium CE?" (Brian Gilmour), "Fragments through the smoke: The evolution of the bloomery furnace in Britain and Ireland" (Tim Young), "Provenancing and dating ferrous artefacts: an outcome of two decades of research" (Philippe Dillmann, Alexandre Disser, Stéphanie Leroy, Maxime L'Héritier, Sylvain Bauvais, Gaspard Pagès, Emmanuelle Delqué-Kolic, Enrique Vega), "Future of Archaeometallurgy" (Thilo Rehren), "Future of Historical Metallurgy" (Paul Belford), a closing discussion, and a closing speech by Eleanor Blakelock and Eddie Birch.

Posters were presented and available for review throughout conference, and included "Late Bronze Age Slags from Trentino (Italy): Interpretation of the Copper Smelting Model" (Anna Addis, I. Angelini, G. Artioli), "Casting in Context: Analysing the Social Settings of Bronze Artefact Production in Late Bronze Age Scandinavia" (Anna Sörman), "Early iron production in the southern Levant; analysis of production remains and objects" (Adi Eliyahu-Behar, Naama Yahalom-Mack, Yuval Gadot, Israel Finkelstein, Steve Weiner), "Ironmaking without the use of bellows" (Arne Espelund), "Anglo-Saxon goldsmithing workshop practices seen from the Staffordshire Hoard" (Aude Mongiatti, Susan La Niece), "The identification of tin oxide in crucible slag" (Frederik Rademakers, Thilo Rehren), "The History of Tin and Bronze in Anatolia" (Gülder Emre), "Microstructure observation on heat treatable high tin bronze bowls excavated at Japanese antiquities" (Takekazu Nagae, Yutaka Maebara, Hidehiro Sugiyama, Yasuji Shimizu, Haruhisa Mifune), "Cross-disciplinary methods applied to reassign the so-called "Guild necklace of the Dean of the silversmiths of Ghent"" (Laure Dorchy, Helena Wouters, Steven Saverwyns), "Ternary bronzes Cu-Sn-Pb in Prehistory: An experimental approach" (Salvador Rovira, Florian Balestro), "In Search of the Roots of Iron Production: Technological Choices in Late Bronze Age Copper Smelting in the Republic of Georgia" (Nathaniel Erb-Satullo, Brian Gilmour), "The Gold from Varna – An impetus for social development?" (Verena Leusch, E. Pernicka, R. Krauß), "New Research into Roman Metal Mining in Britain" (Simon Timberlake, Tim Mighall, Douglas Kidd), "Archaeometallurgy research of bronze turban circle from Iron Age" (Jiří Kmošek, Ing. Šárka Msallamová), "Conservation-restoration and investigation of the Early Iron Age Iron Sword" (Damir Doracic, Roland Schwaab, Hrvoje Potrebica), "Analysis of evidence of early colonial metallurgical research in North America" (Brent Lane, Ervin Walker Lane), "Metallurgy Beyond Technology: Metalworking Debris as Historical Evidence" (Elisa Maria Grassi), and "Elementary Analysis of Roman Enamelled Brooches in Gallia Belgica and Germania: Preliminary results" (Maxime Callewaert, Laurent Tholbecq, Helena Wouters). The complete conference program and abstracts can be found at the HMS website or at: http://hist-met.org/images/pdf/HMS_AGM_2013_AbstractBook.pdf The international conference ***Archéométrie CAEN 2013, XIX^{e} Colloque du GMPCA*** was held from April 22-26, 2013, at the Université de Caen Basse-Normandie, France. One of the conference themes, entitled "Restitution des échanges: de la production à la diffusion" [Return of the exchange: from production to distribution], include oral and poster presentations on archaeometallurgical topics. PDF copies of the programs can be found at the conference website: http://www.unicaen.fr/archeometrie2013/.

Oral presentations discussing metals and metallurgy comprised "Production of Bronze Age defensive armour in Eastern Europe: analyses and archaeological studies" (M. Mödlinger), "L'analyse des objets protohistoriques à base de cuivre de l'Ouest de la France: constitution d'une base de données pour la reconnaissance des signatures chimiques" (C. Le Carlier de Veslud, J.C. Le Bannier, C. Marcigny, M. Fily), "Colorando Auro : comprendre des recettes médiévales pour colorer l'argent doré" (A. C. Crabbé, M.-A. Languille, I. Vandendael, J. Hammons, G. Dewankel, H. Terryn, H. Wouters), "Le plomb : un marqueur des phases de construction en archéologie du bâti" (M. L'Heritier, A. Arles, A. Disser, B. Gratuze), "Investigating the provenance of iron products in the Iron Ages: comparison of trace element chemical and isotopic approaches" (S. Leroy, M. Brauns, S. Bauvais, G. Gasmann, R. Schwab, P. Dillmann), "Les activités sidérurgiques des habitats enclos gaulois en Basse-Normandie (France)" (N. Zaour, H. Lepaumier, P. Fluzin, M. Berranger), and "Un atelier sidérurgique au sein d'un établissement rural gallo-romain prospère du début du Ier siècle de notre ère : Touffréville, Calvados ; études archéométallurgiques" (M. Berranger, N. Coulthard, M. Demarest, N. Dieudonné-Glad, Ph. Fluzin).

Poster presentations discussing metals and metallurgy consisted of "Etude technologique des fibules émaillées romaines en Gaule Belgique et Germanies : résultats préliminaires" (M. Callewaert, L. Tholbecq, H. Wouters), "Characterization 'from manufacture to burial context' of some artefacts from Tintignac hoard (Corrèze, France)" (S. Campodonico, G. Ghiara, P. Piccardo, M. M. Carnasciali), "Neutron diffraction measures on celtic coins from northern Italy" (J. Corsi, A. Scherillo, F. Grazzi, F. Barello, A. Lo Giudice), "Ar.Chi.Min archaeology and chemistry for the ancient mining

heritage: a multidisciplinary project for the study of the mining area of colline metalifere (Toscana, Italy)" (L. Dallai, A. Donati, A. Bardi, S. Fanciulletti), "Influence des ajouts en forge à l'étude de la circulation du métal : récents apports de l'expérimentation archéologique" (A. Disser, S. Bauvais, E. Vega, M. Leroy, P. Merluzzo, M. Berranger, Ph. Dillmann), "The role of corrosion in the metallographic characterization of Iron Age objects" (G. Ghiara, S. Campodonico, P. Piccardo, M. M. Carnasciali), "Analyses métalliques de quinaires gaulois du trésor de Bassing (Moselle) par fluorescence X portable" (P.-M. Guihard, G. Querré, J.-D. Lafitte, L. Thomashausen), "Metallurgical study of iberian armament from *oppidum* of Giribaile (Spain)" (F.A. Corpas Iglesias, L. Pérez Villarejo, L.M.Gutiérrez Soler), "Provenance des objets en fer protohistorique en centre ouest Bretagne" (N. Jouanet-Aldous, C. Le Carlier), "Suivi de la fusion expérimentale de la galène de Melle (79) par microspectroscopie RAMAN" (F. Mercier, F. Téreygeol), "On the interaction of lead alloys with volatile organic compounds: the influence of antimony as alloying element" (P. Piccardo, G. Ghiara, S. Campodonico, C. Martini, P. Storme, V. Bongiorno), "Investigation of the chemical composition of the colchian gold articles of V^{e}-II^{e} CC.B.C. from Dzhantuch burial mound" (I. Saprykina, A. Skakov), "Le couplage des analyses élémentaires et isotopiques pour les études de provenance de l'argent" (G. Sarah, B. Gratuze, F. Téreygeol, C. Guerrot, M. Bompaire), "Saturation en fer des scories de réduction directe du minerai de fer : application à des ateliers des départements de la Mayenne et de la Sarthe" (F. Sarreste), "Recherches actuelles sur la métallurgie ancienne du fer au Pripiat (Bélarus)" (A. Konz, J. Schneeweiß), "Les interactions entre archéologues et géophysiciens sur la fouille de Castel-Minier (09), 2003 - 2011" (F. Téreygeol, J. Heckes, N. Florsch, M. Llubes), "Étude de la chaîne opératoire de fabrication du fer à Castel-Minier à partir de l'analyse in situ par XRF des scories de réduction et traitement statistique" (P. Dillmann, E. Vega, F. Téreygeol, C. Azemard, M. Berranger), and "Nouvelles analyses métalliques du dépôt de Blanot (Côte d'Or, France)" (T. Woreth, F. Cattin, M. Gabillot, I. M. Villa, S. Wirth).

The ***Timna Park International Conference "Mining for Copper: Environment, Culture and Copper in Antriquity"***, an international conference in memory of Professor Beno Rothenberg, was held April 22-25, 2013, at Timna, Israel. The four-day conference included fieldtrips to the well-known copper mining and smelting sites in the Timna Valley as well as commemorative and research presentations. The first partial day of the conference included a guided tour of sites in the Timna Valley, followed by three opening session presentations – "Rothenberg's legacy and the Timna International Conference" (Erez Ben-Yosef et al.), "Times to Remember: My Years of Collaboration with Beno Rothenberg" (Hans-Gert Bachmann), and "Cypriot copper production and trade in the 13th century BCE – a technological and economic success story from the Late Bronze Age" (Vasiliki Kassianidou) – and the day ended with an opening reception.

The second day saw a full slate of oral and poster presentations divided into several thematic sessions. Following a welcome address, presentations in the two morning sessions, "New Research at Timna and Related Issues, Parts A & B", consisted of "Beno Rothenberg and the Chronology of Copper Smelting at Timna" (Jim Muhly), "Investigations and meaning of prehistoric Faynan and Timna in archaeometallurgy" (Andreas Hauptmann), "Reconsidering Timna Site 39a without Site 39b" (John Merkel), "Excavations of the Sinai-Arabah Copper Age – Early Phase (Chalcolithic) Mine T in the Timna Valley" (Tim Shaw, Alexandra Drenka), "Food and culture in smelting sites: a view from Timna" (Lidar Sapir-Hen, Erez Ben-Yosef), "Egyptian Timna-reconsidered" (Uzi Avner), "Decorated and Plain Ceramic Wares and Beads from Recent Excavations in Timna, Site 2" (Tali Erikson-Gini), "Recent discoveries from the Timna Valley Survey" (Eli Cohen-Sasson), "Timna Chariots' Engraving - a reassessment" (Yuval Yekutieli), "The inscription of Ramessesempere in context" (Deborah Sweeney), "Transgendered Copper Mining in the Levant" (Laura Zucconi), and "The rabbis' knowledge of copper alloying is implicit in laws of purity and impurity" (Dan Levene). The first two afternoon sessions, "Copper and Trade in the Southern Levant, Parts A & B" comprised "Copper Trade and the Rise of the Settlement in the South Levant Deserts in the Early Bronze Age IV" (Mordechai Haiman), "Bronze chisel at Horvat Haluqim (central Negev Highlands) in a sequence of Late Bronze to Iron Age living floors" (Hendrik J. Bruins), "The Ashalim Site and Early Bronze Age copper production in the northern Arava" (Erez Ben-Yosef et al.), "Judah of iron vs. Israel of copper - the paradoxes of metal working development in the land of Israel" (Yulia Gottlieb), "Iron IIA Pottery from the Negev Highlands: Petrographic Investigation and Historical Implications" (Mario A.S. Martin), "The Late Chalcolithic copper hoard from Nahal Mishmar (Judean Desert, Israel) in a regional perspective" (Uri Davidovich), "Revisiting the Nahal Mishmar Hoard's place in the Chalcolithic Near East" (Aaron Shugar), "The location of Specialized Copper Production during the Chalcolithic Period as Evident from the Study of Production-Related Ceramics" (Yuval Goren), "Metal finds from Nahariyya Excavations" (Sari Kamil et al.), and "Copper ingots from the s. Levant as

indicators of diverse trade networking; a study of their chemical and isotopic composition and microstructure" (Naama Yahalom-Mack et al.), while the last afternoon session, "New Research at Faynan, Jordan and Related Issues", consisted of "Intensive Surveys, Large-Scale Excavation Strategies and Ancient Metallurgy in Faynan, Jordan" (Thomas E. Levy), "Toxic Metals in Humans in the Faynan Area" (Yigal Erel et al.), "Iron Age copper production: a study utilizing mining and smelting activities at Timna and the Fenan Valley" (Christine T. Chitwood), "The 'Araba Copper Industry in the Islamic Period: The View from Faynan" (Ian W.N. Jones), and "Nahal Tsafit; A Middle Timnian Site, ca. 4000 BC, on the Road from Feinan to Beersheva" (Steven A. Rosen). Posters from the second day consisted of "Archaeometallurgical research in the northern Hajjar mountains (Oman Peninsula) during the Iron Age (1250-300 BCE)" (Julie Goy et al.), "Timna Site 34: Applied Archaeomagnetic Experiment and Excavations" (Ilana Peters, Erez Ben-Yosef), "The Mysterious Copper Scroll" (Robert Feather), "Craft Workshops at Tel Dan" (Ben-Dov, Rachel), "Timna – a UNESCO Heritage Site?" (Yoni Shtern)

Paper presented in the first two morning sessions of the third day, "Ancient Copper Production Beyond the Southern Levant, Parts A & B", comprised "A Comparative Study of Cypriot Bronzes Dating to the Late Bronze and the Early Iron Age" (Andreas Charalambous), "King Herod and the Copper Mines of Cyprus" (Shimon Dar), "Looking Beyond the Levant: Configurations of Copper Production in the Late Bronze Age and Early Iron Age Southern Caucasus" (Nathaniel Erb-Satullo), "Production of copper at different scales in the Early Bronze Age Aegean" (Myrto Georgakopoulou), "The Great Orme Bronze Age Copper Mines in Wales: Ore to Metal Provenancing Opportunities" (R. Alan Williams), "Early Bronze Age refining of copper" (Christopher Davey), "Copper mining and smelting in the British Bronze Age – new evidence from mine sites including some re-analyses of dates and ore sources" (Simon Timberlake), "Experimental reconstruction of Bronze Age chalcopyrite smelting by employing traditional techniques from Nepal" (Gert Goldenberg et al.), "Ancient mining in gold-silver-copper deposits and metallurgical activity in Mavrokorfi area, Pangaeon mount (NE Greece)" (Markos Vaxevanopoulos et al.), "The role of copper tools in early Egyptian society: the case study of Tell el-Farkha copper objects assemblage" (Marcin Czarnowicz), and "Bronze production in Pi-Ramesse: Alloying technology and material use" (Frederik Rademakers et al.), while presentations in the third morning session, "Geology of the Arava Copper Ore Districts and Regional Tourism" consisted of "Stratigraphy, structure and copper mineralogy of the Timna Valley" (Michael Beyth et al.), "The differentiation of ancient copper from Timna and Faynan through stable Cu isotopes" (Moritz Jansen et al.), and "Copper and Environment in Timna as a platform for Earth Sciences, Archeology Study and Tourist Programs" (Hanan Ginat, Assaf Holzer). One afternoon session of presentations focusing on Nahal Amram, Israel, "New Research at Nahal Amram, Israel", included "Renewed Research in the Area of Nahal Amram, Southern Araba" (Uzi Avner et al.), "The Amram Valley, Israel: A survey of Underground Copper Mines" (Amos Frumkin et al.), "Evidence of floods in the Amram copper mines" (Hanan Ginat), "Volume and mass estimation of mine dumps and slag heaps using high-resolution terrestrial laser scans" (Sagi Filin et al.), "Detecting ancient copper mining shafts and depth of mine-dumps using geophysical methods: Nahal Amram and Timna, southern Arava" (Uri Bason), and "Compositional Analysis of Slags from Nahal Amram" (Sariel Shalev et al.), and was followed by a guided tour of Nahal Amram, and a Closing Reception. The final day of the conference consisted of a full-day guided tour of the Wadi Faynan Copper Ore District (Wadi Faynan, Jordan), led by Andreas Hauptmann, Thomas E. Levy, Mohammad Najjar, and Erez Ben-Yosef.

A PDF version of the conference program and abstracts can be found at: http://archaeology.tau.ac.il/wp-content/uploads/2013/04/Timna_Conference_Booklet_2013-s.pdf. The proceedings of this conference are currently being organized into a publication, to be produced by Tel Aviv University. The deadline for submission is October 31, 2013, and the expectation of the editors is for a timely release date for the final publication.

The ***UK Archaeological Science and Association of Environmental Archaeology Spring Conference 2013*** was held at Cardiff University (UK), from April 11-14, 2013. One session on the last day of the conference, "Materials: technologies and conservation (Inorganics/Metals)", included two papers of archaeometallurgical interest "Casting a wider net: portable X-ray Fluorescence and Anglo-Saxon nonferrous metalwork" (M. Nicholas), and "Quantifying post-excavation corrosion of archaeological iron to develop management strategies for long-term storage of site archives" (D.Watkins). The final conference program and abstracts for all papers can be found at: http://ukas2013.files.wordpress.com/2012/12/ukas-2013-abstract-booklet-final1.pdf.

The ***Society for American Archaeology 78th Annual Meeting*** was held from April 3-7, 2013, in Honolulu, Hawaii. Three sessions and numerous other papers covered topics on ancient mining, smelting and metal-working of various metals from across the globe. The three sessions with most or all papers dedicated to archaeometallurgy, were "Invention as a Process: Pyrotechnologies in Pre-Literate Societies", "Precolumbian Mining and Metallurgy", and Technology in Southwest China and Southeast Asia I: The Origins, Spread, and Development of Metal Production in Southwest China, Southeast Asia, and Beyond". Contributions to those sessions comprised "Inventing Metallurgy I: A Global Perspective" (Benjamin Roberts), "Inventing Metallurgy II: A Look through the Microscope Lens" (Miljana Radivojevic), "Inventing Technical Ceramics" (Thilo Rehren), "Between Ideas and Objects: The Doings of Invention in Pottery and Metallurgy" (Roger Doonan, Peter Hommel), "Invention or Innovation? Pyrotechnological Connections between Metallurgy, Glass, and Glazes" (Thomas Fenn), "Invention and Innovation in African Iron Smelting Technology" (David Killick), "Cast Iron Smelting in Early China: Archaeological Survey and Laboratory Simulation" (Wei Qian), "Invention of Silver Technology in the New World" (Carol Schultze), "Beyond the Gleam: A Multidisciplinary Study of Aztec Metallurgy" (Esteban Fernandez), "Comparative Study of Alloying Technology in Bronze Age North Chile and Central China" (Dongdong Li, Tao Li, Francisco Garrido, Wugan Luo), "A Portable XRF Investigation of Archaeological Materials from Two Inca Smelting Sites in Northern Chile's Atacama Desert" (Wugan Luo, Tao Li, Francisco Francisco, Dongdong Li), "Mining Camps and Economic Strategies in the Atacama Desert during the Inca Times" (Francisco Garrido, Tao Li, Dong Li, Wugan Luo), "Scientific Investigation of the Inca Archaeological Materials from Chile's Atacama Desert: An Experience with Portable XRF Analyzer for In-Situ Chemical Analysis" (Tao Li, Tao Li, Francisco Garrido, Dongdong Li, Wugan Luo), "Reconsidering Modes of Contact between the Northern Chinese Bronze Culture and Those of Southwest China – The Crescent-Shaped Exchange Belt Reconsidered" (Kazuo Miyamoto), "The Special Case of Yanyuan: Steppe Influences, Southern Contacts, and Local Particularities as Reflected in a Bronze Assemblage from Southwest Sichuan" (Anke Hein), "Chemical Compositions and Technological Traditions: A Study of Funerary Metal Artifacts from Samdzong (Upper Mustang, Nepal, ca. 400-600 C.E.)" (Giovanni Massa, Marcos Martinon-Torres, Mark Aldenderfer), "The timing, Nature, and Sociopolitical Dimensions of Early Bronze Metallurgy in Southeast China" (Francis Allard), "The Sanxingdui Hoards – Representatives of a Systematic Deposition Practice?" (Richard Ehrich), "Trade, Market-Exchange, and Iron Artifacts in the Xinanyi (Southwestern Barbarians) Societies" (WengCheong Lam), "The Emergence of Copper-base Metallurgy in Prehistoric Southeast Asia: Current Studies and Issues" (TzeHuey Chiou-Peng), "Where Did the Early Bronze Technology in Thailand Come from?" (Joyce White), "The Emergence of Metal Age in Taiwan and Its Relation with Southeast Asia" (Hsiao-chun Hung), "Bronze, Copper, and Gold from the Metal Age Sites of Sembiran and Pacung, Bali, Indonesia: Exchange and Local Production" (Ambra Calo), "Was the Lost-Wax Casting Practiced in the Bronze Age China? A Case Study of the Rim Openwork Appendage of the Bronze Zun-Pan Set in the Tomb of Marquis Yi of Zeng" (Peng Peng), and "Early Bronze Casting and Its Cultural Impact of the Prehistory in Northern Vietnam" (Masanari Nishimura).

Other papers pertaining to archaeometallurgy included "Metal Technology, Organization, and the Evolution of Long-Distance Trade in Anatolia" (Joseph Lehner), "New World Metallurgy: A Comparative Study of Copper Production in the South Central Andes and West Mexico" (Blanca Maldonado), "Metals under the Microscope: Use-Wear Analysis on Prehistoric Copper Alloy Objects" (Rachel Crellin, Andrea Dolfini), "Fusing Scissors, Paper, and Rock: An Archaeological Investigation of the Metallurgy, Text, and Masonry Histories at the Angkorian Khmer Complex of Preah Khan of Kompong Svay, Cambodia" (Mitch Hendrickson), "Time, Space and Place: The Potential of Time/Geography, Geophysical, and Geochemical Approaches for Capturing Experimental Engagement" (Jessica Slater, Brad Comeau), "Prehistoric Globalizing Processes in the Tao River Valley, Gansu, China" (Rowan Flad), "That Old Gold Mine Is Sitting on a Gold Mine: Preserving History in the Face of Active Industry" (Thomas Witt, Kathleen Corbett), "Studies of Iron Smelting Sites around Nanyang Basin during Warring States, Qin and Han Periods" (Zhen Qin), "PXRF for Compositional Analysis of Early American Metalware" (Kimberley Russell), "A Precolumbian Copper Smelting Furnace Studied by Mössbauer Spectroscopy and X-ray Diffraction" (Ursel Wagner, Frances M. Hayashida, Izumi Shimada, Werner Haeusler, Friedrich E. Wagner), "Hazardous Heritage: Assessing the Legacy of Abandoned Mines in Alaska's Fairbanks District" (Paul White, Patrick Martin, William Hedman), "Numismatic Evidence from Antioch for the Interaction of Europe and the East in the Crusader Period" (Alan Stahl), "Dry Run on a Dry Well: An Experimental Investigation of Sintashta Metallurgy" (Brad Comeau, Jessica Slater), "Transitional or Traditional? Technological Choice in Copper Production

at the Cusp of the Iron Age in the Southern Caucasus" (Nathaniel Erb-Satullo, Brian Gilmour, Nana Khakhutaishvili), "Chalcolithic Chiefdoms? Evaluation of the Evidence from County Clare, Ireland" (D. Gibson), "Cyber-Archaeology: The Future of the Past" (Thomas Levy), "Empire without a Voice: Phoenician Iron Metallurgy and Imperial Strategy at Carthage" (Brett Kaufman), "Several Roads Lead to Chichén Itzá: Tracing the Fabrication Histories of Metals Deposited in the Cenote Sagrado" (Bryan Cockrell, José Luis Ruvalcaba Sil, Edith Ortiz Díaz), and "With all Dips, Spurs, and Angles" (Judith Marvin, Rebecca Kellawan). A complete PDF copy of the final program (http://www.saa.org/AbouttheSociety/AnnualMeeting/2013Program/tabid/1498/Default.aspx) and abstracts (http://www.saa.org/AbouttheSociety/AnnualMeeting/Abstracts2013/tabid/1497/Default.aspx) can be downloaded.

The ***British Association for Near Eastern Archaeology (BANEA)*** held its 2013 Conference at the University of Cambridge, January 3-5, 2013. The conference was generally entitled **Metals and Colours**, although these terms really only applied to the keynote lecture on the evening of the 3rd and one main thematic session on the 4th. Archaeometallurgy papers of interest included the keynote lecture "Landscape, material culture, economy and personhood: and the place of metal in the world of the EBA Levant" (Graham Philip), and papers from the main thematic session such as "A preliminary analysis of the metal production at Hirbemerdon Tepe during the Middle Bronze Age" (M. Massimino), "Calling on Clay to Make Sense of Metal: Interpreting Three Late Cypriot Bronzes" (D. Knox), "No Iron for the Arabs!" (M. Young), "The role of colour in the development of arsenical copper alloy production and use" (L. Boscher), and "Tainted ores and the rise of metallurgy in western Eurasia" (M. Radivojevic). The website for the conference is at: http://www.banea.org/conference/, and the schedule of sessions and papers can be found at: http://www.banea.org/conference/wp-content/uploads/2012/01/BANEA-2013-Schedule.pdf.

The conference ***XIII Congreso Internacional Sobre Patrimonio Geológico y Minero, La Minería Sostenible: Patrimonio de Hoy y Del Mañana, XVII Sesión Científica de la SEDPGYM*** was held in Manresa, Catalonia, Spain, from September 20-23, 2012. The Sociedad Española para la Defensa del Patrimonio Geológico y Minero (SEDPGYM)

More information can be found at conference websites: www.sedpgym.org and patgeomine.epsem.upc.edu.

Web-Based Information

The ***Historical Metallurgy Society (HMS)*** has updated its newsletter and given it a new name as well. *The Crucible* (starting with Issue 81 [of the original series *HMS News*], Autumn 2012) is now available, and it is being edited and produced by a new crew in a new home as well. The Editor (Marcos Martinon-Torres) and Assistant Editors (Loic Boscher, Siran Liu, Matt Phelps and Miljana Radivojević), and the production location are now at the Institute of Archaeology, University College London. The first two issues, which include lots of color images, can be downloaded as PDF files at: http://hist-met.org/hmsnews81.pdf, and http://hist-met.org/images/pdf/hmsnews82.pdf.

The new editor also noted that under the new header - *The Crucible* - you will be able to find the usual range of news and project reports on a variety of issues; conference reports and announcements; and new sections including a "One Minute Interview" with well-known archaeometallurgists. They are keen to continue to receive your contributions in the form of news, reports and commentaries as well as suggestions to make *The Crucible* better. If you're not a member of HMS, do consider getting a subscription as a New Year treat: rates start from as little as 6 [British] pounds [£], and include two issues of the journal *Historical Metallurgy* per year as well as other perks. You can find further information at http://www.hist-met.org.

BOOK REVIEWS

David Hill, Associate Editor

***Sacred Darkness: A Global Perspective on the Ritual Use of Caves*.** Holley Moyes (editor), 2012. University Press of Colorado, Boulder. xvii + 410 pages, 75 figures, 26 tables, bibliography and index.

Reviewed by Myles R. Miller, Geo-Marine, Inc.

Sacred Darkness is an impressive and laudable compendium of archaeological, ethnographic, and cognitive studies of human ritual and religious practice conducted within caves or similar natural and constructed features. As described in the introduction, the edited volume represents the "first attempt to address directly the role of caves in ritual practice, myth, and worldview from a cross-cultural global perspective." As stated by Jean Clottes and Andrea Stone in their respective chapters on the Paleolithic and cross-cultural perspectives on cave ritual, if the placement of human burials within caves is

believed to be a form of ritual, then ritual performance within these natural features has an extraordinary time depth extending back at least 50,000 years.

The study of cave ritual occupies a nexus point of research concerns that includes ritual performance, landscape archaeology and ethnology, and neurological and cognitive models that attempt to explain the origins of religious experience and beliefs. The volume provides a comprehensive overview of cave ritual through a variety of archaeological and ethnographic case studies in addition to chapters outlining theoretical spatial approaches to the identification and interpretation of sacred places and ritual performance within caves.

The volume includes 29 contributions along with a concise introductory chapter by Holley Moyes. Moyes' introduction summarizes the various sections and contributions and provides an interesting historical overview of archaeological and popular media perceptions of caves and the people who occupied them under the subheading "The Iconic Cave Man." This section offers an intriguing proposition that our conception of human cave occupation as predominantly for shelter and habitation may be misleading, and this misconception has obscured a deeper understanding that cave occupations were primarily ritual in nature. The introduction also clarifies the definition of what a cave is and is not, the nature and importance of the dark zones within caves, and the potential for - and problems of - identifying ritual behavior in cave contexts.

The individual contributions are arranged within five sections or parts. As a whole, the contributions cover six continents and range in time from the Upper Paleolithic to contemporary ethnographic societies. The first two parts organize archaeological cave studies by Old World and New World contexts. Old World contexts include case studies in Europe, North Africa, the Levant, Tibet, and Australia. New World case studies are limited to North America with an emphasis on the eastern half of the United States, with Mesoamerica and the American Southwest providing broader geographic coverage. The third part deals with archaeological case studies of ritual in cave contexts. Many of the chapters in these sections are quite enlightening as they reveal the breadth and variety of material evidence for cave ritual across the globe.

Part Four provides a sample of ethnohistoric and contemporary ethnographic studies of cave ritual. This section illuminates how some forms of ritual may be difficult to detect using archaeological methods and approaches. The contributions to this section also draw attention to the fact that not all cave ritual was religious in nature and intent, but that caves also served as focal points for social forms of ritual action related to political power or identity formation and maintenance. The fifth and final part of the volume includes three synthetic and interpretive contributions. These contributions attempt to provide cross-cultural, spatial, and cognitive models for interpreting cave ritual. Of ultimate importance, the final section reviews behavioral and cognitive factors that may lead to a greater understanding of why caves and dark zones within caves have been of such profound cosmological significance to human individuals and societies throughout prehistory.

The volume is cleanly edited and well-organized. A minor complaint is that some photographs and figures in the reviewer's copy are slightly faded or fuzzy, but this minor problem does not detract from the overall presentation of the chapters. The main complaint of this reviewer is that, owing to the high number of contributions in the volume, some chapters are too short. This is not truly a criticism, but rather attests to the strength and interest of the chapters in that the reader wishes there was more to read.

Although excavations of habitation strata and features in caves have been conducted since the earliest period in the history of archaeology, the study of caves as sacred places and locations of ritual is a much more recent development. This volume does an admirable job of drawing together a representative collection of current research on cave ritual and, more critically, presents a cohesive statement that cave ritual is an important and worldwide aspect of human culture. *Sacred Darkness* is highly recommended to researchers interested in the archaeology and ethnology of landscapes, the origins of ritual and religious practice, and cognitive and neurological models of religious origins and expression – and of course by researchers interested in the human use of caves.

Archaeology and Apprenticeship: Body Knowledge, Identity, and Communities of Practice. Willeke Wendrich, editor. 2012. The University of Arizona Press, Tucson, Arizona.

Reviewed by Kari L. Schleher, Crow Canyon Archaeological Center, 23390 Road K, Cortez, Colorado, 81321, USA.

This volume explores the transmission of cultural knowledge, with a focus on the role of apprenticeship. In Chapter 1, Willeke Wendrich defines apprenticeship "as the transmission of culture through a formal or informal

teacher-pupil relation, as individuals or groups" (2012:2). Other authors explore a wide range of archaeological and modern examples of the apprenticeship process across the world. The volume builds on previous research on learning and cultural transmission in archaeology, including Jill Minar and Patricia Crown's special edition of the *Journal of Anthropological Research* (2001) and Stark et al. (2008).

This is a valuable contribution, especially for those attempting to reconstruct the social context of learning and transmission of knowledge in the past. Many of the examples presented are ideal case studies, with clear modern and archaeological examples that successfully illustrate how to reconstruct knowledge transmission, ranging from prehistoric hunter-gather societies to modern industrialized contexts. These examples provide insight to researchers working in a variety of regions and trying to reconstruct the social context of learning the past.

Chapters 2 through 4 focus on the social context of learning and producer agency. In Chapter 2, Helene Wallaert examines variation in the pottery making apprenticeship process in New Mexico pueblos and in northern Cameroon villages. Although apprenticeship in both contexts is complex, similarities include a long period of learning and a focus on symbolic and social conventions more than technological demands. In Chapter 3, John Creese explores the differences in microvariables, often used to identify individuals in the archaeological record, as produced by students in an experimental study. Students in two experimental learning groups - social pressure and individualist - exhibited patterns dependent on the social context of learning, suggesting that archaeologists need to focus on this context as well as on individual attributes when trying to identify production groups or individuals in the past. In Chapter 4, Harald Hogseth traces the transmission of knowledge by Norwegian carpenters from the present into the past by studying tool marks and timber selection.

Environmental aspects of learning are major themes in Chapters 5 and 6. In Chapter 5, Simon Holdaway and Harry Allen explore the differences in practical and ritual training in Australian Aborigine society. They find informal learning is characteristic of practical training, but more formalized training is characteristic of ritual knowledge. Both types of training are tied to the environment. In Chapter 6, Marcy Rockman discusses ways in which hunter-gathers learn about their environment, including how different types of environmental knowledge (locational, limitation, and social) are acquired.

Chapters 7-10 and 13 address traces of apprenticeship in the archaeological record. In Chapter 7, S. Brooke Milne outlines expectations and archaeological evidence for identifying novice flintknappers in the past. Milne identifies novice flintknappers in the Canadian Arctic within the Paleo-Eskimo archaeological record. Novice material signatures are localized near raw material sources and are not found at areas more distant to these sources. In Chapter 8, Kathlyn Cooney uses a collection of ancient Egyptian ostraca to explore skill acquisition by draftsmen in ancient Egypt. In Chapter 9, Eleni Hasaki evaluates primary and secondary sources to reconstruct facets of the apprenticeship process for craftsmen in ancient Greece. In Chapter 10, Marilyn Kelly-Buccellati addresses transmission of knowledge in ancient Mesopotamia, both directly from a master to an apprentice and the use of emulation and experimentation to learn directly from a product.

In Chapter 11, Heather M.-L. Miller explores how apprentices learn and the types of learning typically involved in an apprenticeship. Miller uses examples from the modern educational system, with a focus on archaeological lab classes and experimentation. In Chapter 12, Lise Bender Jorgensen explores the vocabularies associated with theoretical and practical knowledge. She argues that developing a vocabulary to describe practical knowledge or skill is essential in the transmission of this type of knowledge. In Chapter 13, Wendrich summarizes the volume with some practical considerations for evaluating knowledge transfer in the archaeological record.

UPCOMING CONFERENCES

Rachel S. Popelka-Filcoff , Associate Editor

2013

5-6 October. Australasian Society for Historical Archaeology (ASHA), Paramatta, NSW Australia. General information: http://www.asha.org.au/2013-conference-sessions-and-program/

2014

19-24 March. REHAB 2014 International Conference on Preservation, Maintenance and Rehabilitation of Historic Buildings and Structures. Tomar, Portugal. General information : http://rehab2014.greenlines-institute.org/

8-12 April. American Association of Physical Anthropologists Annual Meeting. Calgary, Alberta, Canada. General information: http://physanth.org/annual-meeting/83rd-annual-meeting-2014

15-17 May. Medieval copper, bronze and brass: "History, archaeology and archaeometry of the production of brass, bronze and other copper alloy objects in medieval Europe (12th-16th centuries)" – Dinant-Namur Belgium. General information: http://www.laitonmosan.org

19-23 May. International Symposium on Archaeometry (ISA). Los Angeles, CA, USA. General information: http://www.archaeometry2014.com
Abstract deadline December 16 2013.

25-28 June. New Zealand Archaeological Association Conference, Cambridge New Zealand. General information: http://www.nzarchaeology.org/cms/index.php?option=com_content&view=section&id=10&Itemid=60

10-12 September 2014. Synchrotron Radiation in Art and Archaeology. Paris, France. General information: http://www.sr2a-2014.org

[Due to the volume of submissions, space is limited and only an abbreviated list of upcoming conferences is available in this issue. The complete list of upcoming conferences can be found on the SAS Blog (http://socarchsci.blogspot.com/)]

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