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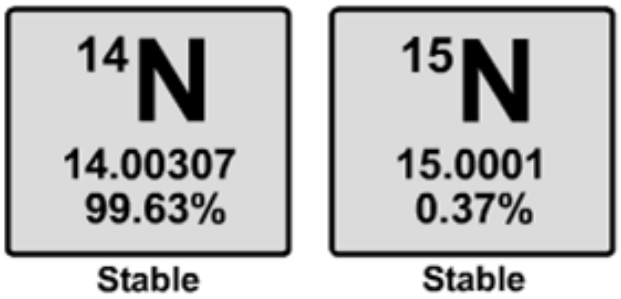


## THE INCREASE IN ISOTOPIC INVESTIGATIONS

Archaeological research using biochemical analyses of stable isotopes has a long and successful history. A quick search of my university's bibliographic database shows that the technique has been used to answer questions about human behavior for over 30 years (possibly beginning with an *American Antiquity* article by J.C. Vogel and N.J. van der Merwe in 1977).

The technology seems to have a promising future as well. At the 38th International Symposium on Archaeometry, held in Tampa, FL this past spring, many of the presentations and posters included data derived from various forms of isotopic investigation (from tracing the movement of people to dietary reconstruction to sourcing glass and metal). A quick count of the final program shows 31 titles that contained the words "isotope" or "isotopic" and there were certainly more that referenced the technique in the text of the presentation. This number was probably inflated beyond that of a typical conference due to the presence of Robert Tykot's special session about the isotopic analysis of human remains, but the prevalence of isotopic studies currently being conducted appears to be at a remarkable level.

Further evidence for the increased role and relevance of isotope analysis comes from the nominees for the R. E. Taylor Poster Award presented to the best student poster from that symposium. The winner was Erika K. Nitsch's research on "Quantifying Changes in Fish Consumption in Roman and Early Medieval Italy Using Stable Isotope Analysis." Not coincidentally, the two honorable mentions (given to Bridget Alex and Ian Scharlotta) also focused on the use of isotopes in answering diverse questions. I sense a pattern of peer pressure in the chemistry labs – everybody is doing it. Take a look at more isotopic work in the sections of this current issue concerning Archaeological Ceramics and Archaeometallurgy.

There are, of course, caveats on stable isotope analysis, just as there are on any tool or technique. Materials are vulnerable to post-depositional diagenesis, and thus more research needs to be done to recognize changes. Currently, most analysis on the organic compounds providing evidence of past dietary behavior is done using only a handful of isotopes. As a result, there is limit to ability to identify specific types of food consumed. Other isotopes, however, are being tested for their potential application. Most importantly, we need to recognize that the material used for many of the investigations determining past lifeways or tracing locations of people during time is taken, in fact, from the bodies of those people. Samples of teeth, hair, and bones are destroyed in the process. While revised recovery techniques now include microsampling, there is always a detrimental impact on the human remains. This is a sensitive issue not only for many descendant communities but increasingly with practicing archaeologists as well.

*Jay VanderVeen, Editor*

## IN THIS ISSUE

## ANNOUNCEMENTS

Because of the volume of information submitted by the associate editors and contributors, the normal space for announcements and opportunities for employment, fellowships, and training is limited. Instead, please take the time to visit the SAS blog (http://socarchsci.blogspot.com/#uds-search-results) and the SAS wiki (http://sites.google.com/site/saswiki/) for all the latest news and positions.

# APPLICATION OF GIS, REMOTE SENSING, AND GEOMORPHOLOGY TO THE RECONSTRUCTION OF HABITATION IN NEOLITHIC THESSALY, GREECE

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The aim of this study is to highlight the contribution of different approaches such as GIS, Geomorphology, Remote Sensing and DEM analysis for the detection of Neolithic settlements and the modeling of habitation in the area of Thessaly - Greece.

The Neolithic settlement mud mounds in the area of Thessaly, Greece are called Magoules. They are low hills of 1-5 meters height and mean diameter 300 meters. The vast majority of Magoules are laid on Larisa basin and a smaller number is distributed in west Thessaly (Karditsa basin). Both of these plains consist of Quaternary alluvial deposits (Alexakis, 2009). The study involved detailed modeling of the Thessalian landscape. In order to achieve the goals of the research it was necessary to proceed with the topographic mapping of the settlements through the use of GPS, digitize 1:50,000 scale topographic and geological maps and construct a detailed archaeological and environmental database in SQL environment.

**Landscape Reconstruction**

Prior to the landscape reconstruction of Thessaly during different Neolithic periods, the reliability of the existing digital terrain model was evaluated compared to other digital elevation models, such as the 90m pixel size DEM from the Shuttle Radar Topography Mission (SRTM) and the 30m pixel size DEMs provided by ASTER images or constructed by the L1-A stereoscopic products (3N and 3B) of ASTER satellite. The results indicated that the RMSE for the DEM created through the digitization of the contour lines of the topographic maps was the lowest.

The two plains contain 181 out of the 342 known registered "magoules", stressing the important role of reconstruction of the relief of each basin during each Neolithic sub-period. Both geological (stratigraphic data from boreholes and past geomorphologic studies) and archaeological data were placed under consideration for achieving this task. A geological data base of 50 selected drill cores (based on the quality of data presented) was constructed out of a total of more than 400 drill cores that had been collected. The depth to the alluvial deposits was estimated based on the most reliable drill cores, whereas provision of the local relief was taken into account for a more accurate and absolute estimation of the alluvium deposits depths. Estimations of the alluvial deposits for the three main Neolithic sub-periods were obtained following Demitrack's assumption (for Larisa basin) about deposition rates (Demitrack, 1986): 5.5m for Late Neolithic, 6.5m for Middle Neolithic and 8.5m for Early Neolithic. Based on the above, the reduction of the drill core data concerning the alluvial deposits for the particular periods was based on the following algorithm:

$$X = (dy - y_{min}/(y_{max}-y_{min})) + y_{min'}$$

where X is the reduced depth of deposits (for the particular drill holes), dy is the current depth of deposits (from drill cores), $y_{min}$ is the minimum depth of deposits (within the basin from drill cores), $y_{max}$ is the maximum depth of deposits (within the basin from drill cores) and $y_{min'}$ is the minimum depth of deposits according to Demitrack. The above estimates were used for calculating (through a best fit line) a much more general equation for converting the current elevation to the corresponding alluvial depths (reconstructed DEMs) for each one of the three major Neolithic sub-periods. The above approximations were applied to the two alluvial basins and a separate reconstructed DEM for each basin and each Neolithic period was created.

The next step regarded the reconstruction of the micro-topography around the settlements. The data regarding the height of the settlements and the excavation information provided for Platia Magoula Zarkou (Van Andel *et al*, 1992) were statistically processed following a classification of magoules to 14 categories according to their habitation period. Finally, the changes of the coastline during the Neolithic periods were based on the results of the studies of Kampouroglou (1991) and Vouvalidis et al (2005). The reconstruction of ancient Lake Karla was also considered to be of major importance. During the Neolithic period, Lake Karla was at the SE of Larisa plain and its coastline continued to fluctuate during different periods until it was dried during the last century. Its reconstruction was based on the outline of its prehistoric extent by Grundmann (1937) and the spatial distribution of the settlements as they were recorded by the GPS survey (Fig. 1.).

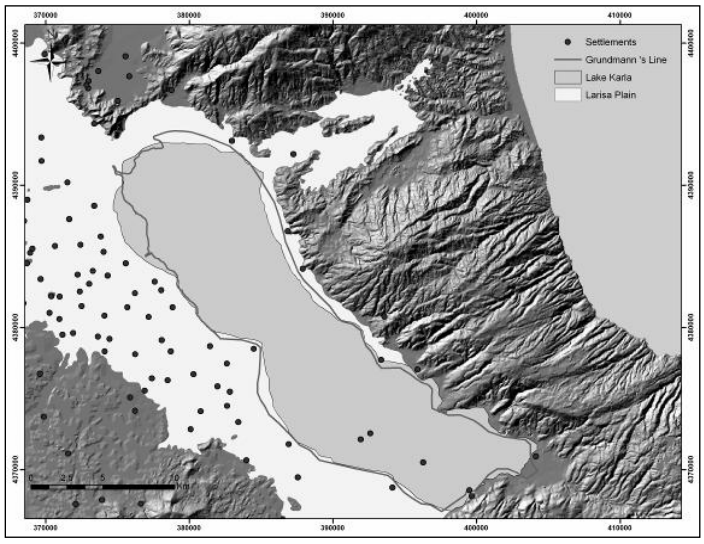


**Fig. 1**. The area of Lake Karla. The dots represent the Neolithic magoules around the lake. The solid line is the suggested lake level in the Neolithic period according to Grundmann (1937). The gray polygon is the suggested lake extent according to the recent study.

**Satellite Image Processing**

Satellite remote sensing was also employed to investigate the capability of space and aerial sensors and image processing techniques in the detection of Neolithic settlements in Thessaly. ASTER, Landsat ETM, Hyperion and Ikonos images were employed, together with aerial photos, having different area coverage and resolution.

Initially, masking of sea, clouds and snow took place and then image mosaics were created and the digital numbers were converted to reflectance values. Different methods of image analysis, such as creation of multiple RGB composites, radiometric enhancement, application of filters, principal component analysis, image fusion, spectral mixer utility, application of classification algorithms and vegetation indices, were used in order to extract the spectral attributes of magoules (Fig. 2).

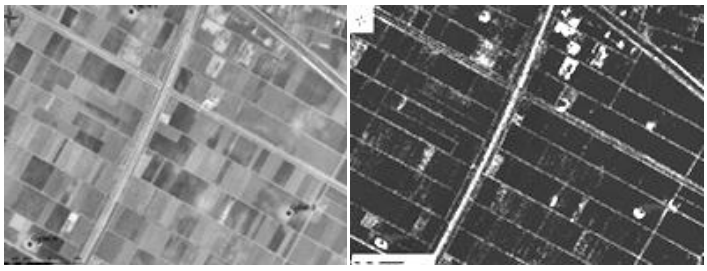

**Fig. 2.** Appearance of 3 settlements in the original IKONOS image (left) and the radiometrically enhanced image where three Neolithic settlements are highlighted (right). To the north of Galini-3 settlement, shown at the lower right of the image), another smaller candidate magoula is suggested.

**Analysis in GIS environment**

An extensive spatial analysis of the magoules was carried out in GIS environment using the reconstructed DEMs. Besides the extraction of statistics regarding the relation of settlements to the aspect, slope and relief height, the distance of settlements from natural resources was calculated by applying buffer zones around the quarries and the water springs (mainly springs existing on the mountainous areas). Watersheds were constructed and the distance of each settlement from its neighbor watershed was calculated. Density maps of the settlements were created for each Neolithic period. The calculation of the density of the settlements was accomplished through the use of a non-parametric Kernel technique. The spatial territorial limits of the settlements were explored using the Thiessen polygons analysis. The site catchment of Neolithic settlements was studied through least cost surface analysis. Cost surfaces contributed also to the exploration of communication between the different settlements (Fig. 3).

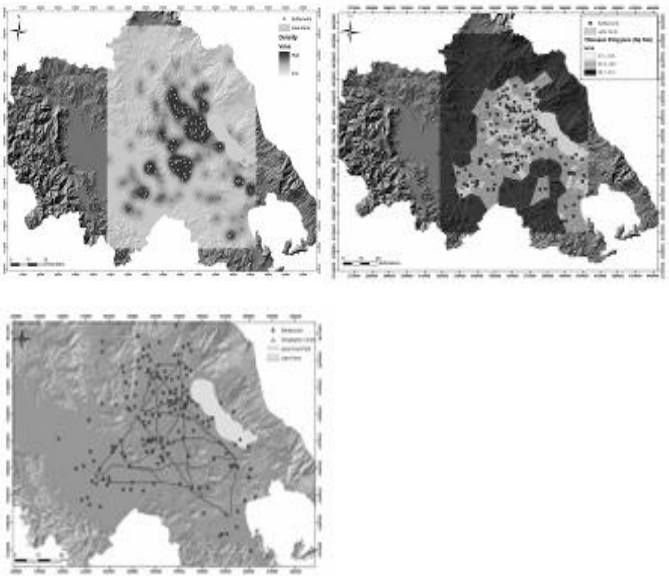

**Fig. 3.** Density maps (top left), Thiessen polygons (top right) and Least Cost path analysis (bottom) for Late Neolithic period.

Finally, GIS tools were employed to construct predictive models for each phase of the Neolithic period in an effort to locate areas that could possibly host similar type of settlements. The specific predictive models were based on the use of a multi-parametric spatial analysis method of geographic elements and other information (statistical, archaeological, a.o.). All the environmental factors (height, aspect, slope, distance from watersheds, distance from water springs, distance from quarries, geology, viewshed, distance from chert sources, least cost paths, a.o.) that could affected the choice of habitation in Neolithic Thessaly were statistically examined and certain weight factors were applied to each one of them. At a final stage, a fuzzy logic algorithm and a normalization equation were also applied for a better tuning of the results and for rating the final probability from 0 to 1.

**Application of filters to the Digital Elevation Models**

The final approach of the study involved the detection of Neolithic settlements through the analysis of the Digital Elevation Models (DEM) with the use of three different semi–automated methodologies. Three different DEMs (90m pixel size SRTM DEM, 30m ASTER DEM and a 20m DEM from the digitization of contours of topographic maps) were tested for their potential in the detection of the magoules.

The first methodology involved the estimation of the index of convexity (CI) to the three different DEMs according to Fry *et al.* (2004). The second methodology was related with the creation and application of customized filters similar to those used by Menze and Sherratt (2006). The third methodology followed the approach of Iwahashi and Kamiya (1995) for the extraction of the geometric signatures of DEMs through an integrated study of surface convexity, texture and slope gradient (Fig. 4.).

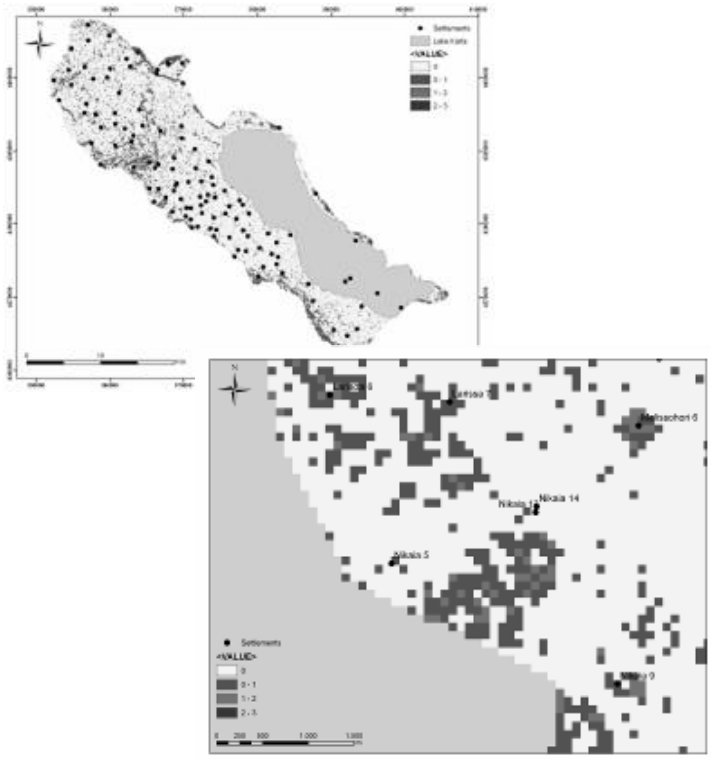

**Fig. 4.** Final detection map of magoules in the Larisa plain created following the approach of Iwahashi and Kamiya (1995) (top) and details of it (bottom).

**Conclusions**

The reconstruction of the Neolithic Thessaly landscape was based to both geological studies and archaeological evidence. Each one of the local environments of the Thessalian plain (alluvial plain, coastline, Lake Karla) was approached in a different way to model the macro-topography of the Neolithic period. The reconstructed DEMs proved to be much more effective than the current DEM for carrying out the spatial analyses required for the study of the settlement patterns of Neolithic Thessaly. Satellite image and DEM processing techniques proved to be really promising for the detection of Neolithic magoules, the latter especially when applied to the SRTM DEM. Spatial GIS analyses, including viewshed analysis, site catchment, least lost surfaces and distances to raw resources, density maps and clustering, suggest that the particular settlement patterns and distribution of sites was not random at all. Based on the combined results of the study, a weighted predictive model was constructed that could promote the further detection of Neolithic magoules.

**Acknowledgements**

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# ARCHAEOLOGICAL CERAMICS

*Charles C. Kolb, Associate Editor*

The column in this issue includes four topics: 1) Obituary: Thomas H. Charlton, 2) Reviews of Books on Archaeological Ceramics, 3) Historic Ceramic Publications, and 4) Previous Meeting.

**Obituary**

Thomas H. Charlton, 71, of Wellman, Iowa, USA, died suddenly Wednesday, June 2, 2010, in Iowa City. He was born August 17, 1938, in Scarborough, ON, Canada, and received a B.A. in Anthropology in 1960 from the University of Toronto and his Ph.D. in Anthropology from Tulane University in 1966; his dissertation was *Archaeological Settlement Patterns: An Interpretation*. Tom taught at the University of Toronto and at Grinnell College in Iowa before joining the University of Iowa's Department of Anthropology in 1967, became a full professor in 1980, and continued teaching until his passing. He collapsed on the Old Capitol Mall while on an errand for his field school at Plum Grove, Iowa which had only a few days left in the field season, and he was pronounced dead at the scene. Charlton's primary research focused on the archaeology of Mesoamerica and central Mexico, in particular. He was also involved in historical archaeology in Iowa and continued excavations at the Plum Grove Historic Site in Iowa City from 1974 until his passing.

Tom's archaeological career began with the British Honduras Project of the Royal Ontario Museum 1961 but in 1963 he began what was to become a lifelong career in the Basin of Mexico when he joined the Teotihuacan Valley Project directed by the late William T. Sanders. The early focus of that research was to conduct a comprehensive surface survey for all periods (Formative/Preclassic through Colonial) supplemented by selected excavations, devise a relative chronology based on the analysis of excavated ceramics, and map diachronic settlement patterns from the earliest times to the 1960s. His colleagues during those early years included Dick Diehl, Charlie Kolb, and Jeff Parsons. Tom focused on the Aztec period in the rural Teotihuacan Valley and later expanded his research into the Basin of Mexico and beyond. His archaeological and archival research and excavations in Postclassic Aztec and Colonial era sites resulted in many significant publications during more than 30 field seasons in Mexico. He was the coeditor with his long-time colleague Deborah Nichols of *The Archaeology of City-States: Cross Cultural Approaches* (Washington, DC: Smithsonian Institution Press, 1997) and he published in the major English and Spanish-language Mesoamerican journals more than 40 peer-reviewed articles in addition to 30 book chapters and 26 book reviews.

His ceramic analysis led to a refined chronology for the rural areas and a better understanding of craft specialization (including figurines, stone tools, and textiles), and settlement dynamics. For many years Tom and his wife, Cynthia Otis Charlton, conducted major research in the Otumba area of the Teotihuacan Valley, and recently began studies of the Classic Teotihuacan settlements and pottery in that region.

His colleagues wrote: "Tom Charlton knew more about Aztec ceramics than anyone else. He was always eager to learn more and to extend his understanding [and] he was generous with his knowledge…" And "most all of us know of his great trajectory as an archaeologist and mentor. His contributions to our knowledge of Teotihuacan and its hinterlands are golden, and he will be sorely missed." A full obituary will appear this fall in the journal *Ancient Mesoamerica* where Tom served on the editorial board. A symposium in his honor and other tributes are planned for the 2011 annual meeting of the Society for American Archaeology. "Sorely missed" doesn't begin to tell the story – he was my close friend and colleague for 47 years.

**Book Reviews**

***Interpreting Silent Artefacts: Petrographic Approaches to Archaeological Ceramics***, Patrick Sean Quinn (ed.), Oxford: Archaeopress, 2010. viii + 295 pages, 94 figures and photographs (including 26 maps), and 37 tables; ISBN-13: 978-1-905739-29-5; ISBN-10: 1-905739-29-X, £24.95 (paperback). Quinn, trained as a geologist and who specializes in thin section petrography, is Research Officer in Archaeological Ceramics in the Department of Archaeology at the University of Sheffield, UK. This peer-reviewed volume presents a range of petrographic case studies as applied to archaeological problems, primarily in the field of pottery analysis, i.e. ceramic petrography. This collection of 16 papers was inspired by the international meeting on "Petrography of Archaeological Material" held at the University of Sheffield, UK, 15-17 February 2008. Petrographic analysis involves using polarizing optical microscopy to examine microstructures and the compositions of rock and mineral inclusions in thin section, and has become a widely used technique within archaeological science. The results of these analyses are commonly embedded in regionally specific reports and research papers or relegated to appendices or obscure grey literature. The analytical method is central to the current volume which has a common theme in the application of petrographic analyses in different archaeological contexts.

The 16 contributions are preceded by a "Forward" (pp. v-viii) written by Ian K. Whitbread (University of Leicester). Three of his publications are frequently cited by the authors of the chapters in this volume: Whitbread (1986), The characterization of argillaceous inclusions in ceramic thin sections, *Archaeometry* 28:79-88; (1989), A proposal for the systematic description of thin sections towards the study of ancient ceramic technology, in Y. Maniatis (ed.), *Proceedings of the 25th International Symposium on Archaeometry, Athens, 1986*, Elsevier, Amsterdam, pp. 127-138; and (1995), *Greek Transport Amphorae: A Petrological and Archaeological Study*, Fitch Laboratory Occasional Paper 4, British School at Athens, London. The 39 authors in the Quinn volume come from six countries: Canada, n = 1; Greece, n = 5; Hungary, n = 5; Italy, n = 12; United Kingdom, n = 9; and United States, n = 7. This monograph has "Acknowledgments" by the editor but no list of

illustrations or list of tables and, alas, no index; each contribution has its own references and there are no abstracts. The 94 figures, including separate images of 233 thin sections and 8 SEM photomicrographs, are all in black-and-white. I next provide brief reviews of each chapter's contents.

"Henry Clifton Sorby (1826-1908) and the development of thin section petrography in Sheffield" by Noel Worley, British Gypsum, Geological, and Mining Service (pp. 1-9, 2 figures, 1 table, 18 references); there are 4 thin section photomicrographs. Readers are likely familiar with the pioneering petrographic studies conducted by Anna O. Shepard, Wayne M. Felts, and D. P. S. (David) Peacock but less so with Sorby, an English geologist whose microscopic studies of thin slices of rock earned him the title "father of microscopical petrography." Worley reviews Sorby's methods of thin section preparation, including the use of Canada balsam adhesive, and provides descriptions of several microscopes, among them an 1861 Smith and Beck model that featured a polarizing apparatus. Sorby analyzed thin sections of fossils and metamorphic rocks but not ceramics; nonetheless, he was a methodological innovator and deserves wider recognition. There is a typo: Nuttall, not Nuthall (p. 9).

Chapter 2, "The provenance potential of igneous glacial erratics in Anglo-Saxon ceramics from northern England" by Rob Ixer (University of Leicester) and Alan Vince (Alan Vince Archaeological Consultancy) (pp. 11-23, 4 figures, 3 tables, 10 references); there are 12 thin section photomicrographs and one map. The pottery in this region typically has angular, mainly igneous rock casts, in a relatively fine-grained paste. The authors review previous studies, materials (47 thin sections from ceramics from 13 sites), methods, the distribution of primary igneous sources, glacial drift and sources of igneous erratics, and igneous temper in specimens from Yorkshire. The 47 specimens were ascribed to one of three groups: Shap adamellite tempered, Scottish igneous tempered, or Leicestershire granite tempered. Most of the ceramics analyzed in this study had inclusions from a single igneous rock type and the authors conclude that the Anglo-Saxon igneous-tempered pottery was produced at several different locations in northeastern England.

The third contribution is "Technological insights into Bell-Beakers: A case study from the Mondego Plateau, Portugal" by Ana Jorge, University of Sheffield (pp. 25-46, 7 figures, 2 tables, 37 references); there are 18 thin section photomicrographs and one map. The ceramics studied are from three Portuguese sites dated to the second half of the third millennium BCE, a period of great social transformation in Western Europe. Jorge discusses the archaeological context and geological setting, the materials (a total of 169 samples from the three sites), methods, and analytical results. There are 30 fabric groups with 2-18 sherds each and a grouping of 22 "loners." There is a lengthy description and discussion of the groups and she concludes that the production of Beakers and their design is the result of improvisations, re-interpretations, innovations, and changes in fashion. The research presented in this chapter is drawn from her doctoral research (not cited in the references).

Chapter 4, "Indigenous tableware production during the Archaic period in western Sicily: New results from petrographic analysis" by Giuseppe Montana, Anna Maria Polito and Ioannis Iliopoulos (Montana and Polito are at Università degli Studi de Palermo, Iliopoulos is at the University of Patras) (pp. 47-63, 9 figures, 4 tables, 18 references); there are 18 thin section photomicrographs and two maps. The painted tableware ceramics with geometric motifs (phytomorphic, zoomorphic, and anthropomorphic patterns and achromatic examples) or, less frequently, decorated with incised and impressed patterns, were made in western Sicily during the $7^{th}$-$5^{th}$ centuries BCE. Potential loci of production which have the remains of kilns have been suggested. The authors characterize the geological background of the region, the materials (73 ceramics mostly from the $6^{th}$ century BCE from the sites of Entella, Adranone, and Saracento), and report their petrographic studies: Entella (16 of 17 clustered into one of two main paste groups), Adranone (26 specimens, most fit into one of three paste groups), and Saracento (30 thin sections, most fit into one of three paste groups sections). The loners and the petrography of two potential local clay sources (fired experimental briquettes were prepared and sectioned) are discussed. The MCA (Multiple Correspondence Analysis) correlation of clays and sherds is reported and demonstrated that this pottery class was produced at more than on center and was widely distributed throughout western and central Sicily. The Montana, Polito, Lavore, Caruso, and Trombi (2007) reference in Italian has several typographical errors (p. 63).

"Petrographic and microstratigraphic analysis of mortar-based building materials from the Temple of Venus, Pompeii" by Rebecca Piovesan (University of Padova), Emmanuele Curti (University of Basilicata), Celestino Grifa (University of Sabbio), Lara Maritan (University of Padova), and Claudio Mazzoli (University of Padova) (pp. 65-79, 5 figures, 4 tables, 13 references); there are 12 thin section photomicrographs and one map. Mortar-based building materials used in walls, floors, and hydraulic structures (conduits, wells, and cisterns) may change through time and the authors sought to identify changes that might have occurred in 127 samples during the archaeologically dated period from the end of $4^{th}$ century BCE to the $1^{st}$ century CE. Standards optical microscopy was employed and selected samples for the main petrographic groups were also analyzed by SEM. The authors detail difference in: 1) wall samples (arriccio [volcanic scoria-rich and clinopyroxene-rich variants], intonaco [with intonachino], cocciopesto, and marmorino variants); 2) floor samples (volcanic scoria-rich, ceramic-rich, and carbonatic classifications); and 3) hydraulic structures (volcanic scoria-rich and ceramic-rich variants). Raw materials (binders and aggregates) and technologies are also characterized.

A sixth contribution is "Provenance and production technology of Early Bronze Age pottery from a lake-dwelling settlement at Arquà Petrarca, Padova, Italy" by Lara Maritan, Claudio Mazzoli, Marta Tenconi, Giovanni Leonardi, and Stefano Boaro (all at the University of Padova (pp. 81-99, 8 figures, 4 tables, 27 references); there are 14 thin section photomicrographs and two maps. The archaeological site of Arquà Petraca (Veneto region of northeastern Italy) represents

the maximum eastern expansion of the Polada Culture (Early Bronze Age, second millennium BCE). The authors describe an archaeometric study of 50 sherds representing the main classes in the ceramic assemblage. All specimens were studied petrographically (following Whitbread 1986, 1989, 1995), mineralogically (using XRD on a Phillips X-Pert PRO diffractometer), and analyzed geochemically (XRF on a Phillips PW2400 spectrometer). There was considerable petrographic variability in the inclusions (mineral and lithological composition, grain size, roundness, and absolute and relatively frequencies) and the geochemical data showed compositional heterogeneity. The authors discuss provenance for each of the three recipe groups identified and report production technologies. They conclude that pottery production was not standardized and was likely family-based, while firing temperatures were 700-850° C. The absence of imported objects among the samples raises questions. There is typographical error: Geek = Greek (p. 99) in the Whitbread (1995) citation.

The next contribution is "Ceramic technology and social process in late Neolithic Hungary" by Attila Kreiter, György Szakmány (Field Service for Cultural Heritage, Budapest) and Miklós Kázmér (Eötvös Loránd University) (pp. 101-119, 7 figures, 2 tables, 37 references); there are 4 thin section photomicrographs and two maps. Late Neolithic Lengyel Culture pottery from three settlements in southern Hungary were studied and compared to determine possible similarities and differences in manufacturing technology. The thrust of the study is to examine social relationships between communities in the 5th millennium BCE in southwestern Hungary. Ceramic assemblages from the sites were examined and 46 specimens selected for thin section petrographic analysis following Whitbread (1986); the authors also discuss the geological characteristics of the region. Nine petrographic fabric groups were discerned and are reported in great detail; mugs, cups, bowls, and jars from the three sites belonged to one fabric group. The social interpretations follow Dobres's *Technology and Social Agency* (2000) with the citations to the publications of Dean Arnold (1985, 1993) Pru Rice (1981, 1991), Melissa Hagstrum (2001), and Cathy Costin (1993).

Chapter 8, "Early pottery technology and the formation of a technological tradition: The case of Theopetra Cave, Thessaly, Greece" by Areti Pentedeka and Anastasia Dimoula (both at Aristotle University of Thesoloniki) (pp, 121-138, 5 figures, 1 table, 36 references); there are 12 thin section photomicrographs and two maps. This cave has a continuous sequence of deposits from the Middle Paleolithic (ca. 50,000 BP) to the end of the Neolithic (ca. 3000 BCE), including the Neolithic to Early Neolithic transition and contains a rich Neolithic ceramic assemblage. This allowed the authors to document all phases of the Thessalian Neolithic, provide a case study on the beginnings of ceramic production, and characterize interregional contacts. The cave and excavations are described briefly and the ceramic assemblage recovered from undisturbed stratigraphy is reported. A total of 110 sherds representing all major wares were selected for thin sectioning and examined with a polarizing microscope, following Whitbread (1986, 1989, 1995); refiring tests were also conducted (700°, 900°, and 1050° C). Seven major fabric groups are documented and described; 92 of 110 specimens were locally produced and the pottery technology is detailed.

The subsequent contribution is "Fine-grained Middle Bronze Age polychrome ware from Crete: Combining petrographic and microstructural analysis" by Edward W. Faber (University of Nottingham), Peter M. Day (University of Sheffield) and Vassilis Kilikoglou (N.C.S.R 'Demokritos') (pp. 139-156. 6 figures, 2 tables, 37 references); there are 15 thin section and 8 SEM photomicrographs and two maps. The authors discuss previous petrographic and chemical studies conducted on Minoan ceramics from Crete and indicate that a goal of the current study is to investigate fine- and coarse-grained ceramics and determine if chemical analysis could differentiate between production groups on Crete. Middle Minoan polychrome ware (Kamares Ware) is a focus of this research; 208 specimens were selected from seven sites located in central and eastern Crete. The results from an integrated approach of petrographic, chemical (NAA) and microstructural analysis (SEM) are reported for four fabrics: two separate Palaikastro fine-grained fabrics, an unsourced very fine-grained calcareous fabric, and a Central Cretan fine-grained calcareous fabric. Microstructural analysis suggests firing temperatures in the 850-1050° C range and the authors' report three patterns showing that microstructural analyses (morphology and vitrification patterns) can complement petrography in differentiating between samples from multiple sources.

Chapter 10, "Pottery technology and regional exchange in Early Iron Age Crete" by Marie-Claude Boileau (British School at Athens), Anna Lucia d'Agata (Istituto du Studi sulle Civiltà dell'Egeo e del Vicino Oriente, CNR), and James Whitley (Cardiff University) (pp. 157-172, 5 figures, 57 references); there are 22 thin section photomicrographs and one map. A large-scale analytical study of coarse ware pottery from central Crete was designed to investigate ceramic technology and regional exchange networks. The study focused on two communities (Knossos and Sybrita) that allowed the authors to shed light on the extent of continuity in the production and consumption of coarse and cooking wares and determine local consumption and the degree to which coarse wares were being imported from other loci in Crete or elsewhere in the Aegean and the Mediterranean. Excavated ceramics were studied and grouped into fabrics based on the mineralogy of non-plastic inclusions, grain-size distribution, color, and optical activity of the groundmass. A petrographic analysis of 414 thin sections followed Whitbread's (1986, 1989, 1995) methodologies. The basic results are: Knossos (214 thin sections) with seven fabric groups and 23 two-sample fabrics and loners; Sybrita (200 thin sections) with seven fabric groups and 14 single-sample fabrics. Specific past recipes were used to produce particular vessel forms and there is evidence of clay mixing but not levigation. There is a great deal of continuity in the raw materials exploited and in clay paste preparation during the Early iron Age. The appearance and disappearance of certain fabric groups was also identified. the introduction of micaceous fabric coincides with external contacts in the late 9th century BCE. Currently underway is a second phase of the research focused on the

geochemistry of 12 clays and 203 samples of semi-coarse to semi-fine wares examined by NAA.

"The movement of Middle Bronze Age transport jars a provenance study based on petrographic and chemical analysis of Canaanite jars from Memphis, Egypt" by Mary Ownby and Janine Bourriau (both at University of Cambridge) (pp. 157-177, 5 figures, 49 references); there are 12 thin section photomicrographs and one map. Transport jars dated to the Middle Bronze Age (2000-1550 BCE) were studied to reveal contacts between Egypt and the Levant. Canaanite jars were made from a variety of clays and tempering materials and were predominantly wheel-thrown. McGovern (2000) published an NAA study of jars from the site of Tell el-Dab'a and Cohen-Weinberger and Goren (2004) identified 11 petrographic groups originating from the coast of Syria to the south to coast and inland areas of Palestine. In the current study, the authors selected 56 specimens representing all major fabric groups (a total of 1,000 sherds were available); procedures followed Whitbread (1989, 1995). In addition, 217 previously prepared thin sections were reanalyzed and compositional information derived from ICP-AES and ICP-MS and assessed using Principal Components Analysis, Hierarchical Cluster Analysis, K-means Cluster Analysis, and Discriminate Analysis. The four major compositional groups among the Middle Bronze Age Canaanite jar samples are discussed in detail. North-central coastal Lebanon was the primary region of production but Memphis, Egypt did not receive jars from all of the various production locations throughout the Levant. This is a splendid study and comes from a part of Owenby's doctoral study at Cambridge under Dr. Charles French.

The twelfth contribution is "Petrographic analysis of EB III ceramics from Tall al-'Umayri, Jordan: A re-evaluation of levels of production" by Stanley Klassen (University of Toronto) (pp. 189-210, 7 figures, 2 tables, 44 references); there are 12 thin section photomicrographs and two maps. The site is located on the northern edge of the Madaba Plain in central Jordan just east of the Dead Sea. Klassen discusses the excavation, regional geology, and previous research on the Early Bronze Age III ceramics and the analysis of 36 thin sections from Field Phase 4 in Field D; methods follow Whitbread (1986, 1995) and Freestone (1991). Five petrofabric groups were discerned: 1; 2 (with subgroups 2a, 2b, 2c, and 2d); 3 (with 3a and 3b subgroups); 4 (with subgroups 4a and 4b); and 5. The first four groups have calcareous clay matrices, some with bioclasts, and chert appears in the fine fraction in differing amounts; one petrofacies is nonlocal. The clays and tempers are local and 81% of the specimens analyzed had grog as the most common tempering agent. However, the mineralogy of the ceramics used as grog temper was not uniform. Crushed calcite is the second most common temper, occurring in 14% of his samples. Craft specialization is seen in the production of holemouth and flared rim jars, but there are no illustrations of these ceramic shapes.

Chapter 13 reports a "Comparison of volcaniclastic-tempered Inca imperial ceramics from Paria, Bolivia with potential sources" by Veronika Szilágyi (Hungarian Academy of Sciences) and György Szakmány (Eötvös Loránd University) (pp. 211-225, 6 figures, 1 table, 21 references); there are 22 thin section photomicrographs and one map. The authors discuss the chronology (1450-1535 CE) and extent of the Inca Empire along the Andean Cordillera of South America and the fact that imperial ceramics are widespread and found in many "every" settlement. (The preferred current spelling is Inka.) The ceramics that were studied were excavated in 2004-2006, and the site and regional geology characterized. Prior studies indicate that the main aplastics added to the clay paste were volcaniclastic rock fragments (20-35%). In the present evaluation, 93 sherds and 17 geological samples were analyzed and four petrographic groups discerned and discussed in detail: I/A (pumice), I/B (glass shard), I/C (volcanic rock), and I/D (minerals). Two probable raw material sources were located in the vicinity of the archaeological site and suitable raw materials for a majority of the pottery came from within 20-30 km of the site. The volcanic material (I/C) they conclude likely "had a special and valuable meaning to the Incas" (p. 223).

"Multi-village specialized craft production and the distribution of Hokoham Sedentary Period pottery, Tucson, Arizona" by James M. Heidke (Desert Archaeology, Inc, Tucson, AZ) (pp. 227-244, 4 figures, 3 tables, 69 references); there are 2 thin section photomicrographs and two maps. Tucson is spelled as "Tuscon" in the Table of Contents and chapter header (p. iv, 227). The author characterizes the Hohokam chronologically and spatially, and focuses on Middle Rincon phase ceramics (1000-1100 CE). Nearly 8,300 sherds from this phase from 38 sites have been characterized by binocular microscope, 159 have been point-counted (400 points per thin-section). Seven petrofacies were described and the authors seek to relate producers and consumers by examining distances between sites for Plain, Red-on-Brown, Rincon Red, and Rincon Polychrome ceramics. Settlement types and sizes are also related and a series of hypotheses presented and tested. Three of the 38 sites had specialists in pottery production and were located near some of the best clay sources in the region.

The subsequent contribution is "A preliminary evaluation of the Verde confederacy model: Testing expectations of pottery exchange in the central Arizona highlands" by Sophia E. Kelly, David R. Abbott, Gordon Moore, Christopher Watkins (all four at Arizona State University) and Caitlin Wichlacz (Washington State University) (pp. 245-266, 5 figures, 2 tables, 45 references); there are 9 thin section photomicrographs and three maps. The authors discuss the Verde Confederacy model in central Arizona, CE 1250-1300: a 45 km wide gap in settlement reflected mounting social tensions between populations in the irrigated river valleys of the Phoenix Basin and people inhabiting the rugged high country to the north. The regional prehistory, sites, and geology are described. To evaluate the model, the authors used qualitative petrographic analysis of 185 plainware pottery thin sections to characterize the mineralogy of sand tempers from a dozen sites in the north. A Joel JXA-8600 electron microprobe was employed on 18 specimens. Nine distinct sand tempers were delineated: Granite I, Granite II, Granite III, Granite IV, Granite V, Schist and Granite, Schist and Phyllite, Sherd Temper, and Volcanics. Perry Mesa plainwares were not locally produced and the authors use the results of their analyses to suggest an exchange

system paradigm (elaborated in Figure 5, p. 259). Socioeconomic models such as this can be used elsewhere. Nonetheless, further research to refine the model is discussed.

The final chapter is "Ceramic petrography and the reconstruction of hunter-gatherer craft technology in Late Prehistoric Southern California: by Patrick Quinn (University of Sheffield) and Margie Burton (San Diego Archaeological Center, San Diego, CA) (pp. 267-294, 9 figures, 4 tables, 69 references); there are 30 thin section photomicrographs and three maps. Plain, undecorated ceramics from western San Diego County, California are accessed in order to provide data on pottery production. Seven archaeological sites and samples (70 sherds) are discussed and are the analytical methods employed (following Whitbread 1996). There was a high degree of variability in the samples so that 18 fabric groups were documented on the basis of specific raw materials and manufacturing techniques; raw materials from the region were also studied. The authors are able to distinguish the technological steps involved in pottery manufacture (coiling predominates, with coil and scrape or paddle and anvil finishing) and variances in added tempers. Ethnographic and historic-era data on pottery-making is also employed in this study, so that sociocultural and behavioral information is related to the potters and settlements.

It is rare to find a volume on archaeological ceramics with content that focuses on thin-section petrographic analysis. Quinn is to be congratulated for organizing the 2008 conference and bringing these contributions together so quickly in this very fine volume. The 16 chapters cover a wide range of archaeological periods and geographic regions and examine key themes such as trade and exchange, the organization of production, craft technology, culture, and tradition.

Issues of trade and exchange are considered by Ixer and Vince, Montana *et al*., Boileau and colleagues, Ownby and Bourriau, Heidke, and Kelly and colleagues. We also see the reexamination of previously made thin sections. These contributions are by seasoned scholars and upcoming researchers from the UK, mainland Europe and North America, and the volume captures the scope of petrographic research being undertaken and highlights the importance of an interdisciplinary approach in articulating archaeological and theoretical concerns within material culture.

***Production Technology of Faience and Related Early Vitreous Materials***, M. S. Tite and M. J. Shortland, with contributions from I. Angelini, A. Boquillon, G. D. Hatton, A. Kaczmarczyk, B. McCarthy, Y. Maniatis, M. Panagiotaki, S. Paynter, and P. B. Vandiver, Monograph 72, Oxford: Oxford University School of Archaeology, 2008. 232 pp., 101 figures, 46 tables. ISBN-13: 978-1-905905-12-6, ISBN-10: 1-905905-12-2, $70.00. Mike Tite is at the Research Laboratory for Archaeology and the History of Art at the University of Oxford, UK, while Andrew Shortland is at the Centre for Archaeological and Forensic Analysis, Department of Materials and Medical Sciences, University of Cranfield, Shrivenham, UK. Nine other contributors (French, Italians, Greeks, and Americans) are co-authors and prepared materials for these essays. The goal of this study was to assemble in a single volume a synthesis of the results of many years of research into production technology of early vitreous materials. The subjects treated in this monograph include glazed steatite, faience, Egyptian blue and green frits, and glazed pottery and bricks from Egypt, the Near East, the Indus Valley and Europe spanning the period from their beginnings in the 5$^{th}$ millennium BCE through to the Roman period. For each subject, the authors present the available analytical and microstructural data which are then interpreted to provide information on the raw materials and methods of fabrication employed in their production. As appropriate, the raw materials used in the production of these materials are compared with those used in the production of contemporary glass. The volume has a "List of Figures" (p. 11), "List of Tables" (pp. 13-14), and a "Preface" (pp.15-16) preceding 10 chapters and an appendix There are conflated "References" (pp. 219-232) with 226 entries incorporating proper nouns and topics but, unfortunately, there is no index. Nearly every chapter (the exceptions are Chapters 1 and 10) has splendidly reproduced, high contrast and clear SEM photomicrographs

The "Introduction" (pp.17-22, 1 figure) by Tite and Shortland provides a review of experimental procedures (pp. 19-21), a discussion of terminology, and an outline of volume's contents. Readers are referred to major reference works and textbooks, for example, Shaw (2000) and Kemp (1989) for Egypt, Roaf (1990) and Roux (1992) on the Near East/Iraq; Kenoyer (1998) and Possehl (2002) on the Indus Valley; Cullen (2001) and Bennet (2007) on the Minoan and Mycenaean world; and Champion *et al*. (1997) and Collis (1997) on Bronze and Iron Age Europe. There is a useful comparative chronological table (Fig. 1.1, p. 8) and the uses of SEM for microstructural characterization and XRD for the identification of mineral phases. The second chapter, "Glazed Steatite" (pp. 23-26, 1 figure, 4 tables) was written with A. Bouquillon (Centre de recherché et de restauration des musées de France, Palais du Louvre, Paris). This chapter includes discussions about glazed steatite in Egypt, provides an historical overview, and has a review of raw materials and the methods of glazing. The Near East and Indus Valley are also considered and methods of glazing and raw materials reviewed for that region. Lastly, there is a discussion about steatite "faience" and a discussion of the materials from these three regions. The production of small glazed steatite beads began toward the end of the 5$^{th}$ millennium BCE, and the authors discuss the potash content of Egyptian steatite and faience, as well as the issue of production versus importation of glazed steatite into the Near East.

Chapter 3, "Raw Materials and Fabrication Methods Used in the Production of Faience" (pp. 37-55, 3 figures, 3 tables) was prepared with assistance of P. B. Vandiver (Department of Materials Science and Engineering, University of Arizona, Tucson). Five topics are considered: raw materials (quartz, alkali flux, lime, colorants, and provenience studies); forming methods; glazing methods (macroscopic and microstructural evidence is reviewed and compositional profiles are presented); methods of decoration; and variants of faience. There is an illuminated discussion on the use of soda-rich plant ash, natron, and mixed alkali flux. The authors also detail colorants: cobalt

manganese, iron, and lead antimonite and they consider the six varieties of faience as defined by Lucas and Harris (1962).

The fourth chapter, "Faience Production in Egypt" (pp. 57-91, 5 figures, 7 tables), written with A. Kaczmarczyk (Centre de recherché et de restauration des musées de France, Palais du Louvre, Paris) and P. B. Vandiver (Department of Materials Science and Engineering, University of Arizona, Tucson) begins with an historical interview followed by a discussion of raw materials (quartz, alkali flux and colorants are the subtopics) and microstructures and glazing methods (including information about copper, cobalt, and particulate colorants). The historical discussion includes Predynastic, Early Dynastic, Old Kingdom and First Intermediate, Middle Kingdom and Second Intermediate, New Kingdom, and Third Intermediate periods. Soda-rich plant ash and natron are reported as are replication experiments. The authors document four primary colorants: copper (seen in materials from Abydos and Amarna bowls, Shabti figures, and Memphis vases), cobalt, manganese oxide and iron oxide, and lead antimonite.

Chapter 5, "Faience Production in the Near East and the Indus Valley" (pp. 93-109, 2 figures, 5 tables) is authored by Tite and Shortland with A. Bouquillon, A. Kaczmarczyk and P. B. Vandiver). Most of this chapter is devoted to the Near East, including an historical overview, a discourse on the raw materials (considering quartz, alkali flux, and colorants), and a discussion of glazing methods. The section on the Indus Valley focuses on the faiences from the sites of Harappa and Nausharo. Faience appears in the Near East during the final phases of the Ubaid period (550-4000 BCE). The colorants include copper, cobalt, manganese and iron, chromite, and lead antimonite. Evidence from Nausharo, Baluchistan, demonstrates that artisans employed a range of raw materials and fabrication methods.

Y. Maniatis (Laboratory of Archaeometry, Institute of Materials, NCRS "Demokritos," Attikis, Greece), M. Panagiotaki (Department of Mediterranean Studies, University of the Aegean, Rhodes, Greece), and A. Kaczmarczyk (Centre de recherché et de restauration des musées de France, Palais du Louvre, Paris) collaborated with Tite and Shortland in preparing Chapter 6, "Faience Production in the Eastern Mediterranean" (pp. 111-128, 3 figures, 6 tables). They take a cultural and chronological approach in their presentation: Crete and the Greek mainland (incorporating an historical overview with presentations on Minoan and Mycenaean faiences), Cyprus (including Chalcolithic period and Bronze Age faiences), and Rhodes in the Archaic period). The authors assess evidence for production versus importation and review data on beads and occasional vessels from Crete and the Greek mainland. Distinctions in faience are seen in Minoan MM IIIA and in MM III B-LM I A specimens; colorant differences are noted in MM III A and MM III B-LM I A. The writers review evidence on quartz and alkali flux and three groups of Mycenaean beads (Groups A and B and Amenhotep III faience plaques). They observe that little is known about Rhodes during the Early and Middle Bronze Ages.

"Faience Production in Northern and Western Europe" (pp. 129-146, 2 figs, 3 tables) prepared with I. Angelini (Dipartimento di Geoscienze, Università degli Studi di Padova, Italy), takes a geographical approach, characterizing production in Russia, Slovakia, Poland, and Britain. A second section of the chapter focuses on Italy, France and Switzerland, notably the Early Bronze Age (2100-1700/1650 BC), Middle Bronze Age 1-2 (1700/1650-1450 BC), Middle Bronze Age 3, Recent Bronze Age (1450-1200 BC), Final Bronze Age (1200-900 BC), and Iron Age (900-450 BC). Interesting data on the Early Bronze Age (2100-1700 BCE) in Italy is presented, suggesting technology transfer, and a rationale for the use of mixed alkali flux being replaced by soda rich plant ash which, in turn, is superseded by mixed alkali flux appears related to the collapse of Mycenaean civilization in the 12$^{th}$ century BCE.

Chapter 8, "Production of Egyptian Blue and Green Frits" (pp. 147-185, 10 figs, 9 tables) is co-authored with G. D. Hatton (Research Laboratory for Archaeology and the History of Art at the University of Oxford). Following an historical overview, there are five major topics: The production of Egyptian blue and green frits (the blue and green frits and color parameters are reviewed); Egyptian blue and green frits from Egypt (detailing microstructures, chemical compositions and raw materials, and the production centers for these two frits); Egyptian blue frit from the Near East (microstructures and chemical compositions and raw materials are documented); Egyptian blue frits from the Aegean (detailing microstructures, chemical compositions and raw materials); and Egyptian blue frits from the Roman Empire (focusing on microstructures, chemical compositions and raw materials, as well as production centers). The frits were used in pigments and some small objects in Egypt (ca. 2900 BCE) and in the Aegean (19$^{th}$ century BCE). During the Roman period, a blue frit manufacturing center has been discovered at Memphis, Egypt. The authors also report chemical compositions of quartz, lime, copper, and alkali flux.

B. McCarthy (Department of Conservation and Scientific Research, Freer Gallery of Art and Alfred M. Sackler Gallery, Smithsonian Institution, Washington, DC) and S. Paynter (English Heritage Centre for Archaeology, Fort Cumberland, Portsmouth, UK) collaborated with Tite and Shortland to author Chapter 9, "Production of Glazed Pottery and Brickwork in the Near East" (pp. 187-198, 3 figures, 3 tables). There is an historical overview, a discussion of the beginnings of glazed clay ceramics, a review of Neo-Assyrian and Achaemenid period materials (notably, glazed clay ceramics and glazed quartz-based ceramics), and evidence from the Seleucid-Sassanian period. The focus of the research presented is on Neo-Assyrian to Achaemenid period glazed bricks, wall plaques, and vessels. The composition of glazes and bodies used in the production of pottery from Mesopotamia was essentially unchanged from the Seleucid through Sassanian period (14$^{th}$ century BCE to 637 CE).

Chapter 10, "Conclusions and Future Research" (pp. 199-213, 2 tables), treats three primary topics: Technological choices (with separate discussions on quartz, alkali flux, colorants, and methods of glazing); independent invention, technological

transfer and trade (reviewing evidence from three macroregions: Egypt, the Near East and the Indus Valley; Minoan Crete and the Mycenaean mainland; and northern and western Europe). Lastly, prospects for future work are described. The authors review colorants derived from copper, cobalt, manganese, and lead and calcium antimonates. They conclude that previous SEM analyses should now be supplemented with LA-ICP-MS analyses and that for colorant sources the research strategy should employ XRF, SEM, LA-ICP-MS, and lead isotope analyses. In addition, they suggest that more laboratory replication experiments should be undertaken to study the effects of weathering on original faience colors. Lastly, "Appendix A: Strontium, Oxygen and Neodymium Isotope Analysis of Ancient Glass" (pp. 215-218) presents detailed information on these three isotopes.

This is an important and masterful synthesis for researchers concerned with vitreous materials as it collects and assesses data for a wide range of materials, geographical regions and chronological periods. The authors have identified similarities and differences in production technology, as well as patterns of technological discovery, adoption, choices, and transfer. Tite and Shortland and their colleagues must be congratulated for assembling and making sense of this mass of data on faience and other vitreous products. Steady and firm editorial hands are evident. The volume will be a benchmark for research on these materials for decades to come. Readers may also wish to consult two online resources: Paul T. Nicholson's 2009 essay on "Faience Technology" in Willeke Wendrich (ed.), *UCLA Encyclopedia of Egyptology*, Los Angeles, http://escholarship.org/uc/item/9cs9x41z and Andrew Shortland's 2009 contribution "Glass Production" in Willeke Wendrich (ed.), *UCLA Encyclopedia of Egyptology*, Los Angeles, http://escholarship.org/uc/item/4jv3f665

***Atlas of the Assyrian Pottery of the Iron Age***, by Stefano Anastasio, European Centre for Upper Mesopotamian Studies, Subartu XXIV, Turnhout, Belgium: Brepols, 2010. 197 pp., 73 black-and-white illustrations, 2 color illustrations. ISBN-13: 978-2-503-53288-2, ISBN-10: 2-503-53288-8, €64,00, $93.00 (paperback). Stefano Anastasio is in charge of the Laboratory of Near Eastern Archaeology at the University of Siena. He also participates in the university's project "Building Archaeology in Jordan" at the site of Umm es-Sarab (Jordan). Anastasio has also studied and published Assyrian pottery assemblages from Qasr Shamamok (Iraq) and from Tell Barri and a survey in the Khabur region (Syria).

In the "Foreword" (pp. 1-2), Anastasio provides a context for the monograph. Iron Age Assyrian ceramics dated 11th to 6th centuries BCE were widely diffused and are related to the expansion of the first "real" Assyrian pottery of the Iron Age and are associated with the first "real empire" in Western Asia. From the 8th century BCE on, the Assyrian polity had a policy of establishing settlements in conquered regions which became provinces of the empire. In addition, the pottery is well described and characterized in terms of ceramic typology, and characterizing methods of manufacture and decoration. Hence, these ceramics hold a special place in Near Eastern archaeology. Over time, Assyrian ceramic types in these regions became mixed with local wares and the latter often disappeared from the archaeological record. In other areas Assyrian influence was weak and a sizeable local pottery tradition remained but in others the local manufacture was confined to the production of luxury or specialty wares. The author also notes that there are numerous preliminary reports on ceramics which often provide "limited information and, sometimes, inadequate illustrations" (p. 1). This atlas is based upon Anastasio's previous research (*Das Obere Haburtal in der Jazira zwischen dem 13. und dem 5. Jh. v. Chr: Die Keramik des Projektes 'Prospection archéologique du Haut-Khabour Occidental [Syrie de N.E]'*, 2007) which focused on the Iron Age pottery from archaeological sites located in Upper Mesopotamia. He prepared this atlas by creating a taxonomical classification of pottery from known Assyrian assemblages and adopting an analytical typology (described pp. 29-59) which led to the creation of a database categorizing a diagnostic repertory of vessels. The database includes the "best examples" of selected types from different sites and incorporates basic GIS information on distributions to "spot the diffusion of the pottery in Assyria and beyond" (p. 1), and published or original drawings were rendered using AutoCAD. The author's stated goal is to develop a global typology that can be applied to the whole Assyrian repertory in order to highlight the main types and to define their precise chronology and diffusion in the regions conquered by Assyrians.

The second chapter, "The Assyrian Pottery of the 'Iron Age': Definition, Chronology and Distribution" (pp. 3-27), begins with a definition of the "study subject" – the Assyrian geographical nucleus and basic definitions. The chronological periods are also distinguished: "Middle-", "Neo-", and "Post Assyrian" as are the "practical divisions" of the Iron Age: Iron Ages 0, 1, 2, 3 (pp. 3-5) prior to a lengthy section on his methodology for selecting diagnostic assemblages and the spatial distribution of diagnostic assemblages of the Assyrian pottery (pp. 6-27). Seven regions are described and 110 sites within characterized in tables and maps (the tables provide map designations and bibliographical citations). The regions and numbers of sites with are then detailed. Region 1: Assyria proper -- the "homeland" of pottery production with 49 sites (pp. 7-14), Region 2: Western Jazira with 33 sites (pp. 14-20), Region 3: Upper Tigris with 2 sites (pp. 20-21), Region 4: Central and Southern Mesopotamia with 19 sites (pp. 21-23), Region 5: Cilicia and Western Syria with 11 sites (pp. 23-24), Region 6: Palestine and Transjordan with 31 sites (pp. 24-26), and Region 7: Western with 5 sites Iran (p. 27).

The third chapter "The Assyrian Pottery of the Iron Age" (pp. 29-59) begins with a discussion of the main shapes of the pottery: shape and fabric following Orton, Tyers, and Vince, *Pottery in Archaeology* (Cambridge: Cambridge University Press, 1993). Anastasio considers shapes (open and closed vessels and others, pp. 29-31), the methodology for describing 'groups' and 'types' (small, medium, and large vessels, pp. 29-31), fabric (the overall characteristics of the materials from which the vessels were made, pp. 31-33), and other attributes such as surface treatment, decoration, and manufacture (the main decoration is incision, pp. 33-34), prior to the description of the types (pp. 34-59). Regarding fabric, Assyrian Iron Age

pottery "is notable for its remarkable degree of standardization and homogeneity" (p. 31). The major wares characterized include Common Ware, Standard Ware, Palace Ware, Tall Shaykh Hammad Ware, and Red Slip Ware.

Anastasio's "Conclusions" are rather brief (p. 61). The Bibliography (pp. 63-79) includes 333 items, in the main, in English language, but also in German and French. In a reference in *Anatolica* 20:193-226 (2000), Whright 2000 should be Wright (p. 79). The Plates (pp. 81-197) include Maps 1-5 (pp. 82-87) which depict a total of 151 sites through five chronological periods and an a atlas of diagnostic types 6-35 (pp. 88-147) with 191 AutoCAD-produced illustrations of drawings of vessels that author considers "ideal representations" of the typology presented in the third chapter. The Region 1 (Assyria proper) diagnostic assemblages 36-58 (pp. 148-194) are direct reproductions of 382 illustrations from publications that illustrate ceramics from that region. Lastly there are two colour plates numbered 59-60 (pp. 195-196) with 12 separate images.

This is a very specialized volume of interest primarily to scholars of Assyria and environs. The compilation of the ceramic types is valuable but there is a reliance on vessel shape and the definitions of fabric for the most part appear to be based on visual observations rather than thin section petrographic analyses. I was especially struck by the author's claim (p. 31) of the high degree of standardization and homogeneity and wished for more substantiation of this judgment. Nonetheless, the atlas does succeed in its goal to develop a global typology that could be applied to the whole Assyrian repertory, in order to highlight the main types and to define their precise chronology and diffusion in the various regions conquered by Assyrians.

***A Manual of Egyptian Pottery***, 4 vols., Anna Wodzińska. Boston, MA: Ancient Egyptian Research Associates. *A Manual of Egyptian Pottery, Vol. 1: Fayum A-Lower Egyptian Culture*, AERA Field Manual Series 1. xi + 200 pp., 515 drawings, 8 color plates (a total of 29 color illustrations), published June 15, 2009. ISBN-10: 097793702X, ISBN-13: 978-0977937028, $30.00 (paperbound and spiral-bound). *A Manual of Egyptian Pottery, Vol. 2: Naqada III-Middle Kingdom*, AERA Field Manual Series 2. ix + 224 pp., 486 drawings, 12 color plates (a total of 51 color illustrations), published June 15, 2009. ISBN-10: 0977937038, ISBN-13: 978-0977937035, $30.00 (paperbound and spiral-bound). *A Manual of Egyptian Pottery, Vol. 3: Second Intermediate through Late Period*, AERA Field Manual Series 3. x + 284 pp., 550 drawings, 14 color plates (a total of 58 color illustrations), published March 31, 2010. ISBN-10: 0982554400, ISBN-13: 978-0982554401, $40.00 (paperbound and spiral-bound). *A Manual of Egyptian Pottery, Vol. 4: Ptolemaic through Modern Period*, AERA Field Manual Series 4. x + 350 pp., 830 drawings, 16 color plates (a total of 73 color illustrations), published March 31, 2010. ISBN-10: 0982554427, ISBN-13: 978-0982554425, $45.00 (paperbound and spiral-bound).

Anna Wodzińska is a member of the faculty of the Institute of Archaeology, University of Warsaw, Poland, and is the Ceramics Team leader of the AERA (Ancient Egyptian Research Associates, Boston, Massachusetts, USA) Field School; she is particularly known for her research and publications on ceramics from Giza. In training both students and experienced scholars, Wodzińska developed four instructional manuals on Egyptian ceramics and AERA has now published and made them available for sale. The publisher states that this four-volume set is the first comprehensive guide to Egyptian pottery and will be valuable to students as well as experienced field archaeologists. The manuals are issued in paperback and spiral-bound versions; the latter with hard laminated covers and tabs, are designed especially for the field and lab. The four books cover in chronological succession 21 prehistoric and historic phases of Egyptian pottery production ranging from the earliest, Fayum A ceramics (5300 BCE) to contemporary pottery manufactured in Egypt today. Wodzińska acknowledges Dr. Mark Lehner for the idea of creating the manuals which are designed to be quick identification guides as well as starting points for more extensive research. As the author points out in her preface to each volume, these manuals are "essentially an illustrated list of ceramic types from different periods, meant to show only the most general trends in Egyptian ceramics" (p. viii) and, therefore, are not a comprehensive tabulation for each period. The more complex third and fourth volumes are edited by Wilma Wetterstrom and Alexandra Witsell.

All four volumes are divided into the following sections: 1) general information, 2) post-excavation procedures, 3) lists of terms and abbreviations, 4) a selected bibliography concerning technological aspects of Egyptian pottery, 5) descriptions of the clays, 6) pottery from all 21 Egyptian periods, 7) selected references relating to the ceramics described in the manual, and 8) color plates with captions. The first two volumes (published in 2009) differ in content from the last two (published in 2010), and I shall indicate these distinctions in this review. For all four volumes, the ceramic types for each period are illustrated with a line drawing, accompanied by a description that includes information on the ceramics' site locations, vessel shapes, materials, manufacturing techniques, surface treatments, references, and chronological affiliations. Information on pottery forming methods and the characterization of the resulting vessels and shapes are derived from Prudence Rice's *Pottery Analysis: A Sourcebook* (Chicago: University of Chicago Press, 1987) and D. Arnold, with P. Nicholson, C. Hope, and P. "Fascicle 1: Techniques and traditions of manufacture in the pottery of ancient Egypt," in Arnold, D., and Bourriau, J. (eds.), *An Introduction to Ancient Egyptian Pottery* (Deutsches Archäologisches Institut Abteilung Kairo 17, Verlag Philipp von Zabern, Mainz-am-Rhein, Germany, pp. 1-141, 1993). The Vienna System, which divides clays into Nile and Marl fabrics (with additional differentiations of groundmass and inclusions) and Wodzińska's descriptions of clays and fabrics follow H.-Å. Nordström and J. Bourriau (1993), "Fascicle 2: Ceramic technology: Clays and fabrics," in Arnold, D., and Bourriau, J. (eds.), *An Introduction to Ancient Egyptian Pottery* (Deutsches Archäologisches Institut Abteilung Kairo 17, Mainz-am-Rhein, Germany: Verlag

Philipp von Zabern, pp. 147-190, 1993). Vessel paste and fabric colors were determined using the Munsell Color System (p. 9, Table 2, in each volume), but these data or general equivalents are not reported in these manuals. However, color plates of representative ceramic types are included at the end of each volume to give a better sense of the color, composition, and surface treatment. Each volume also has a list of suggested readings as well as a bibliography for each period. The books begin with a list of abbreviations used in the text and the obligatory preface and acknowledgments.

The introductory chapters in the first two volumes include "Pottery Workshop" (p. 1), "Pottery Processing in the Field" (pp. 2-9, 3 tables), "Post-Excavation Studies" (p. 10), "Ceramic Glossary" (pp. 11-14, incorporating 10 major groupings and 10 references), and "Further Reading" which is a general selection or references on ceramics (pp. 15-20, with 103 entries). "Pottery Processing in the Field" provides the rationale she uses in classifying ceramics as well as how to draw and photograph the vessels, while "Post-Excavation Studies" focus on the essentials of database entry, data analysis, the study of the results, and publishing. Volumes three and four (published in 2010) have modified introductions based on early readers' suggestions (p. v) in each volume these manuals each include the same list of abbreviations, preface, and acknowledgments, but now with a useful general map of Egyptian Find Sites (p. x) for the ceramics discussed. The initial chapters in the third and fourth volumes are "Pottery Production and Processing in the Field" (pp. 1-11, 3 tables) and "Post Excavation Studies" (pp. 11-12), the "Ceramic Glossary" (pp. 13-17, organized as in the first two volumes and with the same 10 references), and "Further Reading" (pp. 18-23, with the same 103 references). The contents of the manuals diverge at this point, but all volumes have a separate, unique description of clays and fabrics (see specifics below).

The four narrative texts are clear and concise and the manuals are especially valuable to those who work with Egyptian ceramics, but point the way for other archaeologists who study pottery from other regions and seek to organize data for "comprehensive" regional treatises such as these. The volumes are a model of organization and scholarship and Wodzińska is to be congratulated for creating and making available this masterful treatment. Well earned kudos to a young and energetic scholar. Digitizing the pottery descriptions and illustrations, creating a searchable finding aid (such as Encoded Archival Description), and placing these materials on the Internet remain as potential future projects. The AERA Web site, where the Giza Occasional Papers are posted, would be an ideal site: http://www.aeraweb.org/.

***Journal of Roman Pottery Studies*** Volume 14, edited by Pamela V. Irving and Steven Willis, Oxford: Published by Oxbow Books for The Study Group for Romano-British Pottery, 2009, ISBN-13: 978-1-84217-324-4, ISBN-10: 1-84217-324-3, $48.00 (paperback). The *Journal of Roman Pottery Studies* began in 1986 as a modest 79-page publication with five articles; subsequent issues contained upwards of a dozen articles, but beginning with the seventh publication in 1997, there has been a trend toward whole number thematic issues. The Study Group for Romano-British Pottery (SGRP) is the sponsoring organization. Volume 14 contains eight papers on recent and current work on Roman pottery in Britain, with additional case studies from the Netherlands and Gaul. The contents are:

1. "Roman pottery from the Channel Tunnel Rail Link Section 1, Kent" by Paul Booth (pp. 1-26, 15 figures, 3 tables).
2. "Grey face jars in East Anglia: their possible connection with veteran settlement in Britain in the 2nd and early 3rd centuries" by Gillian Braithwaite (pp. 27-50, 11 figures).
3. "The Rowland's Castle Romano-British pottery industry" by Jonathan Dicks (pp. 51-66, 11 figures, 7 tables, color plate with 6 photomicrographs).
4. "Roman miniature pots and their contents from Frensham Common, Surrey" by David and Audrey Graham (pp. 67-70, 2 figures).
5. "Consuming the exotic: Carrot amphorae and dried fruit in early Roman Britain" by Daniel Howells (pp. 71-81, 7 figures, 5 tables).
6. "Terra sigillata from the Nijmegen *canabae* the *canabae* as a market" by Esther van der Linden (pp. 82-90, 4 figures, 1 table).
7. "A ceramic suspended cauldron found at Scole Romano-Celtic temple, Norfolk" by Alice Lyons (pp. 91-94, 4 figures).
8. "Pottery consumption c. AD 260-70 at the Roman coastal defence fort in Oudenberg, Northern Gaul" by Sofie Vanhoutte, Wouter Davies and Wim De Clercq (pp. 95-141, 37 figures, 4 tables, color plate with 18 photomicrographs

The SGRP is a recognized leader in the study of Roman ceramics and provides guidance to best practices in excavating and collection Roman wares. The group has also published *Research Frameworks for the Study of Roman Pottery* (collated and edited by Steven Willis, October 1997, http://www.sgrp.org/RFwork/001.htm) and *Guidelines for the Archiving of Roman Pottery* (edited by Margaret J. Darling, 1994, http://www.sgrp.org/Guidelines/Contents.htm) and is assisting English Heritage in the revision of the 1980 publication *Guidelines for the Processing and Publication of Roman Pottery from Excavations*. The SGRP also collaborates with specialist groups including "United Kingdom Ceramic Thin-Section Database" (1997, http://www.eng-h.gov.uk/archrev/rev96_7/certs.htm) and Minimum Standards for Project Designs and assessments. The group maintains an informative Internet site at http://www.sgrp.org

***The Mminggi Pottery Buildings of Han Dynasty China 206 BC-AD 220: Architectural Representations and Represented Architecture*** by Qinghua Guo, Sussex: Sussex Academic Press, 2010. 216 pp., 8 color and 356 black-and-white photographs (537 total images), 265 chapter endnotes; ISBN: 978-1-84519-321-8, £59.95/$99.95 (hardback). Qinghua Guo is Associate Professor in East Asian architecture at the University of Melbourne. She is also the author of *Chinese Architecture and Planning: Ideals, Methods, and Techniques* (Stuttgart and London: Edition Axel Menges 2006) and *The Structure of Chinese Timber Architecture: Twelfth Century Design Standards and Construction Principles* (Gothenburg, Sweden:

Chalmers University of Technology, School of Architecture, Department of Building Design, 1999).

*Mingqi* (Wade-Giles Romanization *ming-ch'i* ), translated as "visible objects," "spirit articles" or "bright utensils," are funerary furniture or objects placed in Chinese tombs to provide the deceased with the same material environment enjoyed while living, thereby assuring immortality. In her new book Quinghua Guo examines a particular type of *mingqi* - pottery buildings. An enormous number of burial objects have been unearthed from ancient tombs in archaeological excavations in China. These *mingqi* were made in all kinds of materials and in a broad range of forms, techniques and craftsmanship. Although *mingqi* were buried with the dead in nearly all historical periods, the custom was more popular in some periods than in others, notably in the Han (206 BCE-220 CE), Tang (618-907), and Ming (1368-1644) dynasties. Chinese builders used wood and earth in constructing the majority of their architecture, but especially for the Han and Tang, practically nothing survives of the cities and towns except a few remains of walls and terraces made of rammed earth because most of the architecture was fabricated from wood and other perishable materials. Therefore, much of what we know of early Chinese architecture and urban design comes from written texts, scant remains, tomb chamber designs, and *mingqi*. Archaeological excavations suggest that the Han Dynasty emperors esteemed multi-storied building and tall lookout towers up to 100 meters in height. Ceramic *mingqi* pieces made for funerary use replicated all manner of buildings, everyday objects used by the deceased, animals and humans. Pottery buildings of the Han dynasty vary greatly in structural details and in size. The striking realism of the pottery buildings suggests that they were modeled after actual buildings. They bring to life courtyard houses, manors, towers, granaries and pigsty-privies, as well as cooking ranges and well pavilions. These pottery buildings, excavated from sites throughout China, were previously little known or appreciated, but presently occupy a special place in Chinese culture since these objects preserve knowledge of antiquity and demonstrate the architectural quality and structural variety of the period.

The author identifies the typology of the pottery buildings they signify in terms of ontology and semiology, in order to provide a conceptual map for classification, and identifies building systems reflected by the *mingqi* to detect architectonic systems of the Han dynasty. The major features of this volume include: 1) Cross-disciplinary research - architectural study interlocking with archaeological study; 2) architectural study interlocking with graphic study - the pictorial records have been recognized as valuable and authentic materials for the study of Chinese antiquity by art historians; and 3) the Han pottery buildings are important architectural models from the ancient world, and are contrasted with wooden houses of Middle-Kingdom Egypt and brick buildings of the Minoan civilization on Crete, allowing some cross-cultural comparisons.

Structurally, the book has a "Table of Contents" and "Preface and Acknowledgments" (pp. v-viii) and an "Introduction: History and Research" (pp.1-14, 6 figures with 13 separate images, 16 endnotes), nine chapters, a "Glossary of Chinese Characters" (pp. 189-190), "Bibliography References cited and uncited)" (pp. 191-204)" and an "Index" (pp. 205-206). There are no separate lists of figures and each chapter has its own endnotes. The glossary identifies 118 characters and the references are divided into two groups: Chinese and Japanese Sources (a total of 258 accompanied by English translations) and Western Sources (a total of 58 in English but with one each in French and German). The index is rather brief, two pages with triple columns with listings that focus on nouns related to architectural descriptions. The black-and-white illustrations are small (none are full-page) and most lack dimensional scales.

The introductory essay begins with a discussion of sociocultural conditions, focusing on the function of *mingqi* and on patronage which the author believes is of prime importance in understanding the nature of Han pottery buildings. She notes that the earliest representations of earthenware buildings date to the Yangshao Culture (5000-3000 BCE), Dawenkou Culture (4300-2500 BCE), Majiayo Culture (3300-2050 BCE), and Gijia Culture (1000-1600 BCE) but it is unclear if these early house-models were specifically produced for funerary purposes rather than as ritual offerings. The evolution of *mingqi* in China is a "long and complicated process" (p. 1) and the author does not discuss how the system developed and evolved. Political stability during the Han Dynasty (206 BCE-AD 220) is evidenced by cultural unification, administrative complexity, economic prosperity, and the adoption of Confucianism as the official ideology. The author discusses the function of pottery *mingqi* as representational forms of *Li* ("the rites") associated with Confucianism and the fact that the deceased were treated as if they were alive and had only changed dwellings. Archaeological evidence suggests that the pottery buildings were modeled on houses or palaces and were related to rank or social status, and are associated with middle and lower class *shi* (intellectuals and bureaucrats) and commoners (*shumin*). Qinghua Guo focuses her presentation on the *shi* class, the bureaucrats of the Han dynasty who did not use bronze implements when alive, hence, relatively inexpensive pottery *mingqi* were made and placed in burials. Beginning in the Eastern Han, the use of *mingqi* expanded from officials and bureaucrats to merchants, landowners, wealthy individuals, and patrons from different social strata. She also discusses research issues regarding the many different forms, types and sizes, and architectural varieties, and comments on the question if these were individualized or generalized or stylized representations. There are no surviving wooden buildings from before the Tang Dynasty (618-907) so she looks at Han stone gate towers and shrines as well as Han literature and the scholarship of others (Candace Lewis's 1999 doctoral dissertation, Cao Yungang's 2007 M.A. thesis, and Zhou Xueying's 2003 essay on *mingqi* architectural terms), and a Henan Museum exhibition catalog (2002). Qinghua Guo's analysis includes Han pottery buildings over four centuries from specimens in repositories in China and, for the first time, collections outside of China. She uses cross-disciplinary perspectives – notably architecture, archaeology, and art history – to identify five themes commonly represented on a large scale in Han pictorial art: 1) work/production, 2) everyday life/leisure, 3) historical legend, 4) myth, and 5) cosmology/animals.

The first six chapters focus on six broad types of buildings which cover most building models: 1) the courtyard complex, 2) manor, 3) tower, 4) granary, 5) stove/well, and 6) pigsty/privy. These are discussed in terms of descriptions and archaeological and architectural affiliations. The final three topical chapters consider: 1) roofs as related to architectural traditions, 2) *mingqi* manufacturing techniques, and 3) the relationship between tomb bricks and pottery buildings.

As Qinghua Guo writes, "pottery buildings are impressive in the amount of information they convey" (p. 11). The author goes well beyond the work of any of her predecessors and demonstrates that a great deal of architectural information and cultural data can be extracted from these objects. This is a landmark work and ranks with Lothar Ledderrose's chapters "A Magic Army for the Emperor," "Factory Art," and "Building Blocks, Brackets, and Beams" in his *Ten Thousand Things: Module and Mass Production in Chinese Art* (A.W. Mellon Lectures in the Fine Arts, Bollingen Series 35, Princeton, New Jersey: Princeton University Press, 2000). Six examples of Han Dynasty architectural *mingqi* may be found on an Internet site *Mingqi Chinese Tomb Figurines by Willem Claessen*, a Web site which seeks to become the world's largest database for images of Chinese tomb figurines and currently holds more than 430 images: http://www.willemclaessen.com/index.htm The author does not cite this reference. The site includes materials from the Han Dynasty, Six Dynasties including the Northern Qi Dynasty and the Northern Wei Dynasty, Sui Dynasty, Tang Dynasty, and Ming Dynasty. There is additional information on tomb design, the production of *mingqi*, TL testing, and a list of art dealers and a list of musea with collections of Chinese tomb figurines. The Web site includes 20 categories of *mingqi*: agriculture, architecture, attendants, camels, court ladies, domesticated animals, dwarfs, earth spirits, entertainers, grooms. guardians, heavenly kings, horses, merchants, mythical figures, officials, polo players, soldiers, and zodiac figures. For additional information on the Han Dynasty, readers may wish to consult "Han Dynasty (202 BCE-220 CE)" by Charles C. Kolb, in *The Berkshire Encyclopedia of China* (Linsun Cheng, ed.; Great Barrington, MA: Great Barrington, MA: Berkshire Publishing Group Berkshire, pp. 985-990, 2009).

***Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers***, Peter Jordan and Marek Zvelebil (eds.), University College London Institute of Archaeology Publication, Walnut Creek, CA: Left Coast Press, 2009. 589 pp., 144 illustrations, 16 tables, ISBN 978-1-59874-245-9, $99.99 (hardcover). Jordan is a Senior Lecturer, Department of Archaeology, University of Aberdeen, who has focused his research on the ethnoarchaeology of Siberian hunter-gatherers, while Zvelebil is a Professor of Archaeology, Department of Archaeology, at the University of Sheffield and is a recognized authority on prehistoric hunter-gatherers. Readers are informed that: "This volume is an output of the Centre for the Evolution of Cultural Diversity (CECD), which is funded by the UK's Arts and Humanities Research Council (AHRC). The project was co-managed by Peter Jordan (Principal Investigator, CECD) and Marek Zvelebil (Associate Member, CECD) and originally entitled 'Use of Ceramics by Old-World Hunter-Gatherers'" (p. 5).

The contributions were initially presented orally in 2003 at the EAA (European Association of Archaeologists) and 2005 TAG (Theoretical Archaeology Group) conferences and updated for publication through the spring of 2008. There are major essays from international scholars working in Western, Central, and Eastern Europe and Eastern Asia that assembles for the first time different theories and evidence from this broad area. Specific chapters characterize Norway, Sweden, Finland, Poland, Siberia, Korea, and Japan as well as the three larger European regions.

The book has three main sections: "Part 2: Early Ceramic Innovations and Dispersals" (13 essays), "Part 3: Early Pottery in Forager-Farmer Interaction Zones" (4 contributions), and "Part 4: Ceramic Dispersals in World Perspective" (2 chapters). Initial materials in this volume include the "Table of Contents" (pp. 7-9), "List of Illustrations and Tables" (pp. 11-18), "Foreword" by Brian Hayden (pp. 19-26, 19 references), and "Preface" (pp. 27-29).

The text is divided into four parts with a total of 21 chapters, followed by a double-column "Index" (pp. 571-582), in the main, of proper nouns, and "About the Editors and Contributors" (pp. 585-589). Each chapter has its own references; in general, the Russian language references have been translated into English.

In the "Foreword," Brian Hayden (Simon Fraser University) notes that "pottery developed in various parts of the world only towards the end of the prehistoric period" and asks significant questions: "why pottery technology developed initially. What was it used for? How these uses were dealt with before pottery, or were they? If cognitive factors were involved, what specific ideas or abilities changed and why? Why were there no pottery-using hunter-gatherers before 16,000 BP, whereas 12% of the ethnographically known hunter-gatherers used pottery?" (p. 19). This volume is devoted to exploring these issues and confirms that pottery should not be equated with the Neolithic revolution. Hayden discusses ceramic figurine technology (at least Middle Paleolithic and indisputably by 26,000 BP in Europe), the often evoked physical constraints of mobility and humid climates, and the major spread of pottery ca. 13,000 BP. He suggests that technological advances in complex hunting and gathering societies, the acquisition of mates, the making and gifting of prestige goods, ancestral worship, and feasting provide alternative explanations. Prestige technologies and particularly the preparation of special foods required pottery which Hayden suggests initially were few in number, thick walled, conical shaped cooking pots of modest volume associated with semi-sedentary sites where aquatic resources were important. The food, he infers, would have included soups, fish oil, bone grease and marine mammal oil, nut oil, and alcohol. Lipid analysis of sherds confirmed plant, animal, and fish sources, as well as fermented beverages. He goes on to note that impressing guests required prestige serving vessels which were imbued with symbolism (wealth, shared etiquette,

group tradition, inherited status, and iconic meanings) and were "powerful mechanisms for maintaining social relations" (p. 24).

"Part 1: Introduction" includes one essay, "Ex Oriente Lux: The Prehistory of Hunter Gatherer Ceramic Dispersals" by Peter Jordan and Marek Zvelebil (pp. 33-89, 5 figures, 235 references). The emergence of pottery is a significant and long-standing issue in Old World archaeology and the editors discuss the Neolithic revolution, widely-held assumptions, conceptual problems, new data and better chronologies, and point out new ways in which the invention, adoption and use of pottery by hunter-gatherer societies can be studied. They consider current approach to studying pottery among hunter-gatherers and note that 14 regional case studies and four other papers develop broader perspective on the issue of ceramic dispersals into forager-farmer interaction zone. The contributors provide the reader with different foci, details, and paradigms that reflect distinctive scholarly and research traditions in Europe and in Asia. The editors address a significant gap in the regional case studies – the development of early pottery in China (a planned chapter never materialized), and they fill this void with a presentation on relevant data, sites, and chronologies for that area -- primarily for south China (pp. 33-45). There is a good discussion of "Ceramic Innovation and Social Evolution" (pp. 43-48) prior to an overview on the prehistory of Eurasian hunter-gatherer ceramics, an essay casting ceramic technology as a social "practice," and a consideration of the practical implications of the adoption of pottery by hunter-gatherers. They also view the social and symbolic roles of hunter-gatherer ceramics, ceramics in burial contexts, and provide a model relating variables in the introduction and dispersal of pottery (Figure 1.4, p. 66), prior to a consideration of general models of ceramic dispersal in northern Eurasia since 13,000 BP (single vs. multiple origin hypotheses, southern Central Asian dispersal, a Near East into Europe dispersal, and southwestern European farming traditions). The editors also discuss the various definitions of "Neolithic." Jordan and Zvelebil propose four stages in their dispersal model: 1) experimentation, 2) intensification, 3) integration, and 4) dispersal and differentiation.

"Part 2: Early Ceramic Innovations and Dispersals" includes Chapters 2-15 and begins in the Far East, moving through Siberia to Eastern and then Western Europe. "Chapter 2. Long-Term Innovation: The Appearance and Spread of Pottery in the Japanese Archipelago" by Simon Kaner (pp. 93-119, 4 figures, 58 references). Kaner surveys the context for the appearance of pottery in the Japanese archipelago, focusing on pottery and associated assemblages from the late Paleolithic/Incipient Jomon (ca. 16,000-10,000 BP); there are 72 sites associated with this period. He also considers the history of research, examines epistemological issues related to chronology and technological traditions, and considers the reasons that the adoption of pottery took so long. He looks at current models and environmental conditions, examines the characteristics of the period before pottery, presents a case study of the appearance of ceramics in central Honshu, and elaborates the development of decorated pottery (linear relief in particular). The cooler conditions of the Younger Dryas correlates with an increase in pottery production and enhanced manufacture continued into the onset of the Holocene. Kaner also speculates on the reasons for differences in ceramics in central Japan versus southern Kyushu and the manipulation of plant and maritime resources.

The third chapter, "Pottery-making in Prehistoric Cultures of the Russian Far East" by Irina S. Zhushchikhovskaya (pp. 121-147, 9 figures, 7 tables, 3 endnotes, 84 references; the Russian language entries have English translations), documents the emergence or invention of pottery technology and the transformations of pottery making traditions. The focus of the chapter includes the southern mainland (the Primor'e and Priamir'e or lower reaches of the Amur River) and insular region of the Sakhalin Island (Okhotsk culture) for the period 13,000-10,000 BP to 1200-1300 AD. Table 3.1 (p. 123) characterizes the Palaeolithic, Neolithic, and Palaeometal periods. She presents two case studies: 1) the temporal dynamics of pottery making in the mainland regions, and 2) the hunter-gatherer cultures of Sakhalin Island. The first included six radiocarbon dated sites with low-fired pottery (400-600° C), small scale production, and the use of basketry and plaited containers as shape molds. A warmer climate, the development of fishing, and sedentary life preceded the Neolithic (five sites are discussed) when mineral tempering began. Cross-cultural contacts with China, Central Asia, and Siberia are also noted. Four sites are used to characterize the Palaeometal period when higher-fired pottery (700-1,000° C) was made in kilns and vessels were smudged to create black surfaces. An increasing reliance on Agriculture is related to social complexity and community life. The earliest Sakhalin pottery is Neolithic (7000-5500 BC) and three sites show contact with the Amur region, while the Palaeometal period (three sites) has significant changes in economy and morphological diversity in material culture, with larger vessels fired to 600-750° C.

"4. The Hunter-Gatherer Ceramics of Neolithic Korea" by Daeyoun Cho and Ilhong Ko (pp. 149-166, 5 figures, 4 endnotes, 70 references). The post-glacial period saw the production of ceramics and ground stone tools in a hunting-gathering context. Ceramic typology and distribution have had primacy over other avenues of research on the Korean Neolithic; regional sequences are a research goal. The authors consider a broad regional context including the Japanese archipelago and Russian Far East prior to a lengthy discussion of the Korean Neolithic and Gossani pottery dated 10,500-10,000 BP. The Initial Neolithic is dated 8000-5000 BCE and traced to the Amur River region and is followed by an Early Neolithic dating 5000-4000 BCE, and a Middle Neolithic from 4000-1500 BC. The latter has regional variants – Central-Western, Eastern Coastal and Northeastern, Southern Coastal and Northwestern regions. The Late Neolithic, beginning ca. 1500 BCE, witnessed the gradual disappearance of decoration from Neolithic ceramics. A section of the article is devoted to the emergence, spread, and dissolution of Neolithic ceramics in a hunting-gathering societal context. The changes and demise of ceramics are seen in association with modification in subsistence strategies.

"5. Review of Early Hunter-Gatherer Pottery in Eastern Siberia" by Hugh McKenzie (pp. 167-208, 4 figures, 109

references; the Russian language entries have English translations). Eastern Siberia is defined as the territory delimited by the Yenisei River in the wet, the Lena River in the East, the Arctic Ocean to the north, and mountain chains in the south and southeast that extend north from Central Asia and separate the Arctic and Pacific watersheds. Hunter-gatherers in this region adopted pottery before 10,000 BP, making it one of the earliest first centers of pottery use. McKenzie defines basic ceramic terminology, forms, and decoration, then focuses on net-impressed, cord-impressed, Khaita, Posol'sk, and Ust'-Belaia pottery. The Trans-Baikal is distinguished, and he considers the appearance of pottery in the eastern Trans-Baikal (the Ust'Kargena complex and the Chindant site) and western Trans-Baikal (Mukhingo phase, Studenoe locality, and the Ust'-Menza and Ust'-Kiakhta sites). Cis-Baikal Neolithic pottery is known from graves ca. 7000 BP, and is associated with fishing campsites such as the stratified sites of Gorelyi Les and Ust'-Khaita. The author also details the later development of Neolithic pottery in Cis-Baikal. The Central Yenisei Basin has early and late Neolithic stratified sites at Eleneva Cave and Ust'-Kazachka. The appearance of early and late Neolithic pottery on the Central Siberian Plateau is also documented. There are numerous radiocarbon dates that document the introduction of pottery across eastern Siberia but the origins of the earliest ceramics are not well understood. McKenzie also discusses future research possibilities.

"6. Early Hunter Gatherer Ceramics in the Urals and Western Siberia" by Natalia Chairkina and Lubov Kosinskaya (pp. 209-235, 7 figures, 52 references; the Russian language entries have English translations). Pottery technology emerged among mid-Holocene hunter-fisher-gatherer cultures that occupied the Ural Mountains, adjacent West Siberia Plain, the basin of the Ob' River and its tributaries, 7,000-4,600 BP, during a time of warmer and moister climatic conditions. The emergence of Neolithic earthenware vessels was rapid and widespread and there are probable links to Kazakhstan, Central Asia, and probably the Caspian. The authors discuss early pottery in the Urals and western Siberia, defining morphology and technology, Eneolithic economy and the emergence of a "productive economy," documenting transformations in pottery decoration in the Neolithic and Eneolithic. Complex decorative motifs and compositions in early ceramics are characterized, and there is a lengthy section on the semantics of ornamentation, Neolithic and Eneolithic earthenware figurines (animals rather than humans are depicted) and clay fishing net sinkers. Pottery use in the Urals and Western Siberia focused on storage cooking and the serving of food and drink and is associated with Eneolithic metallurgy.

"7. Early Pottery Makers in Eastern Europe: Centres of Origins, Subsistence and Dispersal" by Pavel Dolukhanov, Andrei Mazurkevich and Anvar Shukurov (pp. 237-253, 10 figures, 33 references; the Russian language entries have English translations). The emergence and early development of pottery holds a significant place in the debate about the European Neolithic. The East European Plain, an area of steppe and semi-desert landscapes, was the locus of early pottery making. Twelve early pottery cultures are reviewed (the map, Figure 7.1, p. 239, is especially useful): Ryazan-Dolgov, Southern Don, Sursk Dnieper, Bug Dnieper, Linear Pottery Ware, Dneper-Donetz (Russian)/Dniepro-Donets (Ukrainian), Volga Kama, Upper Volga, Valdai, Narva, Sperrings Comb Ware, and Pechora/Dvina/Kargopol culture group. Dates of ca. 7000 BCE are reported and the associated sites have evidence of hunting-gathering subsistence while some seasonal sites on the Bug Dnieper had cultigens. The ceramics associated with the regional culture are well- described, particularly as to vessel forms and decorations. The Western Dvina-Lovat is presented as a case study and shows a sequence of ceramic production beginning in 6300-6100 BCE through three distinct phases (A, B, and C). Ceramics in the East European Plain show influences from sources in the east of the steppe zone and the authors suggest two distinct waves of pottery making spreading westward. Two models are discussed based on mathematical modeling involving 492 radiocarbon dates. An early hunting-gathering model, sometimes with elements of stock-breeding, was supplanted by a later wave which originated in the Near East and brought to Europe advanced techniques of cereal husbandry, architecture, agriculture-based symbolism, and "possibly," Indo-European speech (p. 251).

"8. Early Hunter-Gatherer Ceramics in Karelia" by Konstantin German (pp. 155-280, 10 figures, 1 endnote, 80 references; the Russian language entries have English translations). Karelia is a historically significant area in northern Europe that is currently politically divided between the Russian Republic of Karelia, the Russian Leningrad oblast, and the regions of North and South Karelia in Finland. In particular, emphasis is placed on the Russian region between the White Sea, Lake Lagoda, and the Finnish border. The chapter focuses on the origins, characteristics, decoration, and potential uses of early hunter-gatherer pottery, and examines the wider ecological, social, and economic contexts in which pottery first appears. The author discusses environmental conditions and ecological parameters (climate, vegetation, landscape, and fauna) 6,500-5,500 BP as a prelude to presenting data on Sperrings pottery (8,000 fragments = 1,473 vessels in four different forms). Storage and cooking jars decorated with fish vertebrae impressions predominate over punctation and "cord-like" impressions. Another ceramic ware termed Säräisniemi I (797 fragments = 117 vessels,) has eight forms of decoration. Karelian and Finnish archaeologists now link Sperrings pottery to ceramics from Upper Volga Early Neolithic sites, while Säräisniemi pottery (linked to present-day Sami peoples) was likely independently developed ca. 6,100 BP.

"9. Ceramic Anthropomorphic Sculptures of the East European Forest Zone" by Ekaterina Kashina (pp. 281-297, 9 figures, 1 endnote, 19 references; the Russian language entries have English translations). Upper Paleolithic clay figurines of various mammals and "Venus women" attest to the ancient roots of creating fired clay objects. The chapter focuses on lesser known clay anthropomorphic figurines created by highly developed hunter-gatherer cultures in the eastern European forest zone (particularly Russian and eastern Baltic areas) some 2,000 years earlier in the Middle and Late Neolithic ($4^{th}$ to $2^{nd}$ millennium BCE). A map showing the distribution of clay sculptures from the eastern Europe and Finland (Figure 9.1, p. 283) helps to document associations with four regional

archaeological cultures defined on the basis of ceramics: Comb-Pitted Ware (variants in European Russia, Karelia, Finland, and Sweden), Pitted-Comb Ware, Asbestos Ware, and Porous Ware. The author is concerned specifically with the objects from Russia and the eastern Baltic. There is a discussion of the morphology of clay anthropomorphic sculptures, their uses, associations (including rituals, burials, and in domestic contexts), and decorations (some motifs on figurines are related to imprints on vessels and human tattooing), as well as probable symbolic meanings (family and fireplace, and female fertility and birth).

"10. Pottery of the Stone Age Hunter-Gatherers in Finland" by Petro Pesonen and Sirpa Leskinen (pp. 299-318, 61 references; the Finnish language entries do not have English translations). Ceramic vessels appear in Finland ca 5300 BCE and continued to be produced by hunting, fishing, and gathering societies until 1500 BCE; Table 10.1, p. 300, provides chronological data on 12 periods. Ceramics were adopted in the Late Mesolithic of Finland and are related to seal and fish catches but ceramics did not spread everywhere in Finland. The Vantaa Maarinkunnas site provided a case study in ceramic uses (storage and food preparation, drinking and beverage preparation, water heating, and rendering oil from blubber). The value of pottery vessels is attested to by the repairing of damaged or worn ceramics. Uniform pottery styles are seen over large areas but there are regional variants in the use of temper. Typology and chronology have been the focus of pottery studied in Finland; the Battle Axe Culture with Corded Ware pottery appeared ca. 3200 BCE. The author also discusses the beginnings of agriculture (no direct evidence is provided) and animal husbandry.

"11. Ceramics as a Novelty in Northern and Southern Sweden" Ole Stilborg and Lena Holm (pp. 319-345, 8 figures, 3 tables, 45 references; the Swedish language entries do not have English translations). The authors are concerned with early ceramics in hunter-gatherer and early agricultural societies in northern and southern Sweden beginning 6,500 and 5,800 BP. A chronological table of culture groups and pottery styles and subsistence differentiates the two regions (Table 11.1, p. 321). Two case studies are presented: Case Study 1) Early ceramics in the northern coastal regions are related to coastal fishing, hunting and gathering or inland hunting, gathering and fishing at "well-structured" settlements. Ceramic data and radiocarbon dates for 10 Early Northern Comb Ware sites are presented and the history of early ceramics along the Bothnian Coast. Three different relationships between coastal economies and ceramics are delineated. In Case Study 2: Ertebølle pottery, the first ceramics in southern Sweden (Scania province), the authors demonstrate that the introduction of pottery was very different, appearing 5000-4500 BCE. Pottery-making came from the south and chemical analysis confirmed the fermentation of grains for beer. Stilborg and Holm provide detailed information about the complexities of ceramics in Sweden as well as the exploitation of marine resources and hunting-gathering, and point out the need for continued research on the social roles of early ceramics.

"12. 'All Change'? Exploring the Role of Technological Choice in the Early Northern Comb Ware of Finnmark, Arctic Norway" by Marianne Skandfer (pp. 347-373, 5 figures, 1 table, 3 endnotes, 56 references; the Finnish, Norwegian, and Swedish language entries do not have English translations). Early Northern Comb Ware (ENCW), known since 1910, is a "rare bird" in the archaeological record of Stone Age Norway and has elicited little interest previously. The author reinterprets this hunter-fisher ceramic assemblage, focusing on morphological characteristics, chronology, and sociocultural contexts. Two main groups of prehistoric pottery which are not technologically or chronologically related have been found in Finnmark – an Early Comb Ware and variants of Asbestos Tempered Ware. A total of 3,847 sherds of ENCW pots were found on 15 sites (Figure 12.1, p. 350); these flat bottomed and conical shaped vessels with repetitive stamped motifs are radiocarbon dated to 6630 and 4100 BCE. Skandfer discusses the social reproduction of ENCW as a long-term technological tradition and focuses on prehistoric pottery and stone tool production technologies in their sociocultural contexts. ENCW groups were part of a wider hunter-fisher-gatherer economy in northern Finnmark and she infers local or regional differences in technological choices, kinship and family tiers, and the social regulation of land use. The current presentation is adapted from her article in *Fennoscandinavia Archaeologica* 22:2-23 (2005).

"13. 'Tiny Islands in a Far Sea': On the Seal Hunters of Åland, and the North-Western Limit in the Spread of Early Pottery" by Fredrik Hallgren (pp. 375-393, 8 figures, 79 references; the Finnish, Swedish and Polish language entries do not have English translations). Ceramic technology was adopted by hunter-gatherers living on the eastern shore of the Baltic Sea from Finland in the north to Poland in the south ca. 5000 BCE. Hallgren notes that Sperrings 1 pottery was made by the seal hunters of Åland who occupied 10 settlements and he reports the changes in the ancient shorelines and 35 radiocarbon dates from 9 sites (Figure 13.7, p. 385). Vessels were made with freshwater clay and tempered with crushed rock. Aceramic hunter-gatherers from Mälardalen are also characterized and he speculates about the fact that they did not adopt the craft of pottery making.

"14. The Pitted Ware Culture in Eastern Middle Sweden: Material Culture and Human Agency" by Mats Larsson (pp. 395-419, 9 figures, 2 tables, 67 references; the Swedish and Danish language entries do not have English translations). The focus of this chapter is to develop a more social, symbolic, and human agency-oriented history of Pitted Ware Culture (PWC) traditions dated to the Middle Neolithic period in eastern Middle Sweden. The author presents an extensive overview of past research on PWC and provides a case study of the Åby settlement, a Neolithic site located north of the town of Norrköping discovered in 1929 and excavated 1934-1936 and 1995 and 1997. About 12,000 sherds of chalk tempered PWC were recovered and analyzed; about 41% are decorated. Six radiocarbon dates 4550-3800 BP are reported and the author acknowledges the influence of scholars such as Barrett, Hodder, Tilley, and Dobres in his interpretation of complex assemblages of pottery and flint tools, and the Alvastra pile dwelling in eastern Sweden and Åby site.. The hanging triangle

motif in pottery, ethnicity, seals, and technological traditions are woven into an interesting reassessment of PWC.

"15. Pitted Ware Culture Ceramics: Aspects of Pottery Production and Use at Ottenby Royal Manor, Öland, Sweden" by Ludvig Papmehl-Dufay (pp. 421-445, 12 figures, 2 tables, 74 references; the Swedish and Finnish language entries do not have English translations). The Pitted Ware Culture (PWC) and Middle Neolithic (3300-2300 BC) in southern and eastern Sweden are detailed and "enormous amounts" of these ceramics are often recovered in excavations – assemblages of 200-400 kg are common but the site of Ajvide on Gotland has >3,000 kg. Excavations in 2004 at Ottenby Royal Manor in 2004 yielded 18,659 objects, including 6,609 Stone Age pottery sherds (12,294.8 kg); marine animals and fish species did not dominate the faunal assemblage but food crusts in the pottery indicated a mixture of terrestrial animals and vegetables rich in carbohydrates (radiocarbon dated to 3100-2800 cal BC). A detailed analysis of the objects, including microscopic studies of the pottery and studies of clay sources, are reported and sociocultural interpretations presented. This is the most detailed report on the pottery recovered from a single archaeological site that is discussed in this volume.

"Part 3: Early Pottery in Forager-Farmer Interaction Zones" contains four contributions (Chapters 16-19). "16. Hunter-Gatherers and Early Ceramics in Poland" by Marek Nowak (pp. 449-475, 12 figures, 77 references; the Polish language entries do not have English translations). Nowak examines the evidence for the early use of ceramic vessel technology by prehistoric communities in Poland and seeks to define social processes rather than present a broad-scale classification of the pottery. He beings by discussing Mesolithic hunter gather cultures in the 9$^{th}$ to 7$^{th}$ millennium BCE and the arrival of farming in mid-6$^{th}$ millennium BCE. The appearance and disappearance of Linear Band Pottery Culture (LBK) is documented as is the appearance of Stroke Band pottery Culture (SBK) 4800-4700 BCE; useful distributional maps are included in the article (Figures 16.1 and 16.2, pp. 451-452). This period is described in detail and well documented by the author who then turns to a discussion of hunter-gatherer Ertebølle pottery and the very complex period from 3000-2000 BCE dominated by Western, Central, and Eastern Globular Amphorae Cultures (Figure 16.8, p. 462) which are also discussed in detail. As he notes, "the Mesolithic ends as suddenly as the Neolithic begins, with each period characterized by very different social, economic, and technological features" (p. 467). Profound sociocultural transformations during the Neolithic are graphically presented (Figure 16.12, p. 468) detailing the archaeological cultures for six geographical areas of Poland for the period 6000-2000 BCE and describes four socioeconomic and subsistence modes and the temporal and spatial distribution of 16 archaeological cultures.

"17. Early Pottery in Hunter-Gatherer Societies of Western Europe" by Philippe Crombé (pp. 477-498, 7 figures, 4 endnotes, 69 references; the French, Dutch, German, and Flemish language entries do not have English translations). The author focuses on the characteristics, chronology, and geographic origins of early pottery made by western European hunting, fishing, and gathering groups. The area includes northern France, the Netherlands, and Belgium and is characterized by a broad delta-front (North Sea) coastline when, during the 6$^{th}$ millennium BCE, the loess area of western Europe was colonized by central European pioneering farming cultures (Linear Pottery Culture = LBK). He provides information on the earliest hunter-gatherer pottery in western Europe, noting three groups, contextual issues, and a lack of reliable radiocarbon dates and scholarly disputes involving interpretations especially of La Hoguette/Limburg/Begleitkeramik pottery which appeared 5500-5300 BCE. Swifterbant hunter-gatherer pottery and its chronological variants are also discussed. He points out that "most scholars now believe that knowledge of pottery production was passed from contemporary agro-pastoral cultures from the loess area through contact" (p. 490). A chronological table that defines four regions and 10 major pottery traditions is a useful summary (Figure 17.7, p. 492).

"18. Ceramic Trajectories: from Figurines to Vessels" by Mihael Budja (pp. 499-525, 10 figures, 4 endnotes, 95 references; the French and Slavic language entries do not have English translations). The author points out that the invention and distribution of ceramic technology and fired vessel production in the Levant, Anatolia, and southeastern Europe is "older than farming and was already embedded in the agency of Eurasian hunter-gather societies" (p. 499). He provides documentation on the appearance of ceramic technology associated with animal and female figurine making since 26,000 BP. The invention of clay pots follows Brian Hayden's argument (1995:257-266) in Barnett and Hoopes's edited *The Emergence of Pottery*. Budja also discusses the absence of ceramic vessels in the West Asian "Early Neolithic" (Pre-Pottery Neolithic A, 10,200 cal BCE and onwards) and he segues into a discussion of plastered human skulls, stone figurines, and small ceramic anthropomorphic and zoomorphic figurines. Ideological and emerging religious symbolism arguments, demic diffusion, and the ceramic figurine "paradox" are also detailed prior to a discussion about the appearance of the earliest pots in southeastern Europe. In addition, he presents a lengthy discussion about locus, human agency, and habitus in the Late Mesolithic and the Early Neolithic in southeastern Europe. He does not subscribe to the "competitive feasting" scenario but correlates the appearance of pottery with the collapse of aggregate centers and the cessation of previous mortuary and ritual practices, the dispersal of peoples following the adoption of crops and livestock (p. 519).

"19. Transregional Culture Contacts and the Neolithization Process in Northern Central Europe" by Detlef Gronenborn (pp. 527-550, 4 figures 3 endnotes, 96 references; the French, German, Flemish, and Russian language entries do not have English translations). The author discusses three neolithization streams that modified central and north-central Europe: 1) The classic "Danubian Tradition" with a passageway through southeastern Europe. 2) The "Occidental Tradition" through western France with an origin in the western Mediterranean, likely the northern or northwestern African continent. 3) The "Hyperborean Tradition" through western temperate Eurasia

with influences from the Russian steppes and Central Asia. He argues that these three Afroeurasian streams spread farming and pottery across this region since ca. 6000 BCE and he provides data on the development of and spread of three types of lithic adzes, 5300 to 3800 BCE. Pottery traditions are also discussed minimally.

The final set of essays, "Part 4: Ceramic Dispersals in World Perspective," includes Chapters 20-21). "20. Discussion: Living at the Edge" by William K. Barnett (pp. 553-560, no references). Barnett, coeditor with John Hoopes of *The Emergence of Pottery: Technology and Innovation in Ancient Societies* (Smithsonian Institution Press, Washington, DC, 1995), points out that China opening itself to the West (1972 ff.) and Gorbachev's "Glasnost" (1985 ff.) which began the opening of the Soviet Union "also ultimately spelled the end of Maoist and Soviet archaeological doctrines" (p. 553). These, he argues, helped form a new generation of Eurasian archaeologists who were not tied to a particular paradigm and could pick and choose their preferred orientations. He also discusses challenges to traditions (ceramic typologies versus sociocultural interpretations, for example), pottery and foragers, and provides a lengthy analysis of the implications of early dates.

The final chapter, "21. Hunter Gatherer Pottery: An Emerging 14C Chronology" by Peter Hommel (pp. 561-569, 2 figures, 91 references; the Russian, other Slavic, Finnish, German, and French language entries do not have English translations) provides an assessment of radiocarbon dates and focuses on the improvements in dating precision. Hommel provides a preliminary analysis of 1,185 published radiocarbon dates from 82 sites associated with early pottery production. The structure of the database is explained, including geospatial locations and dates in 500 year intervals >13,000 to <4500 PB for Eurasia and North Africa.

This volume provides an important, long-overdue synthesis and welcome addition to prehistoric Eurasian ceramic studies that sheds new light on the adoption and dispersal of pottery by non-agricultural societies. Researchers studying the origins and dispersal of pottery, the prehistoric peoples or Eurasia, and flow of ancient technologies will find compelling materials in the volume.

The editors are to be congratulated for assembling papers that cover such a vast area and for their editorial expertise, and Left Coast Press is to be recognized for undertaking the publication of this complex set of essays. The delay in publication was worth the wait.

**Historic Ceramic Publications**

***Volumes in Historical Archaeology*** (34 volumes), ***The Conference on Historic Site Archaeology Papers*** (15 volumes) and ***Historical Archaeology in Latin America/Arqueología Histórica en América Latina/ Arqueologia Histórica na América Latina*** (16 volumes) are available from Stan South (1321 Pendleton Street, Columbia, SC, 29208, USA) through the South Carolina Institute of Archaeology and Anthropology, University of South Carolina, see http://www.cas.sc.edu/sciaa/hapubs.htmL . The volumes are softcover, printed on 8½ x 11-inch paper, and have plastic spiral bindings. The following seven volumes have contents on ceramics:

*Volumes in Historical Archaeology* ($10.00 each): Vol. I: Russell K. Skowronek - *Trade Patterns of Eighteenth Century Frontier New Spain: The 1733 Flota and St. Augustine* (1984) from his 1982 thesis, Florida State University (ceramics pp. 183-198). Vol. IX: Carl R. Steen - *The Inter-Colonial Trade of Domestic Earthenwares and the Development of an American Social Identity* (1990) from his 1989 MA thesis, William & Mary College, Williamsburg, VA. Vol. XVI: Mark David Bograd - *Whose Life Is It Anyway? Ceramics, Context, and the Study of Status* (1991) from his 1989 MA thesis, University of Massachusetts. Vol. XXVIII: Ronald Varnelle May - *Mexican Majolica in Northern New Spain: A Model for Interpreting Ceramic Change* (1994) from his 1975 MA thesis, San Diego State University. Vol. XXIX: Patricia Hagen Jones - *A Comparative Study of Mid-Nineteenth Century Chinese Blue-and-White Export Ceramics from the Frolic Shipwreck, Mendocino, California* (1994) from her 1992 MA thesis, San Jose State University. Vol. XXXIII: Barbara Jo Grindy - *The Farmer Potter Phenomenon in Northwestern Pennsylvania (36ME226)* (1995), from her 1993 Ph.D. dissertation, University of Pittsburgh.

*Historical Archaeology in Latin America* ($10.00): Vol. 3. *Cattle Raising and Rock Painting in Brazil · Ceramica del Buenos Aires Colonial · Arquitectura Publica Urbana de la Colonia del Sacramento, Uruguay · How Argentinian Urban Children Learn to Live in the City*.

**Previous Meeting**

***The Ceramic Petrology Group (CPG) Annual Meeting*** was held 17 May 2010 at 17th May 2010 in the university Museum and sponsored by the Department of Archaeology, University of Nottingham, UK. There were eight major presentations: Michela Spataro and A. Villing "Eastern Mediterranean connections: mortaria production in the Archaic and Classical period"; Kevin Gibbs "Expedient pots: petrographic evidence from Late Neolithic Wadi Ziqlab, Jordan"; Roberta Tomber, Rob Carter and Seth Priestman "Investigating 'Torpedo jars' - their composition and source"; Daniel Sahlén "Pots and crucibles in the microscope: investigation of technology and traditions in prehistoric Scotland; Eddy Faber and Pamela Wood "A comparison of salt-glazed stoneware pottery from the Morley potteries in Nottingham and Crich': Gareth Perry "The Anglo-Saxon cremation cemeteries of North Lincolnshire"; Karen Webb, Eddy Faber and Lloyd Weeks "The development of glazed Stamford Wares from Nottingham: an investigation of the glazes using electron probe microanalysis"; and Patrick Quinn "An on-line database for archaeological petrography."

# ARCHAEOLOGICAL PROSPECTION AND SATELLITE REMOTE SENSING

*Apostolos Sarris, Associate Editor*

**VAST 2010: 11th Symposium on Virtual reality Archaeology and Cultural Heritage, Paris, France, September 21-24, 2010.**

The conference addresses issues of digital technology and virtual reality applied in Archaeology and Cultural Heritage. The goal of the particular conference will be to create an open dialogue platform between different areas of expertise, allowing especially ICT experts to have a better understanding of the critical requirements of the CH scientists for managing and delivering cultural information. The result of this interaction will be disseminated through use of innovative digital techniques in research and education for Cultural Heritage and through publications. 2/3/4D data capture and processing, augmented reality, digital libraries, interactive environments, gaming technology, ethical guidelines, multimedia applications, multi-modal interfaces and rendering are among the topics to be addressed in the conference. For more information: www.vast2010.org

**Archaeology and Cultural Resources Management, Kalamata, Greece, October 21-23, 2010.**

The Symposium focuses on the use of New Technologies (Archaeometry, Computing Technology, Conservation and Restoration) in the Archaeological Research, notably with the presentation of interdisciplinary approaches, special case studies and research of archaeological materials and assemblages. For more information: http://kalamata.uop.gr/~Archaeolab/symposium/symposium.htm

**Archaeological Geophysics and Environmental Forensics, London, G. Britain, December 15-16, 2010.**

Two related meetings will be held at the Geological Society of London, Burlington House, Piccadilly W1J 0BE. The 9th meeting in Recent Works in Archaeological Geophysics will address results and case studies from recent geophysical research on archaeological sites, evaluate their results from the initial data acquisition to subsequent interpretation and management. The Environmental Forensics meeting aims in capturing the shared interests between the geological, environmental science, engineering, geotechnical, mining and archaeological communities in assessing the impact of changes to the environment that may result in legal proceedings. Sessions will include geophysics, remote sensing, geology, hydrogeology, geochemistry, isotope geochemistry. For more information: www.geolsoc.org.uk/page7381.html

**New Instrumentation for Magnetic Susceptibility Measurements**

Bartington Instruments released the new MS3 magnetic susceptibility system to substitute the older MS2 unit that has been used for over the past 20 years in Geosciences. MS3 is lighter than MS2 providing an increased range of measurements that reach up to 26 SI, with a resolution up to $2x10^{-6}$ SI. The unit is accompanied by Barsoft data acquisition software for data collection through the use of a PC, laptop or PDA, enabling also the integration with GPS data. Barsoft allows a fast scanning time and measurements protocols can be customized to allow a semi-automated process of data acquisition. Software is able to integrate GPS and susceptibility data and display on a map in the field the data collected. Thus measurement mode can be carried out either in a walking mode using a GPS unit or in a grid based layout. The MS3 is optimised for use with the majority of MS2 probes and sensors (B, C, D, E, F, G, H and K). For more information: www.bartington.com

# 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) Ph.D. Theses, 4) *Monumentum Obscurum* (New), 5) Previous Meetings, 6) Forthcoming Meetings, and 7) Obituary.

**New Books**

***Metals and Societies: Studies in honour of Barbara S. Ottaway***, edited by Tobias L. Kienlin and Ben W. Roberts, Verlag Dr. Rudolf Habelt, Bonn, 2009. *Universitätsforschungen zur Prähistorischen Archäologie* Band 169, 468p., ill., maps, ISBN: 3774936315; 9783774936317, €87/US $109 (paperback). On the occasion of her 70th birthday, a *grande dame* of archaeometallurgy, Barbara S. Ottaway, was honored with a *Festschrift* of archaeometallurgical papers surrounding four central themes: I) Metals and Societies, II) Aspects of Copper and Bronze Age Metallurgy, III) Approaches to Early Metallurgy, and IV) Studies in Historical Metallurgy. The overwhelming majority of the thirty-two contributions deal with issues relating to copper-based mining and metallurgy in Europe and southwest Asia, including several papers on experimental metallurgy. Also included are a foreword by the editors, two biographical homages ("Of Barbara" by Caroline Jackson, and "Die Begegnung mit Barbara Ottaway: Erinnerungen an die Impulse für die frühen akademischen Studien" by Christian Strahm), a listing of Dr. Ottaway's publications, and a list of contributors. An homage and one chapter were in German, but all other contributions were in English.

Papers from the first section, Metals and Societies, included "Archaeometallurgy: Evidence of a Paradigm Shift?" (Christopher P. Thornton), "Elites and Metals in the Central European Early Bronze Age" (Martin Bartelheim), "Bronze Age Copper Production in the Alps: Organisation and Social Hierarchies in Mining Communities" (Rüdiger Krause), "Singen Copper, Alpine Settlement and Early Bronze Age Mining: Is There a Need for Elites and Strongholds?" (Tobias

L. Kienlin, Thomas Stöllner), "Mining Ore and Making People: Re-thinking Notions of Gender and Age in Bronze Age Mining Communities" (Emma C. Wager), "The Metallurgical Developmental Phases in the Old World" (Christian Strahm, Andreas Hauptmann), "Origins, Transmission and Traditions: Analysing Early Metal in Western Europe" (Ben Roberts), "Moving into the Metal Ages: The Social Importance of Metal at the End of the Neolithic Period in France" (Benoît Mille, Laurent Carozza), "The Social Context of Early Bronze Age Metalworking in Iberia: Evidence from the Burial Record" (Dirk Brandherm), and "Is the Essence of Innovative Archaeology a Technology for the Unconscious?" (John Bintliff).

The second section, Aspects of Copper and Bronze Age Metallurgy, comprised "Absolute Dating of Metallurgical Innovations in the Vinča Culture of the Balkans" (Dušan Borić), "Simple Technology: Casting Moulds for Axe-adzes" (Nikolaus Boroffka), "Aspects of the Production of Copper Age Jászladány Type Axes" (Tobias L. Kienlin, Ernst Pernicka), "How Much Metal was there in Circulation in Copper Age Italy?" (Mark Pearce), "The Copper Mines of Cabrières (Hérault) in Southern France and the Chalcolithic Metallurgy" (Paul Ambert, Valentina Figueroa-Larre, Jean-Louis Guendon, Veronika Klemm, Marie Laroche, Salvador Rovira, Christian Strahm), "Chemical Analyses in Archaeometallurgy: A View on the Iberian Peninsula" (Roland Müller, Ernst Pernicka), "Bronze Age Gold Lock-rings with Cores of Wax and Wood" (Susan La Niece, Caroline Cartwright), "Some Early Bronze Age Stone Moulds from Scotland" (Trevor Cowie, Brendan O'Connor), "The Life Cycle of Middle Bronze Age Bronze Artefacts from the Western Part of the Carpathian Basin" (Viktoria Kiss), "Eastern Alps or Western Carpathians: Early Bronze Age Metal within the Wieselburg Culture" (Elka Duberow, Ernst Pernicka, Alexandra Krenn-Leeb), "Herstellungstechnische Untersuchungen an Riegseeschwertern aus Ostösterreich" (Marianne Mödlinger, Gerhard Trnka), "Metalworkers at the Çukuriçi Höyük? An Early Bronze Age Mould and a "Near Eastern Weight" from Western Anatolia" (Barbara Horejs), "'Luristan Bronzes' and the Development of Metallurgy in the West-Central Zagros, Iran" (Vincent C. Pigott), and "Some Observations on Recent Studies of Bronze Casting Technology in Ancient China" (Quanyu Wang, Jianjun Mei).

The third section, Approaches to Early Metallurgy, consisted of "7000 Years of Trial and Error in Copper Metallurgy - in One Experimental Life" (Walter Fasnacht), "Experimental Archaeology and Education: Theory without Practice is Empty; Practice without Theory is Blind" (Caroline Jackson), "Experimental Co-smelting to Copper-tin Alloys" (Salvador Rovira - Ignacio Montero-Ruiz - Martina Renzi), "Thinking Through Technology - An Experimental Approach to the Copper Axes from Southeastern Europe" (Julia Heeb), and "Seeking the Process: The Application of Geophysical Survey on some Early Mining and Metalworking Sites" (Colin Merrony, Bryan Hanks, Roger Doonan).
Contributions to the fourth section, Studies in Historical Metallurgy, were "Two Statuettes with *hmty km* Inlays in the Fine Arts Museum Budapest" (Alessandra Giumlia-Mair, Péter Gaboda, Hedvig György, Irén Vozil), "Using Mills to Refine Metals: Iron Smelting Technology of the Transitional Byzantine to Ottoman Period in Macedonia, Greece" (Nerantzis Nerantzis), and "Perceptions and Reality: The Fall and Rise of the Indian Mining and Metal Industry" (Paul T. Craddock). Purchase information from the publisher for this volume is available at: http://www.habelt.de/index.php?id=22.

A recent publication, while not widely publicized and distributed, and recent responses to it have significant ramifications for many researchers working in ancient metallurgy, especially on the antiquity of iron metallurgy. The book is: ***Les Ateliers d'Ôboui: Premières communautés métallurgistes dans le nord-ouest du Centrafrique***, edited by Étienne Zangato, 2008. Éditions Recherche sur les Civilisations (ERC), Paris, 151, [1] p. : ill. (some col.), ISBN: 9782865383160; 2865383164, €35/US $44 (paperback). Publicity from this publication drew the attention of *Science* writer Heather Pringle who published a brief synopsis of debate surrounding the recent publication and associated archaeology, *Science*, n.s. Vol. 323(5911, January 9, 2009): 200-202, "Seeking Africa's First Iron Men: Archaeologists are battling over when--and how--ancient African cultures entered the Iron Age." Subsequently Étienne Zangato, with Augustin F.C. Holl, published a review of recent archaeological and analytical research on early iron metallurgy from North-Central Africa (Cameroon and Central African Republic), with claims of production and metal-working between 3000-2000 BC. As many readers will recognize, if these claims are legitimate, than this would be the earliest occurrences of iron smelting and working in the world, and predate the next earliest claims, from the Near East, by almost 2000 years. The review by Zangato and Holl, "On the Iron Front: New Evidence from North-Central Africa" was published in the *Journal of African Archaeology*, 2010, 8(1):7-23, followed by several responses. These responses comprised "On Evidence, Ideas and Fantasy: The Origins of Iron in Sub-Saharan Africa: Thoughts on É. Zangato & A.F.C. Holl's 'On the Iron Front'" (Shadreck Chirikure), "New Paradigms for Old Iron: Thoughts on É. Zangato & A.F.C. Holl's 'On the Iron Front'" (Paul Craddock), "Too Old? Remarks on New Evidence of Ironworking in North-Central Africa" (Manfred K. H. Eggert), and "Thoughts on É. Zangato & A.F.C. Holl's 'On the Iron Front'" (Scott MacEachern).

**New Articles/Book Chapters**

A special section in the most recent issue of ***Türkiye Bilimler Akademisi (TÜBA)*** [The Turkish Academy of Sciences] was dedicated to the long-debated topic of tin in the ancient world. This section, *Tin in Archaeology, TÜBA* 12, Special Section, was edited by Ünsal Yalçın and Hadi Özbal. The editor's present the following abstract for this section.

Considered among the most important metals in human history, tin undoubtedly had strategic significance in Bronze Age archaeology. Trying to locate its provenance is bound to keep archaeologists busy for year to come. With this section we hope to further contribute to the discussion about tin and its origins in the Ancient World. We are conscious that the

volume addresses limited issues and is unable to conclusively answer all pressing questions. Yet our intention was to present multifarious issues revolving around early tin. As the volume neared conclusion we realized that many aspects of research concerning early tin still remain to be considered. Our hope is that TÜBA-AR returns to these questions in the near future by publishing a second issue of investigations on prehistoric tin.

Contributions to this *TÜBA-AR* section comprise "Stratejık 'Önemi Olan' Bır Metal: Kalay = Tin: A Strategically Important Metal" (Ünsal Yalçın), "Metallogenic Evaluation of Turkey: Implications for Tin Sources of Bronze Age in Anatolia" (Hüseyin Öztürk and Nurullah Hanılçı), "Ein neues Zinnvorkommen in Kayseri-Hisarcık, Zentralanatolien: Ein Vorbericht" (Ünsal Yalçın and Hadi Özbal), "Evidence for Early Use of Tin at Tülintepe in Eastern Anatolia" (Ünsal Yalçın and H. Gönül Yalçın), "Strategic Industries and Tin in the Ancient Near East: Anatolia Updated" (K. Aslıhan Yener), "New Analytical Data from Göltepe Crucibles" (Hadi Özbal), "Lead Isotope Analysis and Chemical Characterization of Metallic Residues of an Early Bronze Age Crucible from Göltepe : Using ICP-MS" (Joseph W. Lehner, K. Aslıhan Yener, James Burton), "Altassyrischer Zinnhandel mit Anatolien" (Horst Klengel), "Die Bedeutung von Zinn im licht der Hethitischen Texte" (Metin Alparslan and Meltem Doğan-Alparslan,), "The Uluburun Tin Ingots and the Shipment of Tin by Sea in the Late Bronze Age Mediterranean" (Cemal Pulak), "Rethinking the Tin Mountains: Patterns of Usage and Circulation of Tin in Greater Iran from the 4th to the 1st Millennium BC" (Barbara Helwig), "Introduction of the Deh Hosein Ancient Tin-Copper Mine, Western Iran: Evidence from Geology, Archaeology, Geochemistry and Lead Isotope Data" (Nima Nezafati, Ernst Pernicka, Morteza Momenzadeh,), and "Prähistorischer Zinnbergbau in Mittelasien" (Gerd Weisgerber). The website for the Turkish Academy of Sciences and the journal *TÜBA-AR* is: http://www.tuba.gov.tr/index_en.php?id=83.

From the book ***Prehistoric ᶜAqaba I***, edited by Lutfi Khalil and Klaus Schmidt, 2009, Verlag Marie Leidorf, Rahden/Westf., *Orient-Archäologie* Bd. 23, comes a chapter (pp. 295-304) entitled "Evidence of Late Chalcolithic/Early Bronze Age I Copper Production from Timna Ores at Tall al-Magass, ᶜAqaba" by Andreas Hauptmann, Lutfi Khalil, and Sigrid Schmitt-Strecker.

From ***Applied Geochemistry*** 2009, 24(11): 2093-2101 comes "Archaeological reconstruction of medieval lead production: Implications for ancient metal provenance studies and paleopollution tracing by Pb isotopes" (Sandrine Baron, Cécile Le-Carlier, Jean Carignan, and Alain Ploquin). From *Metalla: Forschungsberichte des Deutschen Bergbau-Museums* 2009, 15(1): 21-34 comes "Ancient metallurgy in the Caucasus during the Chalcolithic and Early Bronze Age: recent results from excavations in Western Azerbaijan" (A. Courcier, A. Gasanova, and A. Hauptmann).

More contributions on African metallurgy inlude "Why the Tumtuu are Not Marginalized: New Perspectives on the Positions of the Smiths in Western Ethiopia, Wollega" by Temesgen Burka, and "Re-visiting African Bloom Refining Technology in Tanzania" by Edwinus Chrisantus Lyaya, published in issue No. 72, December 2009, of *Nyame Akuma*, Bulletin of the Society of Africanist Archaeologists. Another African metallurgy contribution from *African Archaeological Review*, vol. 26, no. 4, December 2009, is "Variability in Eritrea and the Archaeology of the Northern Horn during the First Millennium BC: Subsistence, Ritual, and Gold Production" by P.R. Schmidt, while from vol. 27, no. 1, March 2010, comes "The Hammers of Mawu: Ironworking Traditions in the Togo Hills, Ghana: Recent Iron Age (seventeenth to twentieth centuries), Ghana, West Africa" by Len Michael Pole.

**Ph.D. Theses**

***Prehistoric Copper Production and Technological Reproduction in the Khao Wong Prachan Valley of central Thailand.*** Thomas Oliver Pryce (UCL Institute of Archaeology, University College London, London), 2009, 394 p., 157 illustrations, 52 tables, 24 appendix tables. Employing a technological approach derived from the 'Anthropology of Technology' theoretical literature, this thesis concerns the identification and explanation of change in prehistoric extractive metallurgical behaviour in the Khao Wong Prachan Valley of central Thailand. The 'Valley' metallurgical complex, amongst the largest in Eurasia, constitutes Southeast Asia's only documented industrial-scale copper-smelting evidence. The two smelting sites investigated, Non Pa Wai and Nil Kham Haeng, provide an interrupted but analytically useful sequence of metallurgical consumption and production evidence spanning c. 1450 BCE to c. 300 CE. The enormous quantity of industrial waste at these sites suggests they were probably major copper supply nodes within ancient Southeast Asian metal exchange networks. Excavated samples of mineral, technical ceramic, and slag from Non Pa Wai and Nil Kham Haeng were analysed in hand specimen, microstructurally by reflected-light microscopy and scanning electron microscopy (SEM), and chemically by polarising energy dispersive x-ray fluorescence spectrometry ([P]ED-XRF) and scanning electron microscopy with energy dispersive x-ray fluorescence spectrometry (SEM-EDS).

Resulting analytical data were used to generate detailed technological reconstructions of copper smelting behavior at the two sites, which were refined by a program of field experimentation. Results indicate a long-term improvement in the technical proficiency of Valley metalworkers, accompanied by an increase in the human effort of copper production. This shift in local 'metallurgical ethos' is interpreted as a response to rising regional demand for copper in late prehistory.

***Assaying and smelting noble metals in sixteenth-century Austria: a comparative analytical study***. Aude Mongiatti (UCL Institute of Archaeology, University College London, London), 2009, 354 p., 178 figures, 22 tables. This thesis aims primarily at furthering our understanding of the technologies involved in the metallurgy of precious metals during the Renaissance, by combining a critical evaluation of historical texts with the analytical study of contemporary archaeological remains. In

particular, this work focuses on high-temperature processes performed in the fire assay and smelting of ores, by investigating two archaeological case studies from sixteenth-century Austria: the small-scale laboratory of Oberstockstall – the most complete Renaissance laboratory ever recovered –, and the contemporary large-scale gold smelting site of the Angertal. The analytical techniques used are optical microscopy, X-ray fluorescence, and scanning electron microscopy-energy and wavelength dispersive spectrometry.

In the Oberstockstall laboratory, the study of high-temperature residues produced in triangular crucibles, scorifiers and cupels allows a detailed examination of fire assay practice. The main technical sequence identified is a three-step fusion-scorification-cupellation process, performed on fahlores for their precious metal content, together with a wider range of experimental chemical activities, testing the properties of new materials and illustrating approaches that would prove fundamental in the development of chemistry and modern science.

The analyses of metallurgical remains from the contemporary gold smelting site in the Angertal indicate that silver and gold were extracted from a variety of sulphidic minerals characteristic of the regional mineralization, employing a very standardized technological sequence. Smelting such ores created lead bullion at the bottom of the furnace, which collected most of the noble metals, fayalitic slag on top, and matte in between. The significant gold and silver losses in matte, documented through experimental cupellation of archaeological samples, suggest the possibility of matte being re-smelted, while it demonstrates in practice the links that would have existed between small- and large-scale metallurgical processes.

The archaeological and historical contextualization of these reconstructions, and comparison with contemporary technical treatises, allow a detailed insight into early modern gold and silver extraction and highlight the potential of future work.

***A Lead Isotope Analysis of the Provenance of* Defixiones *(Curse Tables) from Roman Carthage, Tunisia***. Sheldon Arthur Skaggs (The University of Georgia, Athens, Georgia, USA), 2010, xiii+132 p., 24 figures, 12 tables, 3 appendices. A lead isotope study was conducted using thermal ionization mass spectrometry (TIMS) analysis of curse tablets from Roman Carthage and galena ores from northern Tunisia to determine if there was Roman lead mining in Africa Proconsularis, approximately the area of modern day Tunisia. A database was first created from the lead isotope ratios of 83 Tunisian lead ores. These were found to cluster into four types (Nappe/Diapir cluster, Graben/Border cluster, North/South cluster, and the 2nd Layer cluster). The electron microprobe analysis (EMPA) was successfully used to screen the curse tablet samples by X-ray mapping for arsenic, antimony, copper, and silver. This narrowed the number of curse tablets to those most likely produced from Tunisian ores. The curse tablets were then tested using thermal ionization mass spectrometry (TIMS) analysis. A total of 96 Roman lead curse tablets were screened with EMPA and twenty selected for TIMS to determine the ore sources of the lead used to manufacture the tablets. Comparing the lead isotope ratios of twelve of the sixteen tablets most likely to be made of Tunisian lead to samples of Tunisian ores suggests that the Romans were mining lead in Africa Proconsularis and were not relying solely on imports.

**Monumentum Obscurum**

This new occasional feature will spotlight past (old and recent) books/publications in archaeometallurgy which may not have received any/much publicity or which have been forgotten or missed (hence the name of the section). The featured publication for the section premier is a recent but minimally publicized book on ancient metallurgy in Anatolia/Turkey.

***Anadolu: Dökümün Beşiği*** *[Anatolia: Cradle of Castings]*, edited by Önder Bilgi (translation into English by İnci Türkoğlu, English translation edited by Carol Stevens Yürür), Döktaş, Istanbul, 2004, xiv+303p., illus., ISBN: 9758070886; 9789758070886 (paperback). *Anatolia: Cradle of Castings* is an historical and pictorial walk through time of ancient metallurgy in Anatolia (Turkey). It is filled throughout with numerous and wonderful drawings, maps, artists renditions, and photographs of metal objects, ores, metallurgical remains and processes, and archaeological and mining regions. After the initial introductory and background chapters in both English and Turkish – including a Foreword (Yaylali Günay), Introduction (Önder Bilgi), and Castings of Copper-Bronze (Önder Bilgi, Hadi Özbal, Ünsal Yalçın) –the book is divided into five main chronological sections: Pre-Classical Age, Classical Age, Post-Classical Age, Iron Castings, and Industrial Age in Turkey.

Pre-Classical Age (Önder Bilgi) includes discussions on "Late Chalcolithic Age", "Early Bronze Age", "Middle Bronze Age", "Late Bronze Age", and "Iron Age" metallurgy, while the Classical Age (Önder Bilgi) section continues with "Orientalizing, Archaic, Classical Ion-Hellenic Periods", and "Hellenistic Period", and "Roman Period" metallurgy. The Post-Classical Age section includes presentations of "Byzantine Period" (Hülya Bilgi), "Seljuk Period" (Fulya Eruz), and "Ottoman Period" (Fulya Eruz) metallurgy. The section on Iron Castings has discussions on "Iron Technology in Antiquity" (Ünsal Yalçın), "Pre-Islamic Period" (Oktay Belli), and "Islamic Period" (Fulya Eruz) iron metallurgy, and the final section, Industrial Age in Turkey (Yaylali Günay), has discussion of the "Casting Industry in the 19th and 20th Centuries." The book closes with "Last Words" (Önder Bilgi), a chronological table of Anatolian Civilizations, a select bibliography, three wonderful and large maps of ore and metallurgical locations through time, and a fold-out timeline presenting the development of castings through the ages.

**Forthcoming Meetings and Conferences**

***Accidental and Experimental Archaeometallurgy***, the Historical Metallurgy Society Annual Conference, will be held September 2-3, 2010 at West Dean College, which is near Chichester in West Sussex, England. More information about registering for the event and other details can be found by

visiting the following website: http://www.hist-met.org/conf2010.html.

The final program is set and lectures will be held in the College and the experiments will take place on adjacent college land. The first two sessions are on Thursday, September 2nd, with discussants Gerry McDonnell and John Merkel, respectively, and the third and fourth sessions will be on Friday, September 3rd, with discussants David Scott and Tim Young, respectively. The program will include a mixture of oral presentations and reconstruction demonstrations on experimental metallurgy and archaeometallurgy. The experimental program is impressive with at least seven planned experimental reconstructions in both copper and iron metallurgy. David Dungworth will be attempting to reduce rich iron ores to a bloom in a bowl furnace, while both Skip Williams and Gerry McDonnell will be looking to produce cast iron in a shaft furnace.

The Thursday presentations and experimental reconstructions are "25 years of blooming experiments: perspectives and prospects" (Peter Crew, paper to be read by Tom Birch), "Experimental Archaeometallurgy: hypothesis testing, happy accidents and theatrical performances" (David Dungworth), and "Recovering value in experimental archaeometallurgy (Roger Doonan), with a break, followed by "The Application of Metallography to Experimental Ancient Metallurgy: A Review" (David Scott), "Making cast iron in a shaft furnace" (Gerry McDonnell), "The sword as 'serpent': does pattern-welding make Anglo-Saxon swords stronger?" (Thomas Birch), and "What have experimental archaeologists done for us? Iron in the archaeology of the East Yorkshire Iron Age" (Peter Halkon).

Friday's presentations and experimental reconstructions include "Experiments on brass cementation" (David Bourgarit and Nicolas Thomas), "An experimental study of the welding techniques used on the Antique large Bronze Statues" (Aurélia Azéma, Benoît Mille, Patrick Echegut, Domingos De Sousa Meneses), "Experiments in assaying" (Joseph Gauthier), with a break, followed by "Experiments in metallurgy in archaeology: The work of Professor R.F. Tylecote" (John Merkel).

The Freer Gallery of Art presents its Fifth Forbes Symposium, ***Studies of Ancient Asian Metallurgy using Scientific Methods***, on October 28-29, 2010, at the Eugene and Agnes E. Meyer Auditorium, Freer Gallery of Art, Washington, DC. The symposium and proceedings will be in English only. There is no cost associated with the symposium, but registration is required. More information about this symposium, the planned program and registration can be found at: http://www.asia.si.edu/visitor/dcsrSymposium.htm.

The Thursday and Friday lectures will be divided into three sessions: Southeast Asian Bronzes, Chinese Bronzes, and West Asian Copper Alloys. Following a symposium "Introduction", papers in the Southeast Asian Bronzes session include "Session Introduction: Questions about Southeast Asian Bronze Metallurgy" (Paul Jett), "Tin-bronze – a Pan-Asian Technological Phenomenon – and the Development of Metallurgy in Southeast Asia" (Vincent C. Pigott), "Khmer Bronze Metallurgy during the Angkorian Period (12th-13th Century): Technical Investigation of a New Selected Corpus of Bronze Artifacts from the Phnom Penh National Museum" (Brice Vincent), "The Southeast Asian Lead Isotope Project at One Year: Studies in Regional Base Metal Production and Exchange" (Thomas Oliver Pryce), "The High-tin Bronzes of Thailand and their Relationships to those of India and East Asia" (Ian Glover), and "Casting of Ancient Drums in North Vietnam" (Sinh Trinh).

The second session, Chinese Bronzes, begins Thursday afternoon and concludes Friday morning. Paper presentations include the "Session Introduction: A Chemist Under a Spell: R. J. Gettens and Chinese Bronzes" (Francesca Bewer), "The Making of the Freer Chinese Bronze Book Volume Two" (W.T. Chase), "Theories and Observations: Still Looking at the Freer Bronzes" (Robert Bagley), "Technical Studies of Chinese Bronze Vessels in the British Museum Collection" (Quanyu Wang), "Recent Research on Early Bronze Metallurgy in Northwest China (Jianjun Mei, Lu Shen, Jianwei Xu, Hui Wang), "An Enlightened Journey: Transitions in Casting of Chinese Buddhist Images" (Donna Strahan), "Decorated Chinese Bronze Mirrors in the Cotsen Collection" (David Scott), and "Recent Discoveries Concerning Metallurgy in Bronze Age Yunnan" (Zhengyao Jin, Gong Li, Lifeng Yan, Zhilong Jiang).

The final session, West Asian Copper Alloys, includes the "Session Introduction: Ten millennia of Copper Alloy Metallurgy in Western Asia: Influences and Interactions" (Paul Craddock), "The Bazgir Hoard from Golestan Province in Northeastern Iran" (David Meier), "Chalcolithic Crucible Smelting at Tal-i Iblis, Iran" (Lesley D. Frame), "Metallurgy During the Middle Chalcolithic (last third of the 5th millennium B.C.) in South Caucasus : an Insight through Recent Discoveries at Mentesh-Tepe (Azerbaijan)" (Antoine Courchier), "Zinc Alloys at Nuzi?: Dilemmas from an Early Collection" (Katherine Eremin, Andrew Shortland, Susanna Kirk, Megan Richters, Patrick Degryse, Marc Walton), "Techniques of Antique South Arabian Large Bronze Statues" (Benoît Mille), and "Medieval Islamic Copper Alloys" (Susan La Niece, Rachel Ward, Duncan Hook, Paul Craddock).

The Historical Metallurgy Society will have another brief conference in ancient metallurgy with ***Research in Progress 2010***, to be held Wednesday, November 10, 2010, at the Institute of Archaeology, University College London (UCL). Information on registration and the most recent call for papers can be found at the following website: http://www.hist-met.org/hmsrip2010.html.

This meeting is aimed at a wide variety of contributors, from historical and archaeological metallurgists to excavators, historians and economists. If you are working, or have just finished working, on a project related to archaeological or historical metallurgy, the organizers would like to hear from you. They are particularly interested in bringing together contract and public sector archaeologists with academic researchers, and in fostering links between the different disciplines studying metallurgy and related activities. Whether

you are a graduate student, an archaeometallurgical expert, an interested non-specialist or a professional excavator, they invite you to meet others working in this field and present your research to an interested community. Proposals for 10-15 minute oral papers are welcomed from anyone undertaking work in any area of historical metallurgy/archaeometallurgy, and from other researchers whose focus is of relevance to this subject. Titles and 400 word abstracts should reach the organizers, by Monday September 27, 2010 at: hms.rip2010@gmail.com.

The ***First International Meeting on Prehispanic Mining in the Americas*** will be held November 29-December 4, 2010, in Taltal & San Pedro de Atacama, Chile. At present there is no website associated with the conference, but when one becomes available I will add that information. I have reproduced below some information from the first call for papers circular.

Since the first human occupations of the American continent until now, human beings have used different types of minerals. During the Paleo-Indian Period the use of iron oxides is well documented both in functional and ritual contexts from North America to Tierra del Fuego. In the Archaic Period other minerals were also used systematically, such as copper, lead and manganese, from which color pigments and lapidary artifacts were made. During the Formative Period all former uses continued and even increased, but we also see the appearance of metallurgy, first in gold and copper, later in silver and tin, amongst others. Thus, we can say that mining has been an important activity throughout American history, a privileged witness of its processes until today.

In spite of the role that mining has played in American prehistory, we still know very little about its characteristics. Most archaeological research has concentrated on later phases of the productive process, namely metallurgy, lapidary or the preparation and use of colorants and pigments. But there are few studies on how these minerals were extracted.

There are two archaeological projects working on these topics currently in northern Chile, and they have provided first hand data on America's ancient mining activities. The purpose of this meeting is to congregate different scholars interested in American prehistoric mining to share results, and to discuss research experiences and perspectives on mining in prehistory. The following topics are considered especially interesting for the meeting: Research methodologies in the study of prehistoric mining; prehistoric mining technology and exploitation strategies; settlement, social and economic organization of prehistoric mining production; prehistoric mining and its impact on surrounding environments; mineral-source analysis.

In order to present a paper at the *First International Meeting on prehistoric Mining in America*, kindly send your abstracts before June, 30 2010. Papers can be presented both in Spanish and English. Abstracts must be sent to the following email address: fimpma@gmail.com. Abstracts should not exceed 4000 characters (authors and institutional affiliation included). Registration costs are: Presenters: US$ 50, Observers: US$ 30; and Students: US$ 20, with an additional cost of US$ 200 for guided visits to mining and archaeological sites, and for workshops. For further information contact Diego Salazar <dsalazar@uchile.cl>.

The Materials Research Society (MRS) will be holding it annual meeting in Boston Massachusetts, from November 29 to December 3, 2010. This year the MRS will hold ***Materials Issues in Art and Archaeology Symposium IX***, and the call for papers is available at: http://www.mrs.org/s_mrs/bin.asp?CID=25914&DID=307677&DOC=FILE.PDF. The organizers are particularly interested in papers that focus on ancient technologies, nondestructive analysis, and cutting edge applications of modern technology to the study of archaeological and artistic materials. They hope to include at least one session that focuses on technological change and important technological transitions in prehistory, antiquity, and history. Possible paper topics include the relationship between late bronze and early iron smelting, the connection between glazing technology and glass manufacture, or ceramic technology and early copper smelting. However, the submission deadline, June 22, has passed.

The Groupe des Méthodes Pluridisciplinaires Contribuant à l'Archéologie (GMPCA) will hold the conference ***Archéométrie 2011: XVIII$^{e}$ colloque du GMPCA***, will be held April 11-15, 2011, on the site of Sart Tilman at the University of Liège, Belgium. The languages of the conference are French (principal) and English. Registrations fees are 80€, 65€ for GMPCA members, and 50€ for students. The final submission date for abstracts is November 15, 2010, which can be sent to colloque.archeometrie@ulg.ac.be. The Colloque will have several themes, including sessions on metals, glass, ceramics, and analytical tools, instruments, and methods in archaeometry. More information about the Colloque and registration information will be available at: http://www.archeometrie2011.ulg.ac.be.

The ***XVII$^{th}$ International Congress of Ancient Bronzes: The Art of Bronzes in Anatolia and the Eastern Mediterranean from Protogeometric to Early Byzantine Periods (10th century B.C. to 7th century A.D.)*** will be held May 21-25, 2011, in Izmir, Turkey. At present there is no website associated with the conference, but when one becomes available I will add that information. I have reproduced below some information from the first call for papers circular.

This congress encourages dialogue among Turkish, European, and north American scholars in bronze archaeology of the Eastern Mediterranean, and proposes to offer a firm base for future research on bronzes in Turkey. We invite contributions by scholars and graduate students from disciplines related to this subject to discuss issues concerning ancient bronzes in the Mediterranean basin. Proposals may be for 10- to 20-minute papers, as well as for poster presentations.

One goal of this congress is to present the less well-known bronze materials from Anatolia and other neighboring countries in the east. Presentations from the other parts of Classical world are also welcome. We hope to address questions of production, subject matter, function, chronology, and trade. Papers may

deal with archaeology, technological history, history of art, philology, cultural anthropology. Of particular interest are reports from excavations in Asia Minor and the rest of the Eastern Mediterranean yielding Greek and Roman bronzes along with other stratified finds that will help to build a more precise chronology for the bronzes.

Papers may be delivered in English, French, German, Italian, Spanish, Greek or Turkish, but English is the preferred language. Please fill out the form below regarding your intention to participate and send it to Dr. Ergun LAFLI. Submit an abstract of no more than 300 words and attached registration form before February 1, 2011 to <ergun.lafli@deu.edu.tr>, or by fax to +90.232.453 41 88. Abstracts of the congress will be available at the congress, and proceedings of the congress will be published in 2013.

The three-day congress will be combined with two days of post-congress excursions on May 24 and 25 to three archaeological museums with large bronze collections in Izmir as well as to Ephesus and its museum. The participation fee of €40 (60 $US), to be paid on site, will include coffee and refreshments at breaks, and post-congress excursions, but not abstracts, publication of the proceedings, or your accommodation and travel expenses. Hotels available for the congress participants will be announced in a future circular.

A congress website will soon be established, and participants will be informed. The Scientific Organizing Committee comprises: Doç. Dr. Ergün LAFLI (DEU), Prof. İlter UZEL (Çukurova University, Adana) and Dr. Maurizio BUORA (Udine). Contact Address for the Congress: XVII$^{th}$ International Bronze Congress, c/o Doç. Dr. Ergün LAFLI, Dokuz Eylül Üniversitesi, Edebiyat Fakültesi, Arkeoloji Bölümü, Tınaztepe/Kaynaklar Yerleşkesi, Buca, TR-35160 Izmir, TURKEY, Fax/email: +90.232.453 41 88 / ergun.lafli@deu.edu.tr.

**Previous Meetings and Conferences**

The ***38$^{th}$ International Symposium on Archaeometry (ISA 2010)***, was recently held in Tampa, Florida from May 10-14, 2010. A number of posters and presentations with themes relating to metallurgy and metal-bearing minerals were presented. Oral presentations included "Chalcolithic arsenical copper Smelting in Kolubara, western Serbia" (Radivojevic, Miljana; Rehren, Thilo; Blagojevic, Mirjana), "Towards assessing the technological role of the "perforated furnaces" in Early Bronze Age Siphnian (Aegean) lead-silver production" (Bassiakos, Yannis; Georgakopoulou, Myrto; Papadpopoulou, Zozi), "Metallurgy during the 3rd Millennium BC in Upper Mesopotamia: A case study from Tell Chuera and Tell Raqa'i" (Franke, Kristina A.), "Gold jewelry in Ancient Egypt: Gold origin and polychromy, wire, granulation, and soldering techniques" (Guerra, Maria Filomena; Troalen, Lore; Tate, James; Manley, Bill), "Native Copper in the Prehistory of Northeastern North America: Provenance Studies Using Lead Isotope Analysis" (Cattin, Florence; Gauthier, Gilles; Véron, Alain; Poirier, André; Burke, Adrian), "Indigenous silver production at Lake Titicaca, Peru, from 1900 BP to 400 BP" (Rehren, Thilo; Schultze, Carol), "Silver coinage, provenance and trade between Africa and Europe during the Almohad Empire (13th century A.D.): Archaeometric characterization of a dirhams' hoard excavated in Seville (south-west Spain)" (Hunt-Ortiz, Mark A.; García Rivero, Daniel; Montero Ruiz, Ignacio; Valencia Rodríguez, Rafael; Oliva Alonso, Diego), "Metallic encounters in Cuba: The technology, exchange and meaning of metal ornaments before and after Columbus" (Martinón-Torres, Marcos; Valcarcel Rojas, Roberto; Guerra, Maria Filomena), "Zinc production in Chongqing, southwest China, during the Ming dynasty (1368-1644): A case study at Miaobeihou site" (Zhou, Wenli; Chen, Jianli; Liu, Haiwang; Yuan, Dongshan; Martinon-Torres, Marcos), "The apparition and the utilization of the indirect process of iron production in the Mosan region: A new perception given by the archaeometallurgical study of ferrous reinforcements in medieval frames" (Pagès, Gaspard; Mertens, Anne; Maggi, Christophe; Dillmann, Philippe; Hoffsummer, Patrick; Mathis, François), "A new multivariate approach for identifying provenance: The trading of medieval ferrous products in Ariège (French Pyrenees) and the supply of construction iron used in Popes' Palace in Avignon" (Leroy, Stéphanie; Dillmann, Philippe; Cohen, Serge; Gratuze, Bernard; Tereygeol, Florian; Verna, Catherine), and "A workshop for the craftsmen of king Canute?" (Jouttijärvi, Arne).

A wide variety of metallurgically themed papers also were presented as posters including "Investigations of lead pipes and drainage system at Castel Viscardo excavation site" (Daigle, Anna M.; Donais, Mary Kate; George, David; Duncan, Brad), "The metal production at Tepe Düzen (SW Turkey): An archaeological and archaeometric study" (Vyncke, Kim; Music, Branco; Degryse, Patrick; Waelkens, Marc), "Chemical composition of bronze fibulae from ancient Thrace (Bulgaria)" (Bonev, Velislav V.; Zlateva-Rangelova, Boika; Kuleff, Ivelin), "Study of Andean metallurgy by energy dispersive X-ray fluorescence" (Bravo, Jorge A.; Mejia, Mirian; Delgado, Mercedes; Trujillo, Alejandro), "Copper isotopic data from ancient copper metallurgy in Ingadanais, (Vila Velha de Ródão) Portugal" (Carvalho, João; Gaspar, Miguel; Archer, Corey), "Negotiating a colonial Maya identity: Metal ornaments from Tipu, Belize" (Cockrell, Bryan R.; Martinón-Torres, Marcos; Graham, Elizabeth), "The mineralogical and chemical evolution from ore to cinders and slag at the iron works of Clintonville, NY" (Farthing, Dori J.), "Significant others? Returning meaning to metal-detected objects through chemical analyses of Romano-British copper alloys and enamels" (Fillery-Travis, Ruth G.), "Experimental archaeology? Exploratory statistical examination of Roman copper alloys using principal component and cluster analysis" (Fillery-Travis, Ruth G.), "Ancient metals provenancing by statistical analysis: A geochemical database of Alpine copper mines" (Giunti, Ilaria; Artioli, Gilberto; Angelini, Ivana; Giussani, Barbara; Villa, Igor M.), "Mycenaean gold: Jewelry production techniques and the myth of the Golden Fleece" (Guerra, Maria Filomena; Walter, Philippe; Adrimi-Sismani, Vassiliki), "The technology and comparative study of two early iron production sites in Henan, China" (Hong, Qiyan; Chen, Jianli; Rehren, Thilo), "Archaeological register and lead isotopes analysis in the Chalcolithic (3rd millennium B.C.): Metal production in

south-west Iberian Peninsula: ore provenance, transformation and distribution" (Hunt-Ortiz, Mark A.; Hurtado Pérez, Víctor), "Technological choices and metallurgical ceramics in SW Iberian Peninsula during III millennium BCE" (Inácio, Nuno; Nocete, Francisco; Nieto, José Miguel; Sáez, Reinaldo; Bayona, Moisés; Daniel, Abril), "Chemical composition of Bronze Age metal artefacts from Bulgaria" (Ivanova, Silviya I.; Zlateva, Boyka; Kuleff, Ivelin), "Use of magnetite ores in bloomery iron smelting: Kinetic and Chemical Considerations" (Killick, David J.), "ED-XRF analysis of gold from Chalcolithic necropolis of Varna (mid 5th millennium BC)" (Todorov, Boyan; Georgieva, Gergana; Lyubomirova, Valentina; Kuleff, Ivelin), "Geochemical characteristics of copper ores from the eastern Alps and their relevance as a source of copper in prehistory" (Lutz, Joachim; Pernicka, Ernst; Pils, Robert; Tomedi, Gerhard; Vavtar, Franz), "Early copper smelting in northern Chile" (Maldonado, Blanca E.; Rehren, Thilo; Pernicka, Ernst), "Trace element compositions and lead isotopy of Armenian Neolithic, Eneolithic and Early Bronze Age metal artefacts and comparison to ore sources" (Meliksetian, Khachatur Pernicka, Ernst; Badalyan, Ruben; Brauns, Michael; Avetissyan, Pavel), "Abitibi (Quebec, Canada): Copper-based artifacts from the Fur Trade Post and Amerindian sites" (Moreau, Jean-Francois; Hancock, R.G.V.; Côté, Marc; Beaudry, Mathieu), "Metal production in Israel during the Persian period: Archeometallurgical and geometallurgical research" (Sari, Kamil), "Variation in data reported from handheld XRF analysis resulting from minor alterations to machine calibration" (Shugar, Aaron), "Copper isotopes in archaeology: Case-studies of archaeological metals and minerals in the southwestern U.S." (Thibodeau, Alyson M.; Ruiz, Joaquin; Chesley, John; Thomas, Noah; Killick, David; Mathur, Ryan), "Recent archaeometallurgical research of pre-colonial copper and iron production at Shankare Hill, northern Lowveld, South Africa" (Thondhlana, Thomas P.; Martinón-Torres, Marcos; Chirikure, Shadreck), "Analysis of Peruvian metal artifacts in the Orlando Museum of Art" (Tykot, Robert H.), "Composition of bronze and other metal artifacts in the Tampa Museum of Art" (Tykot, Robert H.), "Chemical composition of stamps, moulds and matrixes from Ne Bulgaria: An archaeometallurgy study" (Zlateva-Rangelova, Boika K.; Bonev, Velislav V.; Iliev, Ilian; Kuleff, Ivelin), "Characterisation and provenancing of iron earth pigments by physical and geochemical methods" (Panczyk, Ewa; Panczyk, Magdalena; Giemza, Jaroslaw; Zachariasz, Piotr; Walis, Lech), and "Provenance studies of turquoise artifacts from central Arizona Salado sites and comparison to regional sources using PIXE and XRD" (Simon, Arleyn W.; Crider, Destiny; Murakami, Tatsuya; Wilkens, Barry). The full program and abstracts can be viewed at: http://isa2010.cas.usf.edu/38th%20ISA%20Final%20Program.pdf.

**Obituary**

The following obituary about a great researcher in archaeometallurgy, Gerd Wesigerber, was kindly provided by Chris Thornton.

On June 22, 2010, at the age of 72, Gerd Weisgerber lost his long fight against cancer. He is survived by his wife Angelika and his children Andreas and Monika. Gerd Weisgerber studied European prehistory at the university of Saarbruecken, where he got his Ph.D. in 1970. As assistant to Professor Rolf Hachmann, he came into contact with the Middle East while organizing excavation campaigns for Kamid el-Loz in Lebanon. A pioneer in the study of ancient mining, Gerd Weisgerber's international career started when he was appointed the first mining archaeologist ever at the German Mining Museum (Bochum) in 1973. For almost 40 years, his explorations in Europe, in the Mediterranean and the Near East have broken ground in the fields of archaeometallurgy, ancient mining, and archaeology. Work at Timna, Israel, was followed by expeditions in Iran, before he started his lifelong work on the mining history and archaeology of the Sultanate of Oman.

Beginning with his seminal research at the Bronze Age mining and metallurgical site of Maysar, Gerd and his team went on to define the Iron Age cultures of Oman (at Lisq, Samad), and to characterize the mining and metallurgical history of this country from 3000 BC to 1950 AD. Omani archaeology and the search for ancient "Magan" ("Makkan") occupied him for the rest of his life, as he returned there for more excavations and explorations almost every year until his death. In addition, Gerd is credited with exploring ancient mining and metallurgy in Siphnos and Thasos in Greece, in Jordan, in Iran again, in Central Asia, in Thailand, in Spain, in Portugal, in France, and of course in Germany.

At home, he used his post to establish step-by-step a department for mining archaeology and ancient metallurgy at the German Mining Museum, bringing experts permanently to Bochum. In 1984 he was appointed deputy director of the museum. In 1987 he was awarded an honorary professorship at Freiburg University, where he taught mining archaeology for many years.

In 2003, friends and colleagues from all over the world presented him with a festschrift: *Man and Mining/Mensch und Bergbau: Studies in honour of Gerd Weisgerber on occasion of his 65th birthday*. They expressed the hope to have him with all his expertise around for many more years. But sadly, we all knew that many more years would not be given to him. So we will remember a devoted archaeologist, overwhelming everybody with his friendship, his enthusiasm and his profound knowledge.

# BOOK REVIEW

**What Your Fossils Can Tell You: Vertebrate Morphology, Pathology, and Cultural Modification** Robert W. Sinibaldi, University Press of Florida, Gainesville: 2010, xxiv + 320 pp., 473 b/w illustrations, glossary, notes, selected references, acknowledgments, index. Price US$39.95 (hardcover). ISBN 978-0-8130-3425-6.

*Reviewed by Darryl R. Ricketts, Forensic Anthropology Division, Boston University School of Medicine, Boston, MA 02118, USA*

In *What Your Fossils Can Tell You*, Robert Sinibaldi, a former president of the Tampa Bay Fossil Club and currently a member of the board of directors, has presented a comprehensive fossil guide based on years of personal experience and collaborations with scholars across multi-disciplinary fields. As he contends that he is no expert in the field, Sinibaldi backs up his knowledge with a surplus of endnotes and research articles, along with hundreds of figures, which makes this book more than adequate as a resource manual.

The book is organized in an intuitive manner, with half of the book devoted to explaining what fossils are, how they are formed, and the various structures and terminology involved in fossilized bony tissue. The second half of the book is dedicated to describing a number of processes, both natural and man-made, that can act upon fossilized material and how to identify them. Fully a third of the book is dedicated to describing the various morphological traits in vertebrate anatomy, particularly the fossil teeth record, which has two entire chapters devoted to morphology and pathology of dental material.

Chapter 1, Introduction, is an overview of the field from the perspective of a novice. A relatively short chapter, the introduction deals with the general purpose and use of the book, along with the definitions of terms such as morphology, pathology, and cultural modification. Sinibaldi also differentiates between vertebrates and invertebrates, explains the fossilization process, and describes the geological timeframes involved in amateur and professional fossil hunting.

Chapter 2, The Morphology of Fossil Bones, begins a comprehensive look at the different physical aspects of fossilized bones, beginning with a discussion of the diverse types of joints, through tendon and ligament attachments, and ending with a discussion of the various natural processes by which bones grow, attach, and articulate with one another, and the identifying marks that these processes leave behind. Sinibaldi spends a great amount of time explaining the scientific terminology of the various surface aspects, including identifying growth plates to determine age. Using these techniques, the author describes how to differentiate between terrestrial verses aquatic lifestyles, and monocular versus binocular vision in fossilized skulls. This chapter and the next are excellent condensed teaching guides for osteology in mammals.

Chapter 3, The Morphology of Fossil Teeth, gives a thorough introductory course in mammalian dental structure, growth, and identification, with special emphasis on the differences between herbivore, omnivore and carnivore applications. The author puts a great deal of importance on the dental record, as the hardness of teeth makes them the most likely to be found in the fossil record. Shark, reptile, and fish teeth are covered as well as stages of development and age determination. This chapter, in addition to Chapter 2, provides a comprehensive explanation of the different kinds of fossils that may be found and how to identify them in a professional manner, and would make for a great field manual by itself.

Chapter 4, Natural Alterations to Fossils, begins by pointing out that the vast majority of surface anomalies in fossilized bone is likely to be of natural origins, and this chapter covers four categories of post-mortem changes that can naturally occur in the fossil record: biological, geological, hydrological and atmospheric alterations. In covering the natural damage to fossils, including worm holes and root markings, the author explains how to effectively differentiate these markings from the similar markings of cultural modification and pathological processes. Geological, hydrological and atmospheric alterations are also explained, and coverage is given to how these interactions and geological forces can alter the original specimen. Sinibaldi explains how these processes are identified and categorized apart from other processes.

Chapter 5, Pathologies in Fossil Bones, presents clear explanations and definitions to what can typically be a difficult and exhaustive specialty: injury, stress and disease pathology expressed in fossilized bone. Not intended to be an in-depth analysis, this chapter simply points out the major structural changes that can occur in the fossils and how to identify them, including bone fusion, bone necrosis, inflammation (Ostietis), and arthritis. Stress and trauma is given a particular emphasis in the second half of the chapter, including fractures, bite marks, and birth defects.

In Chapter 6, Pathologies in Fossil Teeth, Sinibaldi discusses the importance of identifying dental wear and disease when looking at the fossil record, since dental anomalies can identify a wide variety of problems including diet, population sizes, stressors and diseases. Typical characteristics of wear patterns, dental caries, specific injuries and diseases are discussed. Sinibaldi spends a great deal of time in this chapter discussing anomalies in shark teeth, as these fossils are often found due to the excessive hardness of fossilized teeth and the abundance of shark remains found in the Florida region.

The last third of the book, Chapter 7, Cultural Modification of Bones, Antlers, and Teeth, covers the intentional and unintentional modifications of bony material by Paleo-Indians in the archaeological record. The author imposes his own standards and classifications of use on most of the worked items. This is not uncommon, however, even among professional archaeologists and paleontologists, where the use of unknown items may at times be little more than educated guesses. Historical background information is presented for

periods and stages from the Paleo-Indian period of about 12,000 years ago to the historical contact period. Unintentional modifications are briefly covered, and the remainder of the chapter focuses on intentionally worked items made of bone, antler, and teeth.

Fishhooks, atlatls, spears, arrowheads, buttons and awls, and decorated items both fragmented and whole, are covered in depth. The particular emphasis on usage and identification makes an impressive list of items that could be found by the amateur fossil hunter. Unfortunately, very little advice is given for the proper recovery of cultural artifacts, other than to check with the local laws since they vary from state to state, and the ethical implications of keeping these artifacts are given the same scant discussion. Sinibaldi merely advises the reader to check with local archaeological or paleontological organizations to see if the item has scientific value. I would have liked to see further discussion on ethically correct methods of the disposition of culturally modified artifacts and archaeological sites and the importance of preserving such finds for professional examination, since this book is written mainly for the novice who may not be aware of their importance.

Throughout the book, the author does an excellent job of explaining general morphology and showing the numerous processes that can affect fossils and mislead the avid fossil hunter. Almost any process that can affect fossilized material is discussed and explained in both technical terms as well as layman's terms, and shown in the numerous figures that accompany the text. This book was designed for the amateur fossil hunter in mind, but can also be extremely useful for the professional fossil hunter, as well as undergraduate and graduate students who may be interested in vertebrate morphology and pathology or as a comparative analysis and identification of mammalian fossils.

One point of contention is, of course, the use of black and white images in showing pathological and morphological characteristics, as it is often difficult to identify certain traits with anything other than color images. However, as a reference source and as an introductory teaching guide, *What Fossils Can Tell You* effectively bridges the gap between generic fossil-hunting aids and more sophisticated college texts.

## UPCOMING CONFERENCES

*Rachel S. Popelka-Filcoff, Associate Editor*

**2010**

2-6 August. 59th Annual Denver X-ray Conference. Denver, Colorado, U.S.A. General information: http://www.dxcicdd.com/

8-12 August. The Meeting of the Americas. Foz Do Iguassu, Brazil. Special Session GP11: Modern Magnetic and Other Physical Techniques Applied to Archaeology and Anthropology. General information: http://www.agu.org/meetings/ja10/program/index.php

21-27 August. 20th General Meeting of the International Mineralogical Association. Budapest, Hungary. General information: http://www.ima2010.org/

22-26 August. 238th National Meeting and Exposition, American Chemical Society. Boston, MA, USA. General information: http://www.acs.org.

23-28 August. 11th International Conference, International Council for Archaeozoology, Paris. France. General information: http://www.alexandriaarchive.org/icaz/ICAZ2010/ICAZ%202010%20-%20home%20page.htm

7-11 September. Fourth International Symposium on Biomolecular Archaeology. Copenhagen, Denmark. Abstract deadline: May 1 2010. General information: http://www.isba4.net/index.php

16-19 September. AIMA 2010 Conference: Perceptions and Misconceptions of Maritime Heritage: accuracy and impact in the public domain, Melbourne, Australia. Call for session proposals due April 30th 2010. General information: http://www.heritage.vic.gov.au/Maritime/AIMA2010.aspx

16-18 September. International Aerial Archaeology Conference, AARG 2010. Bucharest, Romania. General information: http://www.univie.ac.at/aarg/php/cms/

16-19 September. International Past Global Changes (PAGES) Workshop on Floodplain Lakes to be held in Fayetteville, AK USA. General information: http://comp.uark.edu/~shausman/PAGESworkshop/floodplain.html

19-24 September. 7th International Microscopy Congress (IMC17) Rio de Janeiro, Brazil. Special session: Symposium on Materials in Archaeology and Cultural Heritage (S-M20), Abstract deadline: April 30 2010. General information: http://www.imc-17.com/

23-24 September. 7th New World Luminescence Dating and Dosimetry Workshop, Montreal, Canada. General information: http://lux.uqam.ca/

23-26 September. XIX Congress of the Carpathian Balkan Geological Association, Thessaloniki, Greece. General information: http://www.cbga2010.org/

26 September- 1 October. 18th International Sedimentological Congress (ISC), Mendoza, Argentina. Special session on Palaeoceonography. Contact information: Tom Stevens Thomas.Stevens@rhul.ac.uk General information: http://www.isc2010.com.ar/english/home.html

30 September – 2 October. Australasian Society for Historical Archaeology Conference, Brisbane, QLD, Australia. General information: http://socialscience.uq.edu.au/asha-2010-registration

6-9 October. Plains Conference. Bismarck, ND, U.S.A. General information: http://www.ou.edu/cas/archsur/plainsanth/meeting/meeting.htm

18-19 October. Digital Preservation of Archaeological Heritage, Kanpur, India. General information: http://www.iitk.ac.in/arch3d/

31 October- 3 November. The Geological Society of America National Meeting. Portland Oregon, USA "Reaching New Peaks in Geoscience". General information: http://www.geosociety.org/meetings/

2-5 November. Science and Past: From Ancient Methods to New Technologies, Zaragoza, Spain. Interdisciplinary course for graduated students and professionals on cultural heritage. General information: http://iuca.unizar.es/idi.php?section=25

8-13 November. EuroMed2010, Lemesos, Cyprus. "Interdisciplinary and multi-disciplinary research concerning both cutting edge Cultural Heritage informatics and use of technology" General information: http://www.euromed2010.eu/

7-10 November. SR2A: Synchrotron Radiation in Art and Archaeology. Amsterdam, The Netherlands. General information: http://www.sr2a.ua.ac.be/

12 November. Second Science and Archaeology Symposium in Urbana. Urbana, IL, USA. Regional conference on archaeological science. General information: http://www.isas.illinois.edu/atam/newsandevents/atamconf2010.html

17-20 November. American Schools of Oriental Research Annual Meeting. Atlanta, GA USA. General information: http://www.asor.org/am/index.html

1-3 December. Association for Environmental Archaeology (AEA) Annual Conference, Kyoto, Japan. General information: http://www.envarch.net/events/index.html#Kyoto

9-13 December. Australian Archaeological Association Annual Conference, Australian National University, Canberra, ACT, Australia. General information: http://arts.anu.edu.au/AandA/archaeology/aaaconference/aaaconferencehome.asp

13-17 December. AGU Fall Meeting, San Francisco, CA USA. General information: http://www.agu.org/meetings/

**2011**

5-9 January. Society for Historic Archaeology Conference on Historical and Underwater Archaeology, Austin, TX, USA. General information: http://www.sha.org/

7-9 January. 113th Joint AIA/APA Annual Meeting. San Antonio, TX USA. General information: http://www.archaeological.org/webinfo.php?page=10096

7-11 January. 5th International Biogeography Society Meeting, Crete. General information: http://www.biogeography.org/html/Meetings/index.html

13-18 March. Modern Trends in Activation Analysis, College Station, TX, U.S.A. Special session on Archaeometry. General information: http://tti.tamu.edu/conferences/mtaa13/

13-18 March. Pittcon Conference and Expo, Atlanta, GA, USA. General information: http://www.pittcon.org/

20-25 March. Twelfth International Conference on Accelerator Mass Spectrometry, Wellington, New Zealand at the Museum of New Zealand, Te Papa Tongarewa. General information: http://www.gns.cri.nz/ams12/.

27-31 March. 241st ACS National Meeting and Exposition, Anaheim, California, U.S.A. General information: http://acs.org

30 March- 3 April. Society for American Archaeology 76th Annual Meeting. Sacramento, CA USA. General information: http://www.saa.org/meetings/index.html

3-6 April. Qin Period Metallurgy and its Social and Archaeological Context. Xian, China. General information: http://www.ucl.ac.uk/silva/archaeology/events/conference/qinmetallurgy2010

3-8 April. European Geosciences Union General Assembly 2011, Vienna, Austria. General information: http://www.egu.eu/

11-15 April. Archéométrie 2011, Liege, Belgium. General information: http://www.archeometrie2011.ulg.ac.be/Welcome.html

12-16 April. American Association of Physical Anthropologists Annual Meeting. Minneapolis, MN, USA. General information: http://physanth.org/annmeet/

12-16 April. Paleoanthropology Society Meetings, held in conjunction with the American Association of Physical Anthropologists. Minneapolis. MN, USA. General information: http://www.paleoanthro.org/meeting.htm

10-12 May. GLASSAC 11-Conference (Glass Science in Art and Conservation) in the Bronnbach Monastery near Wuerzburg, Germany. "Innovative technologies in glass art, design and conservation from the 19th to the 21st century – the role of the sciences" General information: http://www.glassac.eu/

20-27 July. INQUA 2011: Quaternary Sciences-the view from the mountains, Bern, Switzerland. General information: http://www.inqua.tcd.ie/congress.html

14-19 August. Goldschmidt 2011. Prague, Czech Republic. General information: http://www.goldschmidt2011.org/

22-26 August. 238th National Meeting and Exposition, American Chemical Society. Boston, MA, USA. General information: http://www.acs.org.

28-31 August. CANQUA/Canadian Chapter of the International Association of Hydrologists. Quebec City, Canada. General information: http://www.mun.ca/canqua/index.html

**2012**

2-10 August. 34th International Geological Congress. Brisbane, Australia General information: http://www.34igc.org/

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