



SAS Bulletin

Newsletter of the Society for Archaeological Sciences

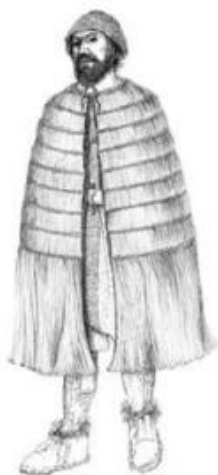
Volume 32 number 3

Fall 2009

The Chalcolithic Chieftain

Ötzi, Europe's oldest natural human mummy (dating to about 5,300 years ago), has not ceased in making headlines since his discovery in 1991. Apart from the excavation itself, most of the headlines have been grabbed by archaeometrists, making Ötzi the poster child for archaeological science. What is impressive about the find is the way in which so many different analytical techniques have been combined to uncover the facts of his life, each time moving one step closer to solving this really, really cold case of the Chalcolithic chieftain.

Ötzi, along with his belongings and environment, have been investigated by a wide range of techniques, including DNA analysis, isotope analyses of his bones and teeth, CT scans and X-rays, pollen analysis, XRD and GC/MS of his copper ax; and various other methods. Earlier this year, Andreas Nerlich, who headed a joint study by Ludwig-Maximilians-Universität München and experts from Bolzano, Italy, offered evidence to prove that Ötzi was shot to death with a flint-tipped arrow rather than dying of exposure as once thought. The team used new immunohistochemical detection methods to determine the ages and sequences of wounds on the body.



Fashion forward Ötzi: archaeological scientists have discovered that Ötzi's loincloth and jacket were made of deer and goat hide, his cape was made of grass and the bark of the Linden tree, his hat was bearskin, and his shoes had bearskin soles and goatskin uppers.

And as recently as July of this year, scientists at the Institute of Cell Biology at the Medical University of Graz reported their research on Ötzi's tattoos, which have long been thought to have been produced by ancient acupuncture. Using optical and scanning-electron microscopy, Maria Anna Pabst and colleagues determined that the tattoos consist of fireplace soot mixed with quartz crystals and purple garnet, producing a dark blue color.

With hundreds of books and scientific articles published about him over the past 18 years, Ötzi is surely the most studied Ice Man in history. And we know so much about him because of the use of multiple physico-chemical methods and the complementary information each contributes. In this issue of the *Bulletin*, we offer two research articles that employ multi-method approaches. The first is a study by Bridget Alex of Dartmouth College, who uses INAA, LA-ICP-MS, TIMS, and other techniques to analyze Early Formative pottery from highland Central Mexico. The second, by Brandon Drake and colleagues from the University of New Mexico and Stanford University, use multiple methods to scrutinize the reliability of portable-XRF results of obsidian from southern Belize. Ötzi would be proud!

E. Christian Wells, Editor

In This Issue

Employment Opportunities	2
Awards, Fellowships, and Training	3
Conference News and Announcements	3
A Word from the President (S. L. Lopez Varela)	5
SAS Business Meeting Minutes (S. L. Lopez Varela)	5
Frame Wins R.E. Taylor Award at SAA	6
Glascock Receives SAA Fryxell Award	6
Analysis of Pre-Teotihuacan Ceramics (B. A. Alex)	7
Error Assessment of pXRF (B. L. Drake et al.)	14
Archaeometallurgy (T. R. Fenn)	17
Archaeological Ceramics (C. C. Kolb)	21
Book Reviews (D. L. Huntley)	
<i>Earth Architecture</i> (E. A. Bagwell)	29
<i>Historic Pensacola</i> (N. M. White)	30
Upcoming Conferences (R. S. Popelka-Filcoff)	31

Employment Opportunities

The Institute for the Study of the Ancient World, New York University (ISAW), seeks to make a faculty appointment in the area of the art and archaeology of ancient Asia, with particular focus on ancient Iran and Central Asia, effective in fall, 2010. ISAW is a newly created, specially funded, cross-disciplinary institute for research and graduate education in the history, archaeology, and culture of the entire Old World, including Asia and Africa, from late prehistoric times to the eighth century AD. (See www.nyu.edu/isaw for details.) The rank of this tenured or tenure-track appointment is open, but we prefer to appoint at an advanced junior level. We seek individuals of scholarly distinction whose work will benefit from freedom from departmental structures and the stimulation of working closely with colleagues in other disciplines, approaches, periods, or geographical areas and who are committed to helping develop the intellectual life of such a community. Applicants with a history of interdisciplinary exchange are particularly welcome. The Institute's graduate program emphasizes individual supervision and research seminars. The faculty is involved in choosing a group of visiting researchers each year. Applications (letter, curriculum vitae, and list of referees) or nominations should be sent to: Professor Roger S. Bagnall, Director, Institute for the Study of the Ancient World, 15 East 84th St., New York, NY 10028. Applications by fax and email are not accepted. Review of candidates will begin on September 15, 2009. Founded in 1831, New York University is the largest private university in the country, with 13 schools, 3 institutes, and nearly 40,000 students. For additional information, please contact Ms. Kathryn Lawson by email at kel306@nyu.edu or by phone at 212-992-7860.

The Institute for the Study of the Ancient World, New York University (ISAW), seeks to make a faculty appointment in the area of the art and archaeology of ancient East Asia, particularly ancient China, effective in fall, 2010. ISAW is a newly created, specially funded, cross-disciplinary institute for research and graduate education in the history, archaeology, and culture of the entire Old World, including Asia and Africa, from late prehistoric times to the eighth century AD. (See www.nyu.edu/isaw for details.) The rank of this tenured or tenure-track appointment is open, but we prefer to appoint at a tenured or near-tenure level. We seek individuals of scholarly distinction whose work will benefit from freedom from departmental structures and the stimulation of working closely with colleagues in other disciplines, approaches, periods, or geographical areas and who are committed to helping develop the intellectual life of such a community. Applicants with a history of interdisciplinary exchange are particularly welcome. The Institute's graduate program emphasizes individual supervision and research seminars. The faculty is involved in choosing a group of visiting researchers each year. Applications (letter, curriculum vitae, and list of referees) or nominations should be sent to: Professor Roger S. Bagnall, Director, Institute for the Study of the Ancient World, 15 East 84th St., New York, NY 10028. Applications by fax and email are not accepted. Review of candidates will

begin on September 15, 2009. Founded in 1831, New York University is the largest private university in the country, with 13 schools, 3 institutes, and nearly 40,000 students. For additional information, please contact Ms. Kathryn Lawson by email at kel306@nyu.edu or by phone at 212-992-7860.

The Department of Anthropology at Pacific Lutheran University seeks candidates for a full-time Assistant Professor in anthropological archaeology beginning in the September 2010. This is a tenure-track position. The candidate should have a research and teaching specialty in New World civilizations. The candidate should also be able to teach introductory, undergraduate classes in biological anthropology (with lab) and archaeological anthropology. The successful candidate will be willing to teach in interdisciplinary programs and to involve students in research. The six-course annual load will include both introductory and upper division courses. Commitment to effective teaching at the undergraduate level is required. A Ph.D. is preferred, although applications from ABD candidate will be considered. Pacific Lutheran University (PLU) is a comprehensive institution with an enrollment of approximately 3600, including international students from two dozen countries. Located in a uniquely scenic region on the Pacific Rim, the university's campus is 40 miles south of Seattle in suburban Tacoma, Washington. As a "New American College," PLU emphasizes integration between its liberal arts departments and its professional degrees in the arts, business, education, nursing, and physical education. Send a letter of interest, curriculum vita, and names of references to: Dr. David Huelsbeck (Huelsbdr@plu.edu, 253 535 7196), Chair of the Search Committee, Department of Anthropology, Pacific Lutheran University, Tacoma, WA, 98447. Applications will close October 31 and be reviewed as received. We hope to complete the search before December 2009.

The Department of Anthropology at Kenyon College invites applications for a visiting position in Archaeology at the assistant professor or instructor level. The theoretical/topical specialization is open, but preference given to areas besides Mesoamerica. Research/teaching interests should complement those of our current faculty. A Ph.D. is preferred; ABD close to finishing his/her thesis will be considered. This position begins fall 2010. The successful candidate would typically teach two introductory archaeology courses per year, as well as three courses aimed at a more advanced undergraduate level, in areas related to the candidate's specialty, for a maximum of five courses. Kenyon College is a highly competitive liberal arts college of approximately 1650 students. The college is located in the beautiful village of Gambier, 50 miles northeast of Columbus, Ohio. Kenyon prides itself on its reputation as an excellent teaching environment enriched by small classes, close contact with highly motivated and engaged students, and an outstanding faculty of dedicated teacher scholars. Kenyon offers competitive salaries and a generous benefits package, including spouse and domestic partner benefits. To learn more about Kenyon, visit www.kenyon.edu. For application instructions, visit <https://employment.kenyon.edu>. The final date for the receipt of

applications is November 1, 2009; preliminary interviews will be held at the 2009 American Anthropological Association Meetings.

The Department of Anthropology at Southern Methodist University invites applications for a tenure-track Assistant Professor appointment in archaeology beginning August 2010. We seek a scholar with ongoing research in environmental archaeology, particularly one who works on issues related to human responses to climatic and environmental change, and human environmental impacts. We are particularly interested in individuals with research expertise and field experience in North America or the Pacific Islands, but are open to excellent candidates who work on comparable issues in other regions. Preference will be given to scholars with methodological skills in zooarchaeology or paleobotany, and who have an established field and laboratory research program, a strong record of obtaining external funding, excellent scholarly credentials, and experience in working on interdisciplinary research projects. Ph.D. is required at the time of appointment. The successful applicant is expected to continue our Department's participation in the Environmental Studies major. Applications may be submitted electronically (pdf format preferred) or by letter, and should include a statement of research and teaching interests, curriculum vitae, and contact information for three references. To insure full consideration, the application must be received by November 2, 2009, but the committee will continue to accept applications until the position is filled. Candidates of interest will be interviewed at the 2009 AAA meetings in Philadelphia. Applications should be sent to Professor David Meltzer, Chair, Department of Anthropology, Southern Methodist University, P.O. Box 750336, Dallas, TX 75275 or to dmeltzer@smu.edu. Hiring is contingent upon the satisfactory completion of a background check.

Awards, Fellowships, and Training

The **Society for Archaeological Sciences (SAS)** will sponsor a contest for the best student archaeometric poster presented at the Archaeological Sciences of the Americas Symposium (October 2-4, 2009) in Tampa, Florida, USA. The prize will include a one-year membership in the SAS, including the quarterly *SAS Bulletin*, and a monetary award of \$100 USD. Entries will be judged on the significance of the archaeological problem, appropriateness of the archaeometric methods used, soundness of conclusions, quality of the poster display, and oral presentation of the poster. A student must be first author on the work and be present at the poster session in order to compete. Undergraduate and graduate-level candidates are welcome to apply. Deadline for submissions: Friday, September 18, 2009. To enter, students should submit an electronic copy of their poster to: [AJ Vonarx](mailto:AJVonarx@email.arizona.edu), SAS Membership Development, ajvonarx@email.arizona.edu. Check out examples of Taylor Award-winning posters from other conferences and review these announcements online: <http://www.socarchsci.org/poster.htm>.

Conference News and Announcements

The **Archaeological Sciences of the Americas Symposium 2009** will be held at the Hyatt Regency in Tampa, Florida from October 2-4 2009. The goal of the symposium is to address and discuss issues pertaining to the science of prehistoric and historic materials. This symposium traditionally focuses on the archaeology of the Americas; however professionals and students engaged in projects outside the Americas are also encouraged to submit abstracts. We are accepting abstracts for both paper and poster presentations. The symposium is open to students, academic faculty and professionals working in independent and government settings. Abstracts are limited to 250 words and the submission/payment deadline is 4 September 2009. Paper presentations will be limited to 20-25 minutes. Please submit abstracts electronically in pdf or word format via e-mail to asas2009symposium@gmail.com. The fee due for abstract submission includes registration and the general fees for the symposium. Rates for students are \$60 and professionals \$90. Payments may be made online with Paypal through the conference website (<http://www.anthro.fsu.edu/news/asas2009>). Rooms will be available at the Hyatt Regency Tampa for a reduced rate from 1-3 October for conference participants. To reserve these special-rate rooms please go to <http://tamparegency.hyatt.com/groupbooking/tpartsoci2009>. For further session questions or more symposium information, please contact us at asas2009symposium@gmail.com.

The **38th International Symposium on Archaeometry** will be held this week next year at the University of South Florida, Tampa, May 10-14, 2010. The aim of ISA is to promote the integration of scientific techniques with archaeology and cultural heritage, with participants coming from a variety of backgrounds and subdisciplines. The website may be visited at <http://isa2010.cas.usf.edu> and includes preliminary information, including title/abstract submission and registration deadlines. Additional information on accommodations, payment methods, social activities, publication, sponsors, etc. will be added in the near future. Registration costs have been kept at the same price as for previous years, while low cost accommodations are available. At least some discounts are expected for participants from Latin America and some other countries. Deadline for submission of abstracts: December 1, 2009.

The **2nd International Sclerochronology Conference** will place from July 24-28, 2010 at the University of Mainz, Germany. This interdisciplinary conference is aimed towards those in the fields of (but not limited to) archaeology, biology, chemistry, earth sciences, and physics who study the incremental structures in marine organisms (shells/corals), otoliths and teeth to examine issues ranging from paleo-climate and environmental reconstruction to populations dynamics and seasonality.

The **19th World Congress of Soil Science** will be held in Australia, 1-6 August 2010 at the Brisbane Convention and Exhibition Centre. The conference theme "Soil Solutions for a

Changing World” provides a tremendous opportunity for a broad range of presentations – we urge you to share your research, experiences and knowledge in Brisbane. The “Call for Papers” has now opened - papers must be submitted by 31 October 2009 to be considered. Registration for the 19th World Congress of Soil Science will open in August 2009. Website: www.19wcss.org.au.

1st International Workshop on Earthquake Archaeology and Palaeoseismology, sponsored by the INQUA Focus Group on Paleoseismology and Active Tectonics (http://www.apat.gov.it/site/en-GB/Projects/INQUA_Scale/default.html); to be held on Sept. 7th -13th, 2009, at the ancient Roman city of Baelo Claudia (Cádiz, Southern Spain). The event will be coordinated with the activities of the IGCP-567 Earthquake Archaeology. The workshop will be thematic and will include invited lectures, oral presentations, posters, as well as a 2-days field training-course on Archaeoseismological Research. After the Dead Sea Rift Workshop in February 2009, this will be the 2nd event in 2009 for the INQUA Project #0811 - Global Catalogue of Environmental Effects - and a Business Meeting for the Project will also take place during the Workshop. Please visit the web page, <http://baelo2009.org/> or contact Christoph Grützner, c.gruetzner@nug.rwth-aachen.de.

Society for Historical Archaeology: “Recent, International Advances in the Use of pXRF and Other Portable, Field Technologies for Archaeochemical Studies of Historic Sites,” Amelia Island, Florida, USA, January 2010. Organizers: Dr. Claudia Brackett (California State University-Stanislaus), Ms. Julia Kleyman (Thermo Fisher Scientific NITON Analyzers) and Mr. Richard Lundin, RPA (Wondjina Research Institute). Below the surface of every landscape is chemical evidence of past human activity and, potentially, an historic site. Recent advances in the use of portable X-Ray Fluorescence (pXRF), RAMAN technologies and the reduction in costs for laboratory analyses have made these technologies affordable for field studies that “complete the circle of understanding” of historic era terrestrial and marine sites through the integration of archaeochemistry, Archaeogeophysics, literature research, oral interviews and excavation. We are looking for presentations from terrestrial and marine archaeologists who have used these new technologies for field and laboratory studies to gain insights into human behavior from the chemical “signatures” that have been left behind. Presentations are encouraged that integrate archaeochemical studies with Combined Survey Format (CSF) archaeogeophysical studies, petrographic provenience studies of lithics, ceramics and metals from field studies, museum studies, and heritage studies. International presentations will be encouraged and it is hoped that many of the recent, excellent, presentations that have been made in other, international, forums will be presented. Some of the basic topics that presentations are being solicited include but are not limited to: basic chemistry of site formation and human activities; chemical characterization of various site types and activities; chemical characterization of marine sites via portable and laboratory analyses of plant, animal and sediment materials; limits of use

of archaeochemical data; issues of contamination: Background chemical “noise” vs. “real chemical signatures” of human activity; case histories and studies of use of these technologies; history of use of archaeochemistry over time to define sites and features; integration of archaeochemical data into Combined Survey Format studies; use and limitations of archaeobiochemical studies; research on deep sea field archaeochemical studies; archaeochemical data analysis. We are also working on a potential method to have remote participation for those who cannot, physically, attend the conference.

SHA 2010 Archaeochemical Workshop, Wondjina Research Institute (WRI), INNOV-X and Country Chemist are sponsoring a SHA workshop of the capabilities of the newly developed pXRF technology for archaeology with “hands on” use of the new, INNOV-X family of analyzers at the Amelia Inn Conference Center, site of the SHA 2010 Conference at Amelia Island Florida on Wednesday, January 6th. Dr. Claudia Brackett, Archaeochemist, of California State University-Stanislaus (CSUS) and Mr. Richard J. Lundin, Archaeogeophysicist, RPA and Director of WRI will conduct the workshop. All interested parties are also invited to bring samples for free pXRF analyses at the INNOV-X booth at the conference. Dr. Brackett and Mr. Lundin are pioneers in the use of this technology for archaeology and have given very successful workshops and presentations on its use at SHA meetings in Sacramento, Williamsburg, Albuquerque and Toronto; SAA meetings in San Juan, Austin and Vancouver, SCA meetings in Burbank and Modesto, AGU meetings in Acapulco and San Francisco, a National Park Service Workshop in San Francisco and several industry sponsored workshops in Vancouver, San Diego and Mexico City. The demonstration and workshop will be held at the Amelia Inn Conference Center 9:00 a.m. to 12:00 p.m. Both Dr. Brackett and Mr. Lundin have extensive archaeochemical field and laboratory experience. They are members of the new SHA Technology Committee and are currently supported by INNOV-X in their research. If you would like to find out more on the reception to the SHA Workshops at Williamsburg, Albuquerque and Toronto or make a reservation for the Workshop, contact Dr. Jamie Brandon at jbrando@uark.edu. The cost for the workshop is \$85 for SHA members, \$105 for non-Members, \$50 for SHA Student members, and \$70 for non-members. To register, go to the SHA 2010 website. Registration is limited to 25 participants.

The Paleocyanography and Paleoclimatology session PP03 ++ Loess 2.0 ++ for the AGU Fall Meeting, San Francisco, California, USA will be held December 14-18, 2009. This session aims to provide a lively forum to review fundamental scientific steps in the study of aeolian sediment archives and discuss new innovative approaches that enhance our understanding of those records. Submissions by students and young scientists are particularly encouraged. The deadline for submission of abstracts is 03 September, 2009, 2359 EDT (Eastern Daylight Time). Abstract Submissions will be open by 30 July. <http://www.agu.org/meetings/fm09/index.php>. In

recent years, rapid advances in the application of highly resolved sedimentological and geochemical studies, in combination with various geochronometric techniques and chronostratigraphic tools, have opened up new vistas in the investigation of paleo-records of atmospheric dust loading using aeolian sediment deposits. As these sediments are widespread on the continents, novel multi-proxy investigations enhance our understanding of long-term aeolian dust dynamics and climate variability, linking inter-hemispheric climates on time scales ranging from glacial-interglacial to (sub)millennial. Innovative contributions are welcome on the application of new and established methodological approaches; results on stratigraphy, geochronology, paleoenvironmental assessments; and geoarchaeology of aeolian deposits in the Northern and Southern Hemispheres. We especially encourage papers that either (a) utilize high-resolution loess & dust records to reconstruct the timing and dynamics of past synoptic atmospheric circulation patterns on regional and inter-hemispheric scales; (b) establish precise correlations and define atmospheric mechanisms that link continental loess/dust records with aeolian records in ice cores and/or the oceans; or (c) address the challenging effort to incorporate the dust proxies of past atmospheric processes into climate models. Conveners: ZhongPing Lai, Bjoern Machalett, Rick Oches, Helen Roberts. AGU Index terms: 4914, 4904, 0429, 1100, 1500. There are a limited number of grants for partial funding for students who are first authors and presenters of a poster or oral presentation. Please note the requirements: http://www.agu.org/meetings/fm09/outreach/student_travel.php. Special discounts on the registrations rates are available to those from low income countries, <http://www.agu.org/meetings/fm09/registration/rates.php>.

A Word from the President

Sandra L. Lopez Varela

President, Society for Archaeological Sciences

Leading the presidency of SAS is a great responsibility that I have been honored with thanks to your support. I would like to take this opportunity to thank you and to outline some of our future plans over the next couple of years. First, I would like to reassure our members that at SAS we understand that making archaeological sciences anthropologically relevant is central to our growth. Learning how social values are communicated through the production and use of material culture is crucial to our uses of archaeological sciences. Promoting different ways of doing science around the world is part of our core mission as an international association, as demonstrated recently by the election of Dr. Patrick Degryse, from Belgium, as Vice President/President-elect of SAS.

At SAS, we are working to provide you with better access to our community and resources. We are endorsing new and innovative journals related to our field of studies. This fall we

expect to have our newly redesigned website ready to improve our exchange of information and communication. In the years to come, we expect to establish stronger partnerships with other organizations to provide greater benefits to our membership of both professionals and students. As of 2010, the R. E. Taylor Poster will be offered as a joint effort with the Society for American Archaeology to strengthen our common interest in fostering the participation of students interested in advancing archaeological science. After a remarkable journey of dedication to publish the *SAS Bulletin*, Christian Wells announced his retirement as Editor. SAS wishes him all the best and we are all looking forward to work with Dr. Jay VanderVeen in 2010.

On behalf, of Dr. Patrick Degryse and myself, I would like to express our gratitude for joining us in our quest of making archaeological sciences more relevant to the study of humankind by using the tools of tomorrow.

Minutes of the SAS General Meeting at the Annual Meeting of the Society for American Archaeology, Atlanta, Georgia, April 24, 2009

Sandra L. Lopez Varela

President, Society for Archaeological Sciences

In attendance: Rob Sternberg, Sandra López Varela, Chris Prior, Anne Skinner, AJ Vonarx, Dana Rosenstein, Rob Tykot, Christian Wells, Destiny Crider, Charles Kolb, Jay VanderVeen, David Hill.

Election results for President-elect. The number of votes in favor of Dr. Patrick Degryse confirms his election as Vice-President/President-elect of the Society for Archaeological Sciences (2009-2011).

R. E. Taylor Poster Award. SAS was unable this year to award the R. E. Taylor Poster Award at the SAA, as it had done for more than 10 years. The SAA and SAS have agreed to continue offering the award as of next year. The R. E. Taylor poster award will be advertised and promoted in the *SAA Archaeological Record* and webpage. SAS has agreed to offer its regular prize including publications and a financial award, exempting from this award the regular membership to our association that had been offered. Students will subscribe via the SAA webpage to the Taylor Poster Award in advance. This year's competition was advertised through our webpage, as a spring competition, restricting participation to those posters presented at a professional venue in April 2009. SAS is exploring the possibility of offering the award at other professional meetings.

Archaeological and Anthropological Sciences Journal. During our meeting it was agreed to support and endorse this

new journal, and to allow our members to subscribe at a discounted rate through their membership fees in SAS, as is currently done for *JAS* and *Archaeometry*. Robert Tykot is in communication with Springer. The SAS logo will be printed in their journal. Negotiations are on their way to have a SAS representative as part of the Editorial Board.

New Editor of the *SAS Bulletin* 2010. After a remarkable journey of dedication to publish the *SAS Bulletin*, Christian Wells announced his retirement as Editor. SAS wishes him all the best and hopes to continue having him back on board very soon. After a careful search for a new Editor, SAS is happy to report that Dr. Jay VanderVeen, faculty member in the Department of Sociology and Anthropology at Indiana University-South Bend, has agreed to join our team as our new Editor. SAS welcomes Jay and offers him all of our support.

SAA-Council of Affiliated Societies. The Society for American Archaeology works cooperatively with a number of affiliated societies, known collectively as the Council of Affiliated Societies. The purpose of the CAS-SAA is to mutually advance the practice of archaeology. The cost of annual membership is \$30.00. SAS has agreed to join the SAA, pending clarification of objectives and extension of commitments. SAS considers joining CAS to improve our visibility and improve our identity as a well recognized academic society.

ISA 2010. The 38th International Symposium of Archaeometry (ISA 2010) will take place in Tampa, Florida between May 10-14th, hosted by the University of South Florida, having Robert Tykot as Chairman. Robert Tykot is evaluating the publication of the ISA 2010 proceedings. Given the new trends in publication, it is preferable to offer an on-line version of the proceedings, not only in terms of costs but also in terms of accessibility. However, libraries and individuals are still interested in printed copies so finding a publisher that can offer both options will be ideal.

Membership. As of April 2009, SAS is experiencing its lowest membership of the last 15 years. In her report, AJ Vonarx relates the situation to: 1) the current economic recession, despite the low cost of membership; 2) the growth of other small archaeological organizations that encourage cross-disciplinary work and the development of specialty groups within large organizations, a problem shared by the SAA; and 3) the lack of visibility of our association in the last few years. To this overview, our discussion considered the critique that our current image apparently promotes an interest only in science and technology, without emphasizing the anthropology behind it. Given this situation, we will follow several lines of action to reposition ourselves as a leading organization.

Budget Approval. SAS approved the budget for 2009 and reviewed the 2008 finances. Currently, our total assets are on the order of \$37,000 USD.

Webpage. Web hosting service by Bluehost continues, but needs another two-year renewal for 2010. The SAS listserv is

the primary portal for information distribution to our membership. It is noticed that not all users are members.

Next Business Meeting. Our next business meeting will be held at the International Symposium on Archaeometry, in Tampa, Florida in 2010.

Frame Wins Spring 2009 R. E. Taylor Student Poster Award

A few months ago, the Society for Archaeological Sciences congratulated the winner of the R.E. Taylor Student Poster Award for Spring 2009: Lesley D. Frame, PhD Candidate in the Heritage Conservation Science Program, Materials Science and Engineering Department, University of Arizona. Her poster was titled, "Technological Change in Southwestern Asia: Comparing Metallurgical Production Styles and Social Values during the Chalcolithic and Early Bronze Age." Her abstract follows: "Early evidence for metal processing is found on the Iranian Plateau at a number of sites, some of which (e.g., Tali Iblis) represent large-scale smelting industries, whereas other sites, including Seh Gabi and Godin Tepe, contain similar crucible technology but with much smaller concentrations of production debris. Through compositional and microstructural analyses, and the use of a theoretical framework of technological change, this project considers the differences among these contrasting scales of production on the Iranian Plateau, in terms of technology and the possible social values placed on that technology. By linking technological changes to social values of the craftspeople, we can understand the role of technology in the cultural context of past communities." Two special Honorable Mentions were extended to: Hanneke Hoekman-Sites (PhD Candidate, Department of Anthropology, Florida State University) for "Examining Animal Product Use Patterns on the Great Hungarian Plain during the Neolithic and Copper Age" and Bridget Alex (AB Student, Anthropology, Chemistry, and Earth Sciences Departments, Dartmouth College) for "Multi-method Analysis of pre-Teotihuacan Ceramics." Contestants submitted their posters to SAS as email attachments by May 1, 2009 and were judged by professional researchers on the significance of the archaeological problem, appropriateness of the archaeometric methods used, soundness of conclusions, and quality of the poster display.

Glascock Receives the 2009 SAA Fryxell Award

On April 24, 2009, Dr. Michael D. Glascock received the 2009 Fryxell Award for Interdisciplinary Research at the 74th annual meeting of the Society for American Archaeology in Atlanta, GA. The annual award is presented in recognition of

the individual's contributions to American Archaeology in one of five distinct areas: zoological sciences, botanical sciences, earth sciences, physical sciences, and interdisciplinary studies. The award cycles through these five categories, and for 2009 it was an award for interdisciplinary research. In addition to a special symposium in the recipient's honor, the award consists of a plaque and a medallion.



Michael Glascock (fifth from left) surrounded by friends and colleagues at SAA.

Multi-method Analysis of Pre-Teotihuacan Ceramics

*Bridget A. Alex
Dartmouth College*

Pottery characterization has been viewed as problematic because ceramic composition reflects a variety of influences, including provenance, processing, use, and diagenesis (Neff et al. 2003; Pollard and Heron 2008:100; Stoltman et al. 2005; Arnold et al. 1991; Blackman 1992). A growing consensus has shown that the multi-faceted composition of pottery necessitates multi-method analysis (Neff et al. 2003; Stahl et al. 2008; Rice 1987:326; Sharer 2007; Stark et al. 2000; Stoltman et al. 1992; Larson et al. 2005). By using complimentary techniques, archaeologists can disentangle and distinguish compositional influences, thereby extracting greater information from ceramic remains.

In this study, ceramics from Mid-Late Formative Central Mexico (1000-100 B.C.) were characterized on four levels of resolution—stylistically, mineralogically, elementally, and isotopically—and chemical signatures were compared to those of local clays. Instrumental neutron activation analysis (INAA) provided bulk elemental compositions, while laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) probed the elemental makeup of clay matrices. These elemental measurements were paired with bulk strontium isotope ratios

measured by thermal ionization mass spectrometry (TIMS) and qualitative mineral characterization by thin section petrography. The methodological goal was to investigate how different methods provide complimentary information.

Samples and Archaeological Context

During the Mid-Late Formative (1000-100 B.C.) the Teotihuacan Valley was a marginal area in the northeastern Basin of Mexico, while population was concentrated in the southwest. The valley consisted of small hamlets and villages, with no evidence of sociopolitical hierarchy. By 100 B.C., however, this situation sharply reversed, as Teotihuacan emerged as a dominant presence, encompassing over 90% of the valley's population (Sanders et al. 1979; Million et al. 1973). Although consolidation of the Teotihuacan Valley appears sudden in settlement records, there may be evidence of increasing socioeconomic cohesion in the period preceding the emergence of Teotihuacan. This study sought such evidence through the lens of ceramic production in the Mid-Late Formative and asked the following questions: Did settlements share a ceramic production center, or did each settlement produce its own pottery? If the latter, did the settlements share raw materials sources or stylistic preferences?

Ceramic samples were collected from four Mid-Late Formative sites during the Teotihuacan Valley Survey, the first stage of the Basin of Mexico Survey under the direction of William T. Sanders of the Pennsylvania State University (Sanders et al. 1975; Sanders et al. 1979). Two of the settlements, Cuanalan and Venta de Carpio, were on the shore of ancient Lake Texcoco. Altica and Cerro Xiquillo were approximately 20 km away, in the piedmont zone of the Patlachique Range. Clays from the northeast Basin of Mexico were collected and analyzed by INAA for a study on Aztec ceramics (Nichols et al. 2002; Neff and Glascock 1998).

INAA

INAA is the most established method of multi-element characterization in archaeology (Neff 1992). Samples are ground into a powder and irradiated by a neutron flux. The radioactive nuclei emit gamma rays of distinct wavelengths, which can be measured to quantify elemental concentrations. In this study one hundred and five samples were prepared and analyzed by the INAA procedure used at the University of Missouri Research Reactor (MURR), summarized by Glascock (1992) and Neff (2000). Elemental concentrations were used to form groups of compositionally similar samples by principal components analysis (PCA) and Mahalanobis distances, statistical procedures explained elsewhere (Glascock 1992; Bieber et al. 1976).

TIMS and Sr Isotope Ratios

The ratio of $^{87}\text{Sr}/^{86}\text{Sr}$ in a given material depends on the age and composition of regional bedrock (Faure 1986). This variation has led to the widespread use of Sr isotope ratios in

the provenance of geological and biological materials (e.g. Dash, E.J. 1969; Asahara et al. 1995; Ericson 1985; Bentley et al. 2002; English et al. 2001; Knudson and Tung 2007), but Sr ratios have seen limited application in ceramic sourcing (but see Li et al. 2005, 2008). It is unclear whether measurement of $^{87}\text{Sr}/^{86}\text{Sr}$ would merely provide an additional variable to the suite of elements collected by INAA, or whether $^{87}\text{Sr}/^{86}\text{Sr}$ offers a more potent variable. Sr isotope ratios can be measured by TIMS, in which isolated elements are ionized from metal filaments into a high-precision mass spectrometer. In this study the Sr isotope ratios of eight ceramics and three clay samples were measured by TIMS. About 100 μg of each sample was dissolved in the high temperature/pressure PicoTrace digestion system, according to the program manual. Sr was separated by column chromatography, loaded onto a W-filament, and analyzed on the Dartmouth Triton TIMS instrument according to the method of Sharma et al. (2007), adapted from Birk (1986).

Laser Ablation Inductively Coupled Plasma Mass Spectrometry

LA-ICP-MS uses a micron-scale laser to vaporize solid material into a plasma torch, in which it is ionized and sent into a mass spectrometer. The method is essentially nondestructive and allows analysts to collect elemental data on specific targets, such as a mineral inclusion or clay matrix. The analysis of ceramics by LA-ICP-MS, however, lacks matrix-matched standards and standardized data quantification procedures (Pollard et al. 2007:198; James et al. 2005; Robertson et al. 2002; Speakman and Neff 2005). Thus, the results should be viewed qualitatively and in conjuncture with other lines of evidence. In this study LA-ICP-MS was used to investigate the elemental character of the clay of four samples. Each sample was subjected to three ablations that targeted the clay matrix and avoided mineral inclusions. Analysis consisted of 60 seconds of background measurement and 100 seconds of sample measurement. Before and after each sample run (consisting of three ablation lines), NIST glass SRM-610 was analyzed under the same conditions and used to calibrate intervening samples. Elements of weight in PCA (Na, Mg, Si, Ca, Mn, Rb, Sr, Sr, Sb, Cs, Ba, and U) were subjected to an abbreviated version of the data quantification procedure proposed by Gratuze et al. (2001) and advocated by Speakman and Neff (2005). Data was left as elemental ratios of X/Si, rather than converted to oxide concentrations and corrected for interferences. Because results were only used for intra-study comparisons, the latter calculations were unnecessary.

Thin Section Petrography

In thin section petrography samples mounted on microscope slides are viewed under a polarizing light microscope. Minerals are identified based on their optical properties. Thin sections were prepared professionally by Quality Thin Sections in Tucson, Arizona and analyzed qualitatively by the author. Thirty-one samples, with representatives from each site and group, were viewed and

photographed under plain polarized (ppl), cross-polarized (xpl), and reflection light at 40x and 100x magnification. Although robust approaches to petrography exist (Stoltman 1989, 1991), visual comparison sufficed for the goals and scope of this study.

Results

Bulk elemental characterization by INAA and PCA identified three distinct composition groups (Figure 1). In addition to these groups was a subset, designated Group 1b that showed lesser probability of belonging to Group 1 (G1). G1 appeared as a tight cluster on nearly all element and principal component (PC) axes, while G2 and G3 almost exclusively segregated by Ba content. All G1 and G1b samples were collected from Altica, a site with roughly the same amount of G2 samples (12 from G1/G1b and 11 from G2). Nearly all high-Ba G2 samples (18/19) were recovered from the piedmont sites, while most low-Ba G3 samples (56/58) were found at the lakeshore sites. Other studies of Mesoamerican ceramics have found the same pattern—that of low-Ba in coastal or lacustrine zones and high-Ba in highlands—and attributed it to diagenesis in differing burial environments (Neff et al. 1988; Neff et al. 1990; Neff et al. 2003; Sheehy 1992). This author believes that such is the case with G2 and G3, and will henceforth regard them as single composition group, G2/G3.

Ceramic compositions were compared to previously measured compositions of clays from the Basin of Mexico (Nichols et al. 2001; Neff and Glascock 1998). With the exception of Ba concentration, G2/G3 samples overlapped in elemental and principal component space with clays from the Teotihuacan Valley. G1 did not correspond compositionally with clays from the Teotihuacan Valley, or the greater Basin of Mexico. Samples were also compared to those in the MURR database, an archive of over 90,000 archaeological and geologic samples analyzed at MURR. A Euclidian search revealed no reasonable matches for G1 samples, indicating that samples of significant similarity have never been analyzed at MURR.

Sr isotope ratios by TIMS show that the G1 sample differed substantially from all other Teotihuacan Valley ceramics and clays (Figure 2). The Sr isotope ratio of the G1 sample (0.713633 ± 0.000007) fell near the range typical for upper continental crust (0.715-0.730). The other ceramics and clays fit the range of island arcs and continental basalts (0.703-0.710) (White 2008:330), values expected for the volcanic geology of the Basin of Mexico (Mooser et al. 1974; Slayton 1985:22). The G1b sample had an intermediate Sr isotope ratio, which may suggest a mixing of “G1 raw materials” with typical Teotihuacan Valley materials. It should also be noted that the variation between G2/G3, unassigned, and clay samples exceeded the analytical uncertainty. Compared to clays, the non-G1 ceramics contained greater Sr concentrations and variable isotope ratios. This is the pattern that one would expect if different amounts and kinds of tempers were added to the same raw clays. Sr-rich tempers would increase the bulk Sr concentration, and skew the isotope ratio toward that of the temper—higher if the temper was volcanic and lower if the temper was continental material.

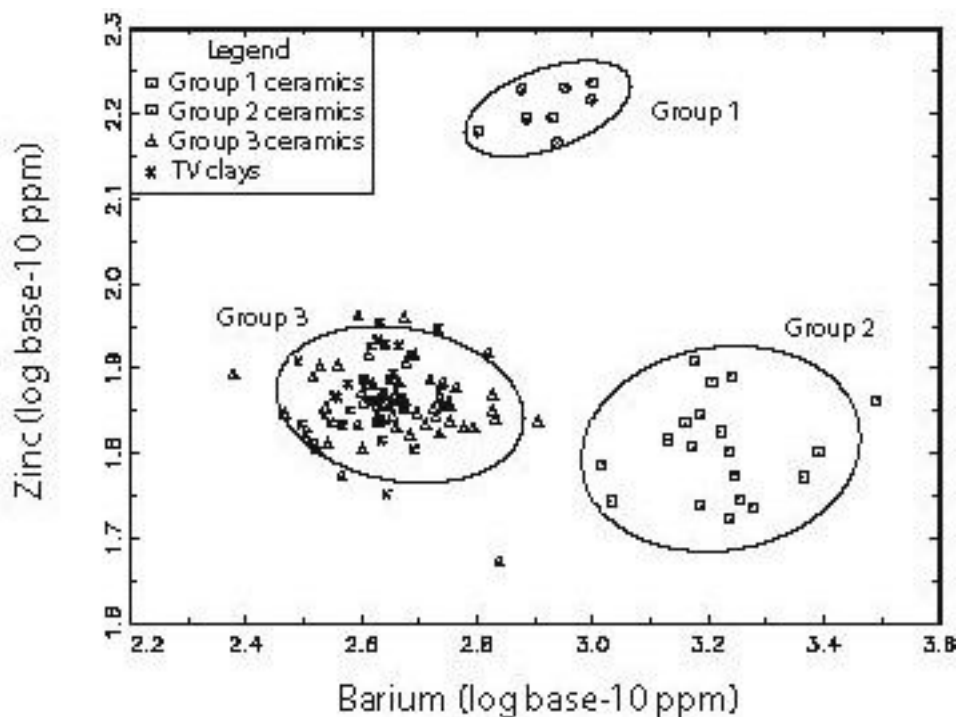


Figure 1. The results of INAA and PCA analysis revealed three distinct composition groups. Group 1 is a tight, distinct cluster on most element and PC axes. Groups 2 and 3 almost exclusively segregate by Ba concentration. Clays from the Teotihuacan Valley most resemble Group 3.

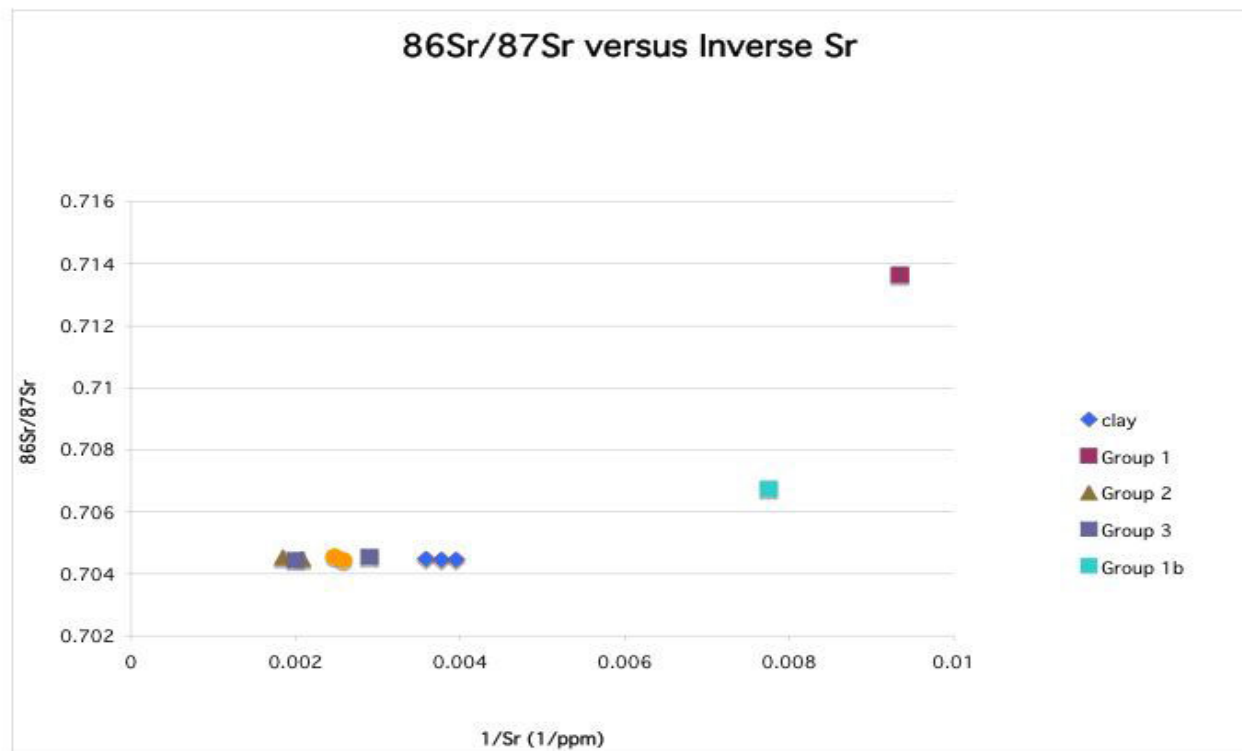


Figure 2. Sr isotope ratio $^{86}\text{Sr}/^{87}\text{Sr}$ plotted against inverse Sr concentration (1/ppm). The G1 sample has a distinct isotope ratio near the range of upper continental crust. Differences between the non-G1 samples exceed error, which was calculated to 2σ standard error, ± 0.000007 .

The ratios are not so distinct as to indicate different tempers and clays, as is the case with the G1 sample.

LA-ICP-MS was performed on the clay matrices of four samples from Altica—two from G1 and two from G2. Figure 3 shows that clay of G1 samples had an elemental makeup distinct from that of G2 samples.

Thin section petrography showed that the mineral inclusions and/or temper of G1 and G1b samples were distinct from that of G2/G3 and unassigned specimens. The former groups were characterized by mid-size (~0.5 mm diameter) volcanic clasts, elongate pores, and opaque black inclusions suspected to be organic material. This hypothesis is supported by the fact that contemporary and historic potters in the area have tempered ceramics with plant material, especially cattail fluff (Hopkins 1995:338). G2/G3 specimens predominately contain small-large (>0.3 – 1 mm diameter) clasts of quartz and plagioclase, which may be natural to the clay source, or added during production. Thin sections of raw clays would aid in this distinction, but were unfortunately unavailable. Typical G1 and G2/G3 samples are shown in Figure 4. It was also observed that all hemispherical bowls from Cerro Xiquillo had temper of uniform type, size, and density. Other vessels from Cerro Xiquillo and hemispherical bowls from other sites do not show this homogeneity.

Discussion

Chemical and petrographic analyses revealed two distinct ceramic groups from four Mid-Late Formative sites in the Teotihuacan Valley. The major group (77 samples, G2/G3), represented at all four sites, matched the bulk multi-element and Sr isotope fingerprints of Teotihuacan Valley clays. Eight samples from Altica (G1) differed from other ceramics and clays by all assessments and were unequivocally made from unique raw materials.

This compositional pattern was paired with stylistic analysis of samples performed by Sanders et al. (1975). G1 and G2 samples from Altica are visually indistinguishable by vessel form and surface decoration; both groups include a variety of vessel forms, and exhibit mainly white-slipped incised or plain surface decoration. The stylistic homogeneity and compositional heterogeneity of G1 samples compared to others from Altica merits two hypotheses. First, G1 samples may represent imports that were copied stylistically by local potters. Alternatively, Altica potters may have had access to two clay sources, one of which was used by other sites and one of which was not. As Altica is the oldest and easternmost site (Sanders et al. 1975), it is possible that its potters exhausted their alternative source before the other settlements emerged, or that the source was geographically impractical for the other settlements.

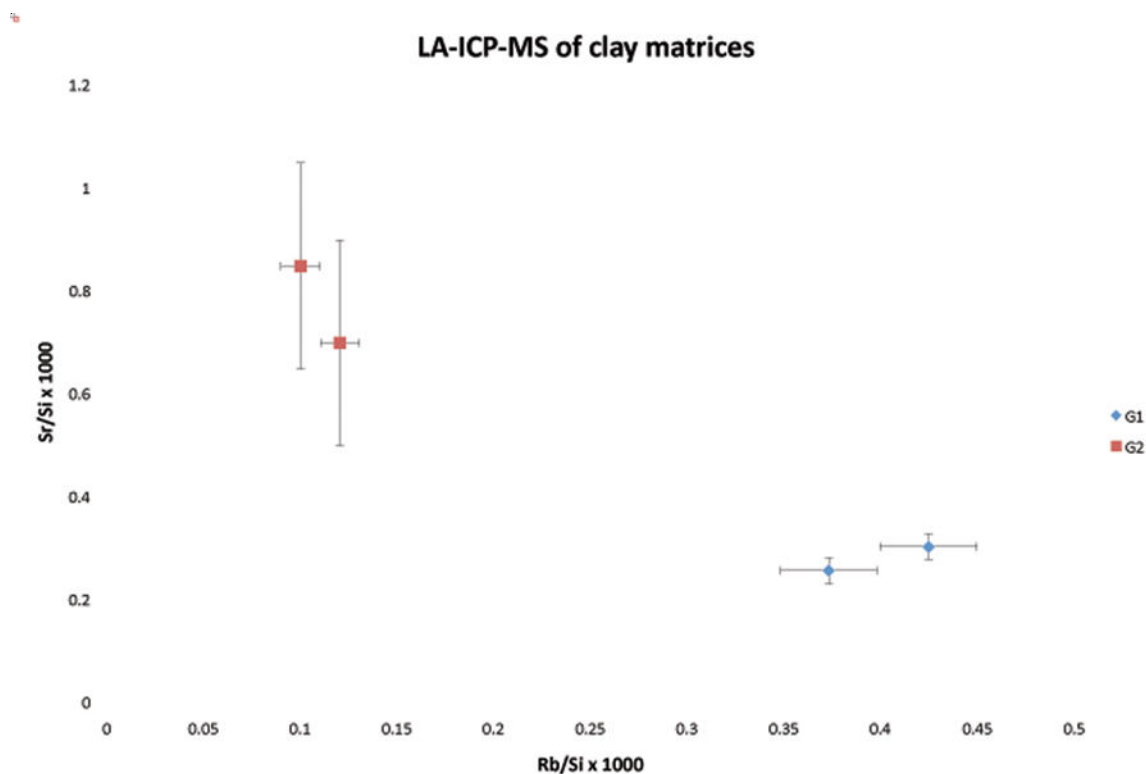


Figure 3. The Sr and Rb contents of clays from G1 and G2 ceramics are distinct based on LA-ICP-MS. Sr and Rb were high loading factors in the first principal component, indicating that these elements contribute significantly to the variation between groups.

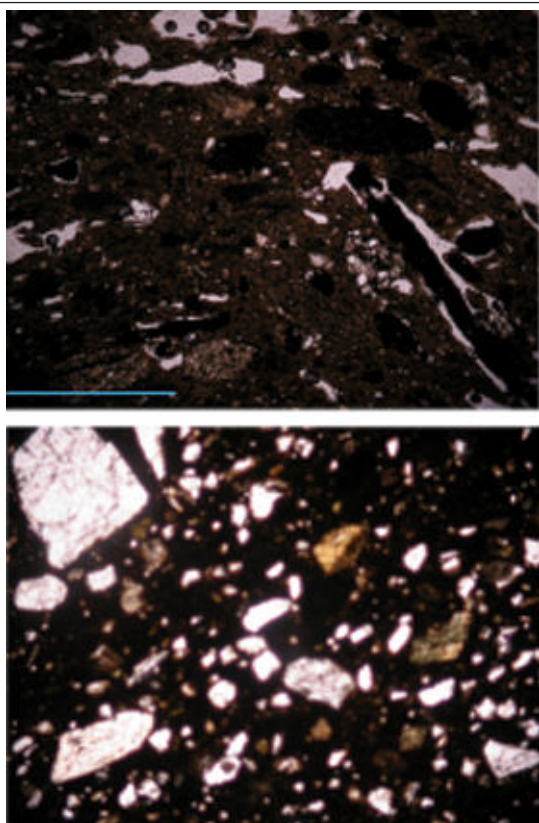


Figure 4. Petrographic thin section of a typical G1 (top) and G2 (bottom) sample in plain polarized light. Scale bar 1 mm.

Consideration of the distribution of surface decoration techniques between the sites revealed another pattern (Figure 5). The piedmont sites of Cerro Xiquillo and Altica had a high proportion of white-slip incised surfaces, as compared to contemporaneous remains from Venta de Carpio. The latter site exhibited a greater variety of surface decorations, but few white-slipped incised vessels. It thus appears that inhabitants of Altica and Cerro Xiquillo had a preference for white-slipped incised pottery. It was also noted that hemispherical bowls from Cerro Xiquillo exhibit striking uniformity in temper, unseen in other vessels from that site or in hemispherical bowls from other sites. It seems that potters from Cerro Xiquillo followed a prescribed recipe for hemispherical bowls. This pattern, paired with the apparent decorative affinities of sites, suggests that these settlements produced their own pottery in the Mid-Late Formative. Moreover, this pottery was made from primarily the same raw materials or geologically indistinguishable materials from within the Teotihuacan Valley. The socioeconomic image that emerges, then, is contemporaneous peoples within 20 km of one another making their own pottery, from homogenous raw materials. Altica, however, contained a set of stylistically identical, but compositionally unique ceramics—either imported or made from an alternative raw materials source.

These conclusions were drawn through the compatibility of multiple characterization methods. Bulk elemental

characterization by INAA established composition groups, but it was unclear whether compositional differences were due to provenance, processing, use, or diagenesis. Consideration of burial environment and prior studies led to the hypothesis that two groups differed from diagenesis and the consolidation of these groups. One compositionally unique group (G1) of eight samples from Altica remained. As the samples in this group were found in the same context as samples from the major group, diagenesis was an unsuitable explanation for compositional differences. It is also unlikely that these ceramics had a special function that altered their composition because G1 ceramics had identical vessel forms and surface decorations as other ceramics from Altica.

Measurement of Sr isotopes by TIMS reiterated the information derived from INAA: the G1 sample varied substantially from other ceramics and clays collected from the Teotihuacan Valley. Thus, *for this sample set*, the measurement of a single variable—Sr isotope ratio—led to the same general conclusion as the measurement of 33 elements by INAA. This result does not confirm the viability of the Sr isotope system for ceramic provenance, but it does invite further experimentation in other geologic contexts. This author advocates analysis by INAA whenever possible because of the vast archives of INAA data to which one can compare results. However, if INAA is unavailable and a study seeks to make comparisons within a single sample set, Sr isotope ratios may offer an alternative method of bulk composition grouping. Moreover, Sr isotope ratios provided additional information regarding the continental/volcanic nature of samples and the variation within non-G1 samples, suggestive of tempering.

However, measurement of bulk Sr isotope ratios did not, and could not, distinguish whether G1 samples differed due to provenance or processing. Both INAA and TIMS measure bulk variables, so that the compositional effects of temper and clay are indistinguishable. LA-ICP-MS and petrography allowed these components to be analyzed independently. Laser ablation work showed that the clay matrices of G1 samples differed in elemental makeup from other Altica samples. Petrography revealed distinct inclusion patterns in G1 samples, as well as hemispherical bowls from Cerro Xiquillo.

A synthesis of stylistic, contextual, and compositional data suggests that ceramic production in the Mid-Late Formative Teotihuacan Valley occurred within individual settlements, exploiting homogenous resources. An anomaly to this pattern emerged at Altica, where a set of visually identical, but compositionally unique ceramics was found. Only through a multi-method approach could these conclusions have been reached. This project had admitted shortcomings. More raw materials should have been sampled and more ceramics should have been analyzed by TIMS and LA-ICP-MS. Robust data quantification for petrography and LA-ICP-MS was eschewed because it was unnecessary for the goals at hand. These methods provided intra-study comparison of a sub-set of samples, in order to evaluate and extend the conclusions drawn from INAA.

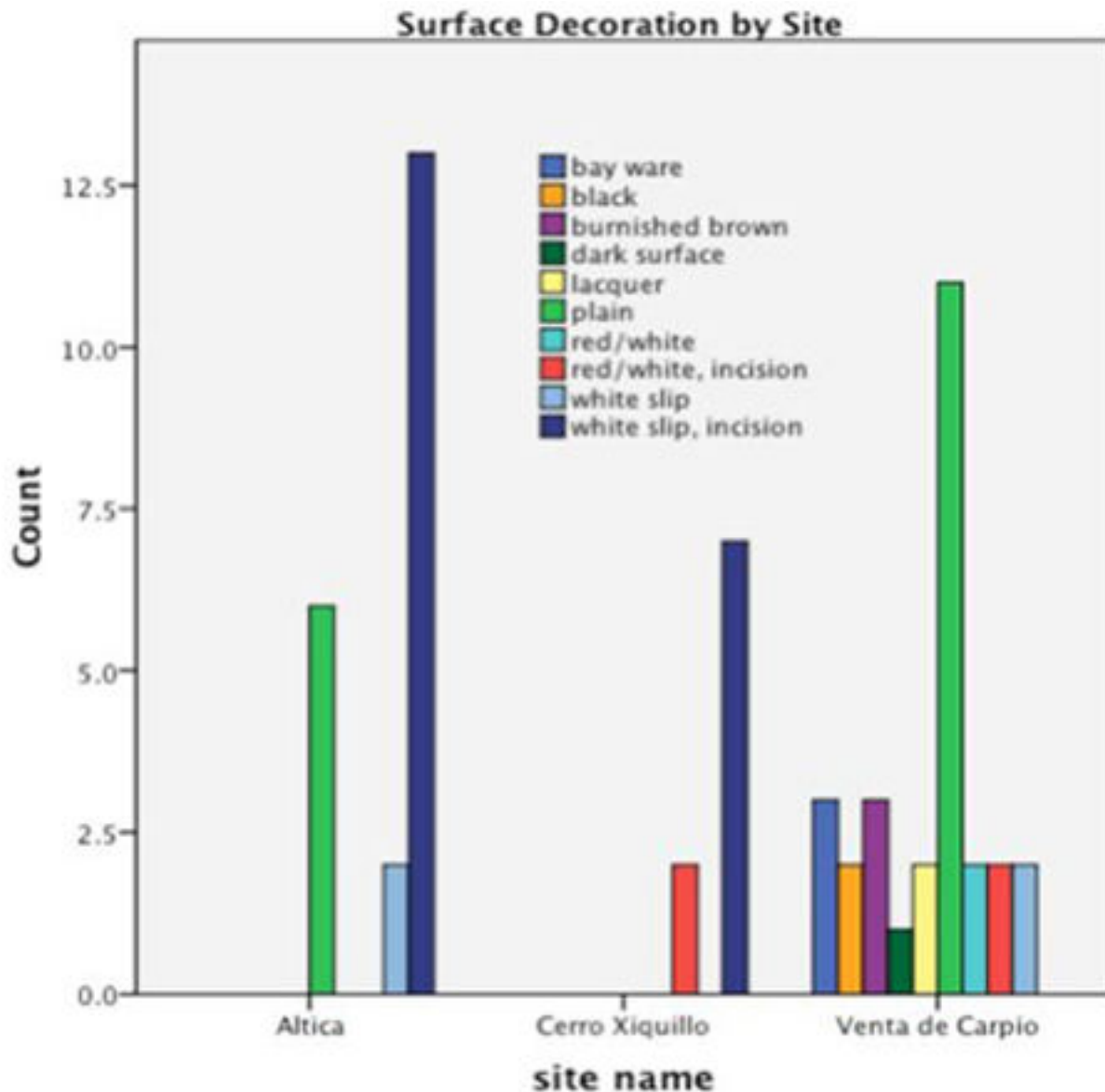


Figure 5. Middle Formative vessels from three sites are counted by surface decoration. The piedmont sites of Altica and Cerro Xiquillo have a high concentration of white-slip, incised ceramics, but Venta de Carpio has none. Distributions are based on this sample set, but the patterns are consistent with the greater collection. Stylistic attributions by Sanders et al. (1975).

This study provides a model for multi-method analysis, following exemplars before it (Neff et al. 2003; Stahl et al. 2008). Ceramic characterization should consist of a triad of bulk compositional analysis, mineralogical assessment, and microprobe work. These results should be paired with analysis of raw materials, stylistic analysis, and archaeological context. With this approach one may be able draw anthropological meaning from ceramic composition—a record of geologic, anthropogenic, and thermodynamic interplay.

References

- Arnold, D.E., Neff, H., Bishop, R.L. (1991). Compositional analysis and “sources” of pottery: an ethnoarchaeological approach. *American Anthropologist* 93, 70-90.
- Asahara, Y., Tanaka, T., Kamioka, H., Hishimura, A. (1995). Asian continental nature of $^{87}\text{Sr}/^{86}\text{Sr}$ ratios in North Central Pacific sediments. *Earth and Planetary Science Letters* 133, 105-116.
- Bentley, R.A., Price, T.D., Luning, J. (2002) Prehistoric migration in Europe: Strontium Isotope analysis of early Neolithic skeletons. *Current Anthropology* 43, 799-804.
- Bieber, A.M., Brooks, D.W., Harbottle, G., Sayre, E.V. (1976). Application of multivariate techniques to analytical data on Aegean ceramics. *Archaeometry* 1, 59-74.
- Birck, J.L. (1986). Precision K-Rb-Sr isotopic analysis: application to Rb-Sr chronology. *Chemical Geology* 56, 73-83.
- Blackman, M.J. (1992) The effect of human size sorting on the mineralogy and chemistry of ceramic clays. In (H. Neff,

- Ed.) *Chemical Characterization of Ceramic Pastes in Archaeology*. Madison, Wisconsin: Prehistory Press, pp. 113-124.
- Dash, E.J. (1969). Strontium isotopes in weathering profiles, deep-sea sediments, and sedimentary rocks. *Geochimica et Cosmochimica Acta* 33, 1512-1552.
- English, N.B., Bentacourt, J.L., Dean, J.S., Quade, J. (2001). Strontium isotopes reveal distant sources of architectural timber in the Chaco Canyon, New Mexico. *PNAS* 98, 11891-11896.
- Ericson, J.M. (1985) Strontium isotope characterization in the study of prehistoric human ecology. *Journal of Human Evolution* 14, 503-514.
- Faure, G. (1986). *Principles of Isotope Geology*. New York: John Wiley.
- Glascok, M.D. (1992). Characterization of archaeological ceramics at MURR by Neutron Activation Analysis and multivariate statistics. In (H. Neff, Ed.) *Chemical Characterization of Ceramic Pastes in Archaeology*. Madison, Wisconsin: Prehistory Press, pp. 11-27.
- Gratuze, B., Blet-Lemarquand, M., Barrandon, J.N. (2001) Mass spectrometry with laser sampling: A new tool to characterize archaeological materials. *Journal of Radioanalytical and Nuclear Chemistry* 247, 645-656.
- Hopkins, Mary R. (1995). *Teotihuacan Cooking Pots: Scale of Production and Product Variability*. Ph.D. Dissertation, Brandeis University.
- James, W.D., Dahlin, E.S., Carlson, D.L. (2005). Chemical compositional studies of archaeological artifacts: Comparison of LA-ICP-MS to INAA measurements. *Journal of Radioanalytical and Nuclear Chemistry* 263, 697-702.
- Knudson, K., Tung, T. (2007). Using archaeological chemistry to investigate the geographic origins of trophy heads in the Central Andes: Strontium isotope analysis at the Wari site of Conchopata. In (Glascok, M.D., Speakman, R.J., Popelka-Filcoff, R.S., Eds.) *Archaeological Chemistry: Analytical Techniques and Archaeological Interpretation*. Washington, D.C.: ACS, pp. 99-113.
- Larson, D.O., Sakai, S., Neff, H. (2005). Laser ablation-inductively coupled plasma-mass spectrometer (LA-ICP-MS) as a bulk chemical characterization technique: comparison of LA-ICP-MS digestion-ICP-MS, and INAA data on Virgin Branch Anasazi ceramics. In (R.J., Speakman, H. Neff, Eds.) *Laser Ablation-ICP-MS in Archaeological Research*. Albuquerque: University of New Mexico Press, pp. 95-102.
- Li, B., Zhao, J., Greig, A., Collerson, K., Zhuo, Z., Feng, Y. (2005). Potential of Sr isotopic analysis in ceramic provenance studies; Characterisation of Chinese stonewares. *Nuclear Instruments and Methods in Physics Research B* 240, 726-732.
- Li, B., Zhao, J., Chen, Z., Feng, Y., Han, G., Zhu, J. (2008) Chemical fingerprinting of whitewares from Nanwa Site of the Chiense Erlitou State. *Nuclear Instruments and Methods in Physics Research B*, 266, 2614-2622.
- Millon, R. (1973). *Urbanization at Teotihuacan, Mexico, The Teotihuacan Map*. Austin: University of Texas Press.
- Mooser, F., Narin, A.E.M., Negandank, J.F.W. (1974) Paleomagnetic investigations of the Tertiary and Quaternary igneous rocks: VIII A Paleomagnetic and Petrologic Survey of Volcanics in the Valley of Mexico. *Geologische Rundschau* 63, 451-483.
- Neff, H. (1992). Introduction. In (H. Neff, Ed.) *Chemical Characterization of Ceramic Pastes in Archaeology*. Madison, Wisconsin: Prehistory Press, pp. 1-10.
- Neff, H. (2000). Neutron activation analysis for provenance determination in archaeology. In (Cilibert, E., Spoto, G., Eds.) *Modern Analytical Methods in Art and Archaeology*. John Wiley & Sons, pp. 81-134.
- Neff, H., Bishop, R.L., Arnold, D.E. (1988). Reconstructing ceramic production from ceramic compositional data: a Guatemalan example. *Journal of Field Archaeology* 15, 339-348.
- Neff, H., Bishop, R.L., Arnold, D.E. (1990). A reexamination of the compositional affiliations of Formative Period whiteware from Highland Guatemala. *Ancient Mesoamerica* 1, 171-180.
- Neff, H., Cogswell J.W., & Ross Jr., L.M. (2003). Microanalysis as a Supplement to Bulk Chemistry in Archaeological Ceramic Provenance Investigations. In (L. Zelst, Ed.) *Patterns and Process: A Festschrift in Honor of Dr. Edward V. Sayre*. Suitland, MD: Smithsonian Center for Materials Research and Education, pp. 201-234.
- Neff, H., Glascok, M.D. (1998) Chemical Variation in Ceramic Raw Materials from the Basin of Mexico and Adjacent Regions. Unpublished University of Missouri Research Reactor (MURR) Report.
- Nichols, D.L., Brumfiel, E.M., Neff, H., Hodge, M. Charlton, T.H., Glascok, M.D. (2002) Neutrons, Markets, Cities, and Empires: A 1000-Year Perspective on Ceramic Production and Distribution in the Postclassic Basin of Mexico. *Journal of Anthropological Archaeology* 21, 25-82.
- Pollard, A.M., Batt, C., Stern, B. Young, S. (2007). *Analytical Chemistry in Archaeology*. Cambridge, UK: Cambridge University Press.
- Pollard, A.M. & Heron, C. (2008). *Archaeological Chemistry*. 2nd ed. Cambridge, UK: Royal Society of Chemistry.
- Rice, P.M. (1987). *Pottery Analysis: A Sourcebook*. Chicago: The University of Chicago Press.
- Robertson, J.D., Neff, H., Higgins, B. (2002). Microanalysis of ceramics with PIXE and LA-ICP-MS. *Nuclear Instruments and Methods in Physics Research B* 18, 378-381.
- Sanders, W., Parsons, J., Santley, R. (1979) *The Basin of Mexico: Ecological Processes in the Evolution of a Civilization*. New York: Academic Press, Inc.
- Sanders, W., West, M., Fletcher, C., Marino, J. (1975). *The Teotihuacan Valley Project Final Report- Volume 2: The Formative Period Occupation of the Valley*. Vol. 2. The Pennsylvania State University: Department of Anthropology.
- Sharer, R. (2007). Early Formative pottery trade and the evolution of Mesoamerican civilization. *Antiquity* 81, 201-203.

- Sharma, M., Balakrishna, K., Hofmann, A.W., Shankar, R. (2007). The transport of osmium and strontium isotopes through a tropical estuary. *Geochimica et Cosmochimica Acta* 71, 4856-4867.
- Sheehy, J. (1992). *Ceramic Production in Ancient Teotihuacan, Mexico: A Case Study of Tlanjina 33*. Ph.D. Dissertation, The Pennsylvania State University.
- Speakman, R., Neff, H. (2005). Introduction. In (R.J., Speakman, H. Neff, Eds.) *Laser Ablation-ICP-MS in Archaeological Research*. Albuquerque: University of New Mexico Press, pp. 1-17.
- Slayton, P. (1985). *A Compositional Analysis of Clays and Ceramics from the Basin of Mexico*. M.A. thesis, University of Colorado, Boulder.
- Stahl, A.B., das Dores Cruz, M., Neff, H., Glascock, M.D., Speakman, R.J., Giles, B., Smith, Leith. (2008) Ceramic production, consumption and exchange in the Banda area, Ghana: Insights from compositional analyses. *Journal of Anthropological Archaeology* 27, 363-381.
- Stark, M.T., Bishop, R.L., Miksa, E. (2000). Ceramic technology and social boundaries: cultural practices in Kalinga clay selection and use. *Journal of Archaeological Method and Theory* 7, 295-331.
- Stoltman, J.B. (1989). A quantitative approach to the petrographic analysis of thin sections. *American Antiquity* 54, 147-160.
- Stoltman, J.B. (1991). Ceramic petrography as a technique for documenting cultural interaction: an example from the upper Mississippi Valley. *American Antiquity* 56, 103-120.
- Stoltman, J.B., Burton, J.H., Haas, J. (1992). Chemical and petrographic characterization of ceramic pastes: two perspectives on a single data set. In (H. Neff, Ed.) *Chemical Characterization of Ceramic Pastes in Archaeology*. Madison, Wisconsin: Prehistory Press, pp. 85-92.
- Stoltman, J.B., Joyce, M., Flannery, K., Burton, J., Moyle, R. (2005) Petrographic evidence shows that pottery exchange between the Olmec and their neighbors was two-way. *PNAS* 102, 11213-11218.
- White, W.M. (2005). *Geochemistry*. Unpublished text. University of Cornell.

reliability. Reliability is a product of an instrument's *precision* and *accuracy*. Precision pertains to the repeatability and stability of the geochemical source attribution of a sample, while accuracy addresses the extent to which measurements conform to 'correct' values (Hughes 1998).

Method

For this study, 56 obsidian artifacts were geochemically analyzed using both laboratory and portable energy dispersive XRF instruments. The artifacts were randomly chosen from the artifact populations of two Classic Period (A.D. 250 - 800) (Coe 2005) Maya sites—Uxbenká and Ek Xux—both located in southern Belize.

The samples were first analyzed by Dr. M. Steven Shackley at the Geoarchaeological XRF Laboratory at the Department of Anthropology, U.C. Berkeley, using a Thermo/ARL *Quant'X* energy dispersive X-ray fluorescence spectrometer. The X-ray tube was operated at 30 kV for 200 live seconds, using a 0.05 mm (medium) Pd primary beam filter in an air path to generate X-ray intensities at the K-alpha₁-line for elements iron (as Fe^T), rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), and niobium (Nb). Conversion of raw spectra to trace elemental intensities (reported here in ppm) was achieved at the Berkeley laboratory through a least-squares calibration line for each element from the analysis of international rock standards certified by the National Institute of Standards and Technology (NIST), the US. Geological Survey (USGS), Canadian Centre for Mineral and Energy Technology, and the Centre de Recherches Pétrographiques et Géochimiques in France (Govindaraju 1994).

Following geochemical analysis at Berkeley, the samples were analyzed using a Bruker AXS Tracer 3-V Portable EDXRF analyzer, equipped with a rhodium tube X-ray source and a peltier cooled, silicon PIN diode detector, operating at 40 kV and 9.0 µA from an external power source for 300 live seconds using a filter composed of 6 mil copper (Cu), 1 mil titanium (Ti), and 12 mil aluminum (Al). Samples were positioned with as much contact as possible to the instrument's surface. This was done to ensure that the greatest amount of X-rays would bombard the sample, optimizing the count rate and mitigating the effects of irregular sample surface structure on X-ray scatter. During analysis, the instrument was mounted in a Bruker designed hold, which allowed for fixed positioning during analysis. Energy counts were processed using the Bruker S1PXRf spectra program. Instrument calibration was achieved through comparison of expected and produced elemental concentrations of 17 Mesoamerican obsidian samples of known geochemistry. We used the Bruker S1CalProcess program, which utilizes the Compton's scatter derived from rhodium backscatter. In addition, a single standard sample of known geochemistry was run each day as to ensure the stability of the instrument. Analysis was conducted at the K-alpha₁-line for tin (Ti), manganese (Mn), iron (Fe), rubidium (Rb), strontium (Sr), zirconium (Zr), niobium (Nb), zinc (Zn), yttrium (Y), and barium (Ba).

Error Assessment of Portable X-Ray Fluorescence Spectrometry in Geochemical Sourcing

Brandon L. Drake¹, Adam J. Nazaroff², Keith M. Prufer¹
¹Department of Anthropology, University of New Mexico
²Department of Anthropology, Stanford University

The availability and use of portable X-ray fluorescence (PXRF) instruments among archaeometrists has increased in recent years. Such proliferation warrants an in depth look at the quality of the instruments and the data they produce. Here we attempt to test one aspect of PXRF instrumentation:

Geochemical source determinations were achieved through utilization of rubidium and zirconium trace elemental concentrations (Figure 1), and by comparison to references provided by the Berkeley standard library. Both instruments determined that the sample population contained seven samples from the Ixtepeque obsidian geochemical group, 47 from the El Chayal group, one from the Pachuca group, and one unknown.

Two-sample t-tests were employed at the 95% confidence level between the El Chayal and Ixtepeque geochemical source clusters for elements Rb, Sr, Zr, and Y derived from portable and laboratory XRF instruments in order to test the accuracy of the PXRf instrument. Previous research (see for instance Davis et al. 1998; Shackley 2005) has demonstrated the validity of laboratory XRF instrumentation for archaeological provenance research. It follows that data produced from the U.C. Berkeley lab make a suitable control for which to test the accuracy of PXRf analysis.

Summary statistics were generated within a single source cluster—El Chayal—and were used to determine the percentage distance between the means of the laboratory and

portable derived El Chayal source clusters. This percentage was then used to generate a treatment for the PXRf data by increasing each datum by that percentage, and re-running the two sample t-tests to determine if systematic (predictable) or random (not predictable) error is present.

K-means cluster analysis was employed to identify a central point of variation in the El Chayal, Ixtepeque source groups. This was done using the Lloyd algorithm and partitioning the data into three clusters based on the sources confirmed through laboratory XRF analysis, i.e. the laboratory XRF data sets a hypothesis by which to judge the PXRf instrument. The standard error in each cluster was used to generate confidence levels about the centroid, allowing comparison of the overlap between laboratory and portable XRF data both graphically and statistically (Figure 2). These data were then run through a two sample t-test to assess accuracy.

Results

P-values between laboratory XRF and both untreated and treated PXRf data are seen in Table 1. With the exception of yttrium, all trace elements showed significant differences at

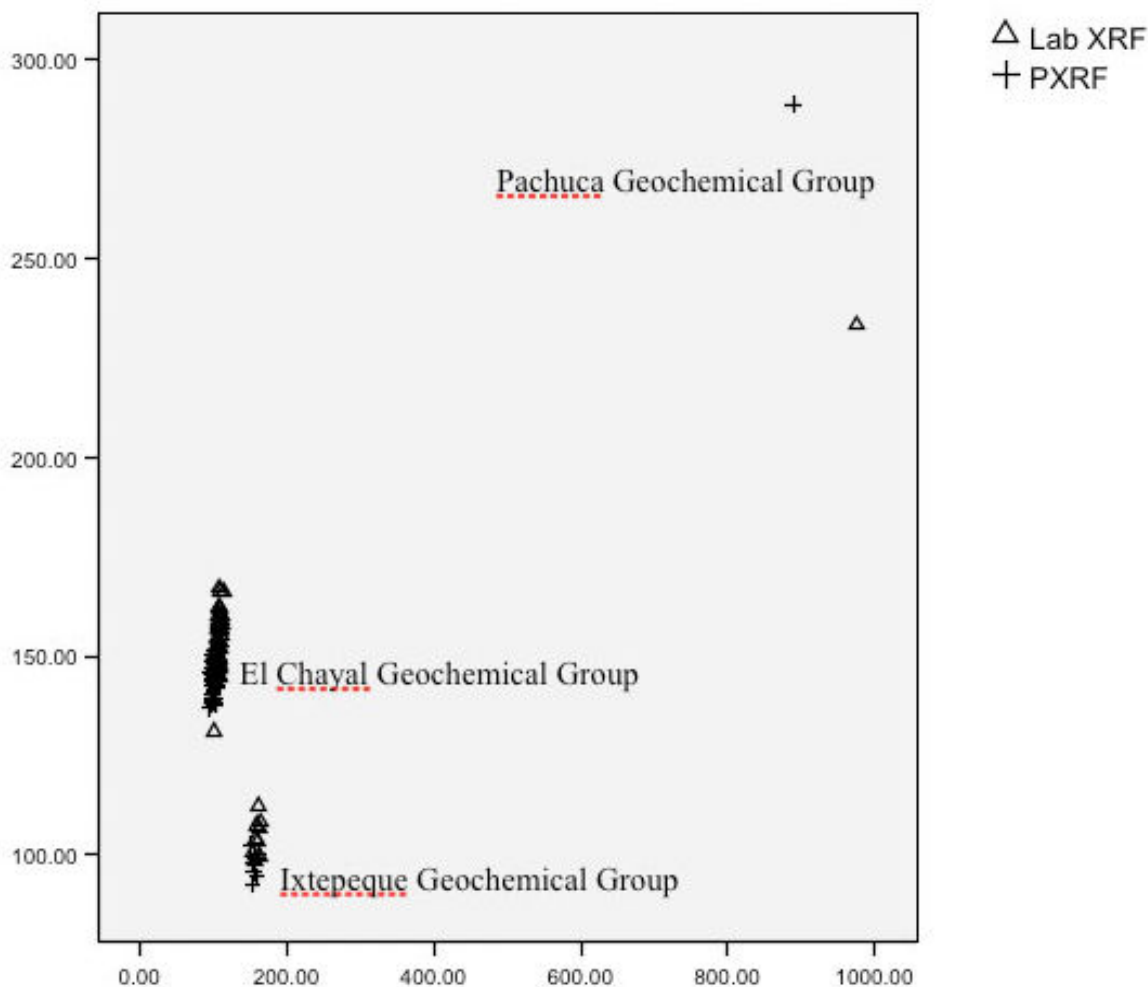


Figure 1. Bivariate plot of rubidium (Rb) (y-axis) and zirconium (Zr) (x-axis) trace element concentrations, utilized in source assignment, acquired via laboratory EDXRF (triangles) and Portable EDXRF (crosses) instruments.

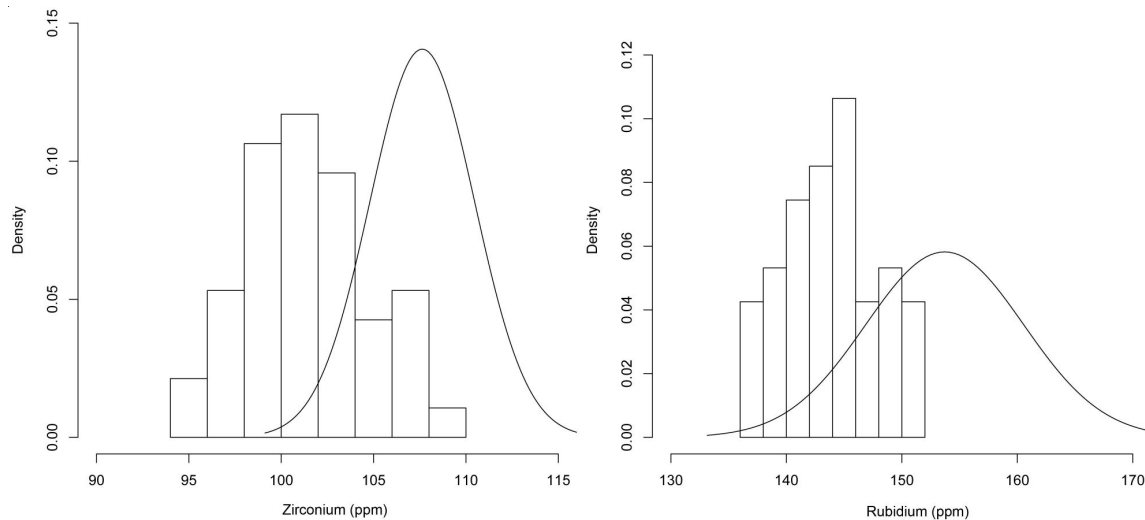


Figure 2. Histograms of Zirconium and Rubidium comparing PXRF data (bars) to laboratory XRF (solid line curve).

Table 1. Average trace element concentrations detected in the El Chayal cluster by laboratory XRF and PXRF with the percent error between the two instruments.

Instrument	Zr (ppm)	Rb (ppm)	Sr (ppm)	Y (ppm)
LXRF	107.5957	153.7021	151.9787	19.44681
PXRF	101.2867	143.90896	144.8979	20.81104
% Error	5.86%	6.37%	4.66%	-7.02%

the 95% confidence level for untreated PXRF data. This supports the argument that our PXRF instrument is inaccurate when compared with data derived via laboratory XRF analysis.

By contrast, treated PXRF data showed non-significant differences at the 95% confidence level with varying degrees of strength. This suggests that while inaccurate, PXRF data are precise.

Measurement between data from laboratory XRF and untreated PXRF show that Bruker PXRF tends to produce geochemical readings for Rb, Sr, Zr and Y which consistently differ from the laboratory XRF data by 6%. The results of these analyses can be seen for each element in Table 2 and Figure 2.

K-means cluster analysis mirrored the two sample t-test results. Untreated PXRF results showed statistically significant differences with a *p*-value of < 0.001, while treated PXRF results had a *p*-value of 0.500.

An additional strength of k-means cluster analysis was generating an automated sourcing technique; the identification of clusters was done directly through computer calculation.

Both treated and untreated PXRF data was automatically and properly sourced despite inaccuracy when compared with laboratory XRF data (Figure 2).

Table 2. Table of *p*-values from two-sample t tests between laboratory XRF and both raw and treated PXRF data.

Test	Zr	Rb	Sr	Y
LXRF - Untreated PXRF	0	0	0	0.406
LXRF- Treated PXRF	0.343	0.824	0.706	0.969

Discussion

Consistent with past research (Craig et al. 2007), while statistical analysis demonstrates that geochemical data acquired from the PXRF instrument are not equivalent to that acquired via laboratory XRF, it can successfully distinguish geochemical source clusters.

Of central importance to this discussion is the nature of this inter-instrument error. By creating a treatment for the PXRF data, a large amount of error (roughly 6% in trace elements Rb, Sr, Zr, Y) can be identified and potentially corrected; this is depicted in Figures 1 and 2.

This systematic error, once identified and removed, results in non-significant differences at the 95% confidence level between data acquired by portable and laboratory XRF instruments.

This method of dual-analysis using two instruments may be of use in determining the error rates of other PXRF instruments.

The inaccuracy demonstrated here is not intended to dismiss the use of PXRF instrumentation in archaeological provenance research. Indeed, the Bruker instrument was found to have sufficient intra-instrument consistency for geochemical source determination.

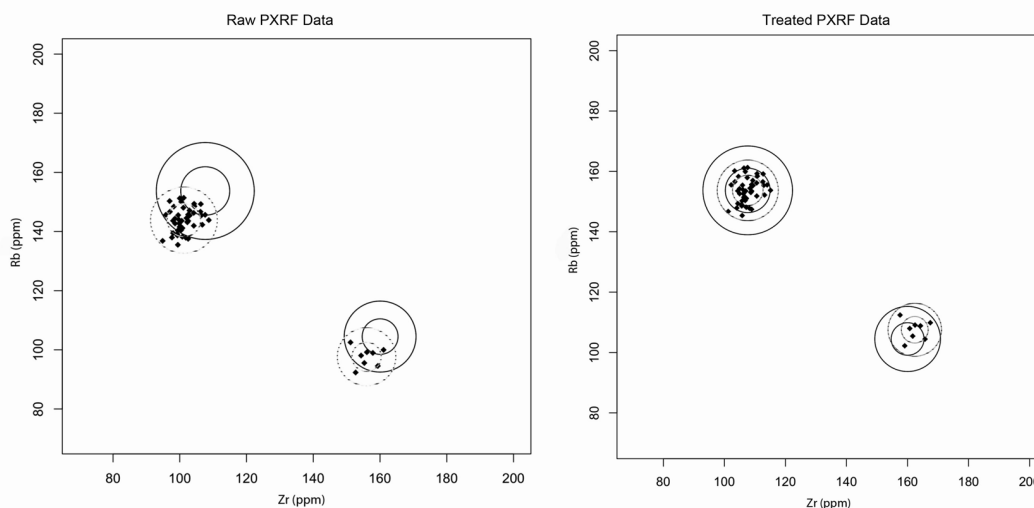


Figure 3. K-means cluster analysis centroids centered around El Chayal (upper left) and Ixtepeque (lower right). Data in the left diagram reflect raw PXRF data, while in the right diagram treated PXRF data are used. Solid line circles represent laboratory XRF data at the first and second standard deviations; dotted lines show the same standard deviations for PXRF data.

Acknowledgements

We thank Dr. M. Steven Shackley, not only for his generous analysis of several obsidian artifacts, but for many insightful discussions which helped to guide the development of this research. We are also indebted to Bruker AXS and Dr. Bruce Kaiser for granting us acquisition of the Bruker AXS Tracer 3-V analyzer. We also thank Dr. Peter Dunham, the Maya Mountains Archaeological Project. All archaeological research was conducted under permits issued by the Belize Institute of Archaeology and we are grateful to Drs. Jaime Awe and John Morris for their support. Funding for this project was provided by the National Science Foundation (BCS-0620445 to Prufer), the Alphawood Foundation (to Prufer), and the University of New Mexico Office of Graduate Studies (to Nazaroff).

References

- Coe, M. D. (2005) *The Maya* 7th Edition. Thames and Hudson, New York, NY.
- Davis, M. K. T.L. Jackson, M.S. Shackley, T. Teague, and J.H. Hampel (1998) Factors Affecting the Energy-Dispersive X-Ray Fluorescence (EDXRF) Analysis of Archaeological Obsidian. In *Archaeological Obsidian Studies: Method and Theory*, edited by M.S. Shackley, pp. 159-180. Springer/Plenum Press, New York.
- Govindaraju, L. (1994) Compilation of working values and sample descriptions for 383 geostandards. *Geostandard Newsletter* 18 (special issue), pp. 1-158.
- Hughes, R. E. (1998) On Reliability, Validity, and Scale in Obsidian Sourcing Research, in A. F. Ramenofsky and A. Steffen (eds) *Unit Issues in Archaeology: Measuring Time, Space, and Material*, pp. 103-114. University of Utah Press.
- Shackley, M. S. (2005) *Obsidian: Geology and Archaeology in the American Southwest*. University of Arizona Press, Tucson, AZ.

Archaeometallurgy

Thomas R. Fenn, Guest Associate Editor

The column in this issue includes the following categories of information on archaeometallurgy: 1) New Books; 2) Ph.D. Theses; 3) Previous Meetings; 4) Forthcoming Meetings; and 5) Online Resources.

New Books

Iron and Steel in Art: Corrosion, Colorants, Conservation, David A. Scott and Gerhard Eggert, 2009, 196 pp., 138 illus., ISBN: 1904982050, £55.00/\$90.00 (Hardback). Contents: 1. Iron and steel in art: an introduction, 2. Iron oxides and hydroxides, 3. Iron carbonates, 4. Iron chlorides, 5. Iron sulphides and sulphates, 6. Iron phosphates, 7. Iron silicates, 8. Iron organometallic compounds and cyanides, 9. Iron corrosion in the soil and burial, 10. Iron corrosion in the atmosphere, 11. Iron corrosion in marine environments, 12. The conservation of iron: an overview, 13. The conservation of iron from soil burial, 14. The conservation of iron in the atmosphere, 15. The conservation of iron from marine sites, 16. Conservation decisions, 17. Appendix 1, 18. Bibliography, 19. Glossary of Some Technical Terms. This book will be of interest to all who seek to further their understanding of iron artefacts, their corrosion, conservation and pigments based on iron compounds, which mankind has used for millennia. The authors take the reader through some of the latest observations on the occurrence and role of compounds of iron – from the hot water undersea vents where the presence of iron pyrites is thought to be vital to the emergence of life on Earth to the discovery of jarosite on the surface of Mars, possibly indicating the occurrence of water; from the pyrophoric surprises one can have when dealing with iron artefacts taken from beneath the sea to the use of a blue oxide of iron as a pigment in mediaeval wall paintings; from rusticles on the Titanic to the analysis of colouring matter on the Turin shroud. The great variety of iron

compounds is examined (from the simple oxides to the exotic green rusts, from Prussian blue to yellow jarosites), the corrosion of iron in different environments is discussed and a critical review of the attempts to conserve iron is presented.

Ph.D. Theses

Industrial capitalism and the company town: Structural power, bio-power, and identity in nineteenth-century Fayette, Michigan, by Sarah E. Cowie (The University of Arizona, Tucson, 2008). This research explores the subtle distribution of power within early American industrial capitalism, as seen in the nineteenth-century company town of Fayette, Michigan. Research methods for the project include GIS-based analysis of the built environment and artifact patterns; the development of a historical ethnography for the town; and archaeological excavations of household refuse excavated from three class-based neighborhoods (an artifact database is attached to this document in CD format). Issues surrounding power and agency are explored in regard to three heuristic categories of power. In the first category, the company imposed a system of structural, class-based power that is most visible in hierarchical differences in pay and housing, as well as consumer behavior. A second category, bio-power, addresses disciplinary activities surrounding health and the human body. The class system extended to discrepancies in the company's regulation of employee health, as observed in medicinal artifacts, disposal patterns of industrial waste, incidence of intestinal parasites, and unequal access to healthcare. In addition, landscape analysis shows how the built environment served as a disciplinary technology to reinforce hegemonic and naturalized class divisions, to regenerate these divisions through symbolic violence and workers' daily practices, and to impose self-regulation. The third ensemble of power relations is pluralistic, heterarchical, and determined by personal identity (e.g., consumer behavior and gender). Individuals drew upon non-economic capital to bolster social status and express identity apart from the corporate hierarchy. This research explores the social impacts of our industrial heritage and the potential repercussions of industrialization today.

Seventeenth century metallurgy on the Spanish colonial frontier: Transformations of technology, value and identity, by Noah H. Thomas (The University of Arizona, Tucson, 2008). This dissertation analyzes archaeological features and materials related to metal production excavated from the early colonial component (1598-1680 AD) of the Pueblo of Paa-ko (LA 162), Bernalillo County, New Mexico. The dissertation characterizes the metallurgical technology employed at Paa-ko through the integration of archaeological, technological and ethnohistorical data in order to develop a comprehensive understanding of the technology in terms of its material and social aspects. By integrating many scales of analysis, from site specific behavioral observations, to regional and global economic networks, the project investigates how economic, technical and social knowledge is communicated, contested, and transformed across the social and cultural boundaries present in early colonial communities. The dissertation addresses how the situated

agency of indigenous practitioners incorporated within colonial industries shapes such industries. It also explores the effects of such agency in the resulting technology at LA 162, and early Spanish colonial constructions of 'value' (of both an economic and social nature), more broadly.

Bronze Age Metallurgy of the Eastern Carpathian Basin: A Holistic Exploration, by Christopher A. Papalas (Arizona State University, Tempe, 2008). By the beginnings of the Bronze Age (2500 B.C.), simple metallurgy was widely practiced in Hungary and Romania. Although Bronze Age societies in the region remain less hierarchical than their Mediterranean and Near Eastern contemporaries, they show greater social differentiation and a wider scale of social integration than their precedents. The key commodity in both intra and interregional interactions was metal. This study attempts to reconstruct the processes of early metallurgy and situate metal production in its broader social context. I approach the research holistically in a multidisciplinary format. First, slags ascribed to the Maros and Ottomány/Gyulavarsánd cultures of the Early to Middle Bronze Age were analyzed using x-ray diffractometry, particle induced X-ray emission, and optical and electron microscopy. They indicate a diverse and expedient technology with much variation in raw materials and a wide range of techniques. Some appear to be atypical metallurgical slags derived from smelting very pure copper oxides or casting native or smelted copper. Second, thirteen copper ore deposits of western Romania were sampled and analyzed using the same methods. A few local copper deposits in the area contain significant amounts of arsenic and tin, suggesting that alloying associated with the beginning of the Bronze Age was largely accidental. In addition, discriminant analysis is capable of distinguishing between these ore deposits using trace element concentrations, a prerequisite for sourcing artifacts with these methods. Finally, replicas of copper tools were manufactured using traditional methods in a series of experiments designed to assess their practical capabilities. This work indicates that pure copper is vastly superior to stone for economic tasks when work hardened. Copper tools gave obvious and important advantages to those who possessed them. Overall, the evidence presented here indicates a diverse set of metal production behaviors that nevertheless shows directionality through time. The impression is one of a two tiered metal production system, with many domestic level smiths and fewer fully specialized artisans. The difficulties associated with controlling such a dispersed production system may have countered tendencies toward greater hierarchy.

Previous Meetings and Conferences

The *World of Iron Conference 2009 (WIC)*, held from February 16-20, 2009, in London, United Kingdom, was a resounding success. You can read Brian Dolan's review of the conference in *HMS News*, p. 5, at: <http://www.hist-met.org/hmsnews71.pdf>. A proceedings of the conference is in the works and may be in press by summer 2010; for more details, see the website: <http://www.ironsmelting.net/WIC2009/proceedings.php>.

The 74th Annual Meeting of the Society for American Archaeology, held April 22-26, 2009, in Atlanta, Georgia, United States, included a number of individual papers through a number of non-metallurgical thematic sessions which included information on ancient and historic metals and metallurgy, and on metallic mineral usage, such as galena and turquoise. Relevant presentations from other sessions can be generally grouped as New World and Old World papers. The New World papers on ancient metals, metallurgy and metallic minerals included: "Embedded Networks? Pigments and Long-Distance Procurement Strategies in the Late Prehispanic Southwest" (Deborah Huntley, Thomas Fenn, Judith Habicht-Mauche and Barbara Mills), "The Right Ingredients: Southern Cerrillos Hills Lead in Paint on Pajarito Plateau-Produced Glaze-Painted Pottery" (Diane Curewitz and Sheila Goff), "Mineral Wealth and Value: Tracing the Impact of Early Spanish Colonial Mining on Puebloan Pigment and Paint Production" (Noah Thomas), "Local Copper Production During the Middle Horizon at the Pirque Alto Site, Cochabamba, Bolivia" (Colin Thomas and Timothy McAndrews), "Craft Production at Cahokia: Mound 34's Copper Workshop" (Lori Belknap, Kathleen Ehrhardt, Lucretia Kelly, Kathryn Parker and Julieann Van Nest), "Multiscalar Examination of Turquoise Procurement in Pueblo Bonito, Salmon, and Aztec Ruin" (Sharon Hull, Mostafa Fayek and Joan Frances Mathien), "Ornaments and Metals from Noble Households at Cerro Leon on the North Coast of Peru" (Juliana Quist and Brian Billman), "Tracing Archaic Social Networks in the Western Great Lakes: Chemical Composition Analysis of Native Copper and its Application to the Development of Regional Systems in the Midcontinent" (Mark Hill), "18th Century Metallurgical Investigation of Blacksmithing at Fort Michilimackinac" (Amy Roache-Fedchenko), "Tracing Turquoise from Site to Source Using Radiogenic Isotopes" (Alyson Thibodeau, Joaquin Ruiz and John Chesley), "Studying Glaze-Paint Production and Exchange in the American Southwest Using Lead Isotope Analysis" (Judith Habicht-Mauche), "Fingerprinting Turquoise Provenance Regions in the American Southwest and Northern Mexico" (Mostafa Fayek and Sharon Hull), "A Synthesis of Sican Metallurgy and its Analytical Methodology" (John Merkel), "Environmental contamination associated with historic mining and milling within Nelson, Nevada, USA" (Gavin Gillmore, Doug Sims and Peter Hooda). Old World papers on ancient metals, metallurgy and metallic minerals included: "Identity Formation and the Display of Migration Period Scandinavian Gold Bracteates" (Nancy Wicker), "Peering through Odin's Eye: Issues Surrounding the Interpretation of Post-Roman Metalwork" (Heather Flowers), "The Changing Meanings of the Willow Leaf Shaped Sword in Western Zhou China" (Yan Sun), "The Many Faces of Metal Kettledrums in Ancient Asia" (TzeHuey Chiou-Peng), "Accidental Alloying and the Early Bronze Age of the Eastern Carpathian Basin" (Christopher Papalas and Alexandru Szentmiklosi), "Final Results from Lead Isotope Studies of Defixiones from Roman Carthage" (Sheldon Skaggs), "Coinage at Lattara. Using archaeological context to understand ancient coins" (Luley Benjamin), "Indus Civilization Rock and Mineral Trade Networks: An Emerging Multi-Regional Picture" (Randall Law), "The Numismatic State: Iconoclasm and Political

Subjectivities in the First Century of Islam" (Darryl Wilkinson), "The Origins of Metallurgy in Central Turkey: Distinguishing Stone from Metal Cutmarks on Animal Bones" (Sarah Adcock and Benjamin Arbuckle), "Technological Change in Southwestern Asia: Comparing Metallurgical Production Styles and Social Values during the Chalcolithic and Early Bronze Age" (Lesley Frame), "Sources of Tin in Prehistoric Bronzes: A Novel Approach" (Lisa Molofsky and David Killick).

The conference *Fe09: Coalbrookdale 300. Footprints of Industry*, was held June 3rd to 7th, 2009. *Conference Statement*: The 300th anniversary of the first successful commercial use of coke to smelt iron is an appropriate moment to consider the impact of the industrial revolution on the modern world. It will be 50 years since the iconic blast furnace at the centre of the 'Birthplace of Industry' was rediscovered. That last half century has seen a dramatic expansion of research into historical industrialisation, coupled with overwhelming public support for the conservation of its material remains. The wide range of disciplines involved – archaeology, history, metallurgy and conservation – have themselves developed in response to the challenges of understanding this often fragile heritage. Big themes and issues arise which have tremendous relevance to the world today: environmental change, social transformation, technological progress, leisure as industry and industry as leisure. This conference provides an exciting opportunity for inter-disciplinary debate, discussion and analysis, through which we can find ways to take forward the study of these important processes and bring our findings to bear on the reality of life today. The conference was hosted by the *Ironbridge Gorge Museum Trust* in Coalbrookdale, Shropshire with the support of the *Historical Metallurgy Society*, the *Society for Post-Medieval Archaeology*, the *Association for Industrial Archaeology* and the *Newcomen Society*. *Organizers*: The Conference was organized by Paul Belford. Email: paul.belford@ironbridge.org.uk. The final program can be accessed at: <http://www.hist-met.org/conf2009prog.pdf>.

Forthcoming Meetings and Conferences

ArchaeoMetallurgy Conference: A Celebration of Gerry McDonnell's time at Bradford University, will be held at the University of Bradford, 10th-12th November 2009. Dr Gerry McDonnell is leaving the University of Bradford's Division of Archaeological Science. The overall aim of this conference is to therefore celebrate the research carried out by Gerry McDonnell during his time at Bradford, and to wish him well for his future research. The first day, which is open to all, will focus on research carried out at Bradford University, bringing back many students and researchers associated with Gerry and Bradford. Following this day the *Historical Metallurgy Society* will hold a *Research in Progress Meeting*. This is an opportunity for anyone to present the results from current historical metallurgy or archaeometallurgy research in progress, in a friendly and supportive environment. We hope to be able to welcome a broad, national and international participation. The *Abstract Deadline* has now moved to the 26th of June. For more information visit the conference website

www.archaeomaterials.me.uk/conf/archmet09.html or the HMS website www.hist-met.org, or email Eleanor Blakelock at eleanor.blakelock@ironsmelting.net. You can write her at the following address: Eleanor Blakelock, Division of AGES, University of Bradford, West Yorkshire, BD7 1DP, UK.

The meeting *Archaeometallurgy: Technological, Economic and Social Perspectives in Late Prehistoric Europe*, will be held at TESME, Madrid, Spain, November 25-27, 2009, in honour of Salvador Rovira. *Conference Scope*: Research on the Bronze Age in Europe has been strongly influenced first by the consideration that metallic objects are the main chronological and cultural markers for periodization and, later on, by the idea that metallurgical activities are related to concepts such as “specialisation”, “social complexity” and “trade”. Since the last decades of the 20th century, other questions have also been posed, these include the importance of the context in which this technology was adopted, as well as technological change conceived from a double perspective: internal and external to metal production. The internal perspective explains the change within the technological system itself: what shifts occur and how they occur due to pre-existing knowledge and innovations. The external one tries to answer the question “why does it change?” by looking at the society, the economy and the politics in which the technology works, acting as factors that unleash this change through innovation and adoption mechanisms. The scientific meeting will take place in Madrid from the 25th to the 27th of November 2009 and it is organised by the Centre for Human and Social Sciences (CCHS) of the Spanish National Research Council (CSIC) of Madrid. This conference hopes to bring together specialists interested in this topic, to exchange knowledge and update the different notions about metallurgical activity in late prehistoric Europe from a global archaeometallurgical perspective. The conference will schedule six sessions discussing the following topics: 1) Technological change; 2) Craft specialisation and organisation of production; 3) Exchange and/or trade of raw materials and objects; 4) Technology and experimental archaeology; 5) Function and use of metal; and 6) Environmental impact of the mining and metallurgical activity. Oral presentations will have a maximum length of 20 minutes. The conference programme will allow a total of 40 presentations. The Conference Organisers and Scientific Committees will select among all the proposals those that will be finally presented. In addition, 20 poster presentations will be also admitted; the poster format will be notified at the time of the acceptance of proposals. Abstracts should be sent as text documents (preferably in Word format) by March 20th, 2009 to: tesme.cchs@cchs.csic.es. Please include a title, the authors’ complete name and affiliation, a full postal address and your email address. Abstract should be maximum 1000-2000 characters and contain a clear description of the main paper’s topic. Please indicate the preferred session for the presentation at the end of the text. The official languages will be Spanish and English.

The *Symposium on the Metallurgy of the European Iron Age 2010*, will take place at the Reiss-Engelhorn-Museen, in Mannheim, Germany from 20-22 April 2010. The *Scope and aim of the conference*: Iron Age societies in Europe are strongly associated with the historical Celts who populated

Europe from Spain to Asia Minor and from the British Isles to Italy temporarily. This geographical and chronological outline should be the emphasis of this conference to illuminate the use, the production and the significance of various metals within different parts of the Celtic world. Nevertheless, as technological traditions of the beginning of the first millennium BC remained unchanged and as the Roman conquest did cause technological changes; it is obvious that these periods will also be highlighted. Since there is substantial archaeological evidence for the interaction between the Celts and the Mediterranean world and also with its neighboring regions, regional and chronological differences in the use of metals should become apparent. Local ore mining and extractive metallurgy are regularly underestimated during this period and the participants will have the opportunity to open new vistas or certifying established views. It is the aim of the conference to bridge current scientific research on Iron Age metallurgy in different countries, to correct and to update our knowledge of European Iron Age metallurgy. The official language of the Symposium language will be English. *Acceptance of papers*: The conference should provide an overview of recent and long-time research in all of Europe. Therefore, they would like to have a balance between countries, metals and periods. Speakers will have enough time to present their results and there should be enough time for discussions. Therefore, the number of lectures will be limited and there will be no parallel sessions, but the poster session will allow maximum participation. It is proposed to publish selected papers in a refereed volume of “Forschungen zur Archäometrie und Altertumswissenschaft”. Abstracts of 200-400 words should be submitted to: SMEIA@cez-archaeometrie.de. The abstracts should contain information about the location, the archaeological period and the materials which were investigated. Please give the title followed by the author’s name and title, affiliation, full postal address and email address. The organizers look forward to welcoming you to the conference and hope to keep the registration fee at a moderate level in order to enable students and those without financial support of their institution to participate. Please see the Payment Detail pages for more information. *Key Dates*: Deadline for submission of abstracts: June 30th, 2009; Notification of acceptance or rejection: July 30th, 2009; Deadline for registration and payment of reduced registration fee: December 15th, 2009. *Scientific committee*: Justine Bayley (Portsmouth, United Kingdom), Irene Calliari (Padua, Italy), Peter Northover (Oxford, United Kingdom), Ernst Pernicka (Tübingen, Germany), Roland Schwab (Mannheim, Germany), Vincent Serneels (Fribourg, Switzerland), Thomas Stöllner (Bochum, Germany). *Organisers*: Roland Schwab and Ernst Pernicka. Web site: <http://www.cez-archaeometrie.de/en>.

The *Archaeological Iron Conservation Colloquium*, will be held Thursday 24 June - Saturday 26 June 2010. The Aim of the International Conference is Preservation of the masses of iron finds is still a problem. Although somewhat neglected in the last decades, now there are many current research projects going on in Germany and worldwide. Summer 2010 will be the right time to give an overview of their outcome and the state of

the art in general. A number of invited researchers already agreed to present their work. *Submission of Contributions*: Researchers who want to contribute need to send an abstract (ca 200 words) until 31 December 2009 per e-mail to Gerhard Eggert. Contributors will be notified until 31 January 2010 about acceptance. There will be no conference publication. Speakers are free to submit talks and papers elsewhere as they like. We do not expect exclusivity. To help non-native English speakers to understand the contents, speakers are asked to submit an extended abstract of 3 pages in English until 31 March 2010 (ready for print without editing, will be collected in a photocopied conference reader for all attendants and put on the web). *Program*: Lectures (20 min + 10 min discussion) on June 24th and June 25th. Excursion to places of interest in art history/archaeology: June 26th. *Keynote address*: ‘Iron and the Microscope’: David A. Scott, USA. *Conference Language*: All lectures must be given in English. *Fees*: Conference fee 50 EUR (waived for speakers and conservation students). *Audience*: Mainly Central European conservators and students, max. 120 (lecture hall capacity). *Organizer/Co-Organizers*: State Academy of Art and Design Stuttgart, Objects Conservation; Landesamt für Denkmalpflege Baden Württemberg; AIAE ‘Archaeological Iron after Excavation’, sub-WG of ICOM-CC WG Metals; Deutsche Bundesstiftung Umwelt (DBU); Landesmuseum Sachsen-Anhalt / KUR-Project. Contact: gerhard.eggert@abk-stuttgart.de.

Internet Resources

The *Historical Metallurgy Society* (HMS) has updated their website to include downloadable PDF files of past issues of the Society newsletter, *HMS News*. Not all issues are available yet, but currently it goes back a decade, running from Spring 2009 (No. 71) to Winter 1998/9 (No. 40). The plan is to continue to digitize back issues and add them to the website, <http://www.hist-met.org/newsletter.html>.

A *Metallurgy Glossary* has been compiled by Chris Salter and Brian Gilmour. This document is available as a PDF file from: <http://www.hist-met.org/glossary.pdf>. However, the compilers request further contributions from the archaeometallurgical community. If you have any suggestions please email: david.dungworth@english-heritage.org.uk.

Archaeological Ceramics

Charles C. Kolb, Associate Editor

The column in this issue includes three topics: 1) Books Reviews; 2) Previous Meetings; and 3) Internet Sites and Databases.

Book Reviews

Ceramics in America 2008, edited by Robert Hunter; Milwaukee, WI: The Chipstone Foundation, distributed by

Antique Collectors Club, Ltd., Easthampton, MA and Woodbridge, Suffolk, UK; 2008, xiv + 383 pp., 414 color illustrations; ISSN 1533-7154, ISBN 0-9767344-2-7, \$65.00 US (hardcover). For the eighth consecutive year, historical archaeologists have been gifted with another *Ceramics in America* annual volume. Just when you think that editor Rob Hunter can't produce an even better and more interesting treatise, he surpasses himself. There is something of interest to archaeologists, social historians, art historians, decorative arts specialists, curators, and a variety of other scholars and the informed public. Hunter is a specialist in English ceramics with 20 years of professional experience in historical archaeology excavating Colonial British sites throughout Virginia and North Carolina. He was the founding director of the Center for Archaeological Research at The College of William and Mary. In addition to his exposure to English ceramics as an archaeologist, Hunter served as curator of Ceramics and Glass in the Department of Collections at Colonial Williamsburg. The current volume has articles that span four centuries of ceramic history; there are 11 major articles, 13 shorter contributions in the section “New Discoveries,” seven book reviews, and 14 pages listing important recent publications — the “Checklist of Resources.” The long and short articles are superbly illustrated by 414 color images taken by photographer Gavin Ashworth and the articles are accompanied by scholarly endnotes. The volume is well worth its price but new copies may be obtained from many online booksellers for prices as low as \$40.00.

The volume begins with an “Introduction” by Robert Hunter (pp. xi-xiv). The major contributions includes “The Eighteenth-Century New Jersey Stoneware Potteries of Captain James Morgan and the Kemple Family” by Arthur F. Goldberg, Peter Warwick, and Leslie Warwick (pp. 2-40, 66 figures, 78 notes) that focuses on the Robert J. Sims archaeological collection of stoneware (jars, mugs, plates, and chamber pots) associated with the two potting groups, Morgan (1775-1784) and Kemple (1746-1790s). This reanalysis of previously published descriptions resulted in the identification of new stoneware jars. The authors also relate these New Jersey potters with New York City artisans, and suggest a possible source for the “watch-spring” (cogged spiral) motif. “New York City Stonewares from the African Burial Ground” by Meta F. Janowitz (pp. 41-66, 44 figures, 49 notes) concerns the collection from the burial ground in lower Manhattan which was stored near the World Trade Center and destroyed on 9/11/2001. Janowitz discusses the history of the excavations and analysis of 22,298 sherds, and her careful documentation of the collection and superb color photos provide production evidence of jars, jugs, pitchers, beakers, tankards, porringers, and dishes fabricated by Corsilius, Crolius, Remmey, and others, 1720-1765. In “War and Pots: The Impact of Economics and Politics on Ceramic Consumption Patterns,” George L. Miller and Amy C. Earls (pp. 67-108, 36 figures, 90 notes) consider consumption patterns (based on 101 invoices dated 1806-1886) for ethnic and social groups, and devise an economic model based on oversupply and falling prices (rather than innovation based on fashion and consumer demand). They also discuss potters’

terminology, regional variants, market shares, and life cycles of five English pottery types. “Comparative Studies in Anglo-American Ceramic Demand” by Neil Ewins (pp. 109-142, 18 figures, 125 notes, 6 appendices) concerns economic and social factors influencing ceramic purchasing behaviors for American and British ceramic trade (1848-1860). Data on customers and locations as well as pottery values based on the Cork and Edge factory (Staffordshire) are employed to demonstrate global customer distributions (Great Britain, Continental Europe, the United States, the Caribbean, and Australia). Differences in demand and buyers’ attitudes are related.

In “Robert H. Miller, Importer: Alexandria and St. Louis,” Barbara H. Magid (pp. 143-161, 16 figures, 65 notes) presents a correlation of archaeological ceramics with wares listed in newspaper advertisements and other records for Miller (1798-1874) who maintained a store on King Street in Alexandria, Virginia and on Main Street in St. Louis, Missouri. She considers commemorative wares, European porcelain and yellow ware imports, as well as printed, edged, and enameled wares. “Ceramics from the ‘Blue China’ Wreck” by Hawk Tolson, Ellen Gerth, and Neil Cunningham Dobson (pp. 165-185, 42 figures, 29 notes) concerns a British-made ceramic cargo (Blue china) on a still unidentified American sailing ship wreck, a presumed coastal trader discovered in 2003 at 367 m depth located east of Jacksonville, Florida, that went down in the mid-19th century. The ceramics include British shell-edged and yellow earthenwares, as well as dipped, painted, and transfer-printed wares, stoneware, Canton ginger jars, and one American-made salt-glazed stoneware jug (New York City, 1850-1860). “A Monroe Punch Bowl and American Lithographers in Paris, 1814–1824” by Sumpter Priddy III and Joan Quinn (pp. 187-202, 14 figures, 36 notes) presents information on a French “Old Paris” porcelain bowl with an American eagle lithograph which was associated with President James Monroe; surprisingly, the process is earlier than Staffordshire lithographs. In “It’s Quarter to Twelve . . . and Way Too Late,” Richard Prowse (pp. 203-212, 16 figures, 3 notes) discusses the Asa Smith Pottery in Norwalk, Connecticut – one of the largest in New England — that functioned from 1825 to 1888. The history of this reused building and its demolition in 2004 are reviewed. “A Long Way to Lug a Jug” by Ivor Noël Hume (pp. 213-223, 17 figures, 20 notes) provides a fascinating study of a mammoth British salt-glazed stoneware handled jug with olive-green lead glazed interior and applied decoration (sprigs) that was produced in Yorkshire in 1830 and related to the coronation of King William IV. Sam Margolin’s “‘A Magnificent Failure’: Ceramic Souvenirs of the 1907 Jamestown Tercentennial Exposition” (pp. 224-262, 59 figures, 100 notes), reports on commemorative ceramics made for the 1907 and 1957 anniversaries of Jamestown, Virginia. Among the ceramics considered are Staffordshire plates, miniature bricks, teapots, plaques, ashtrays, German-made tiles, and bisque porcelain figurines. He contends that the 2007 ceramic commemoratives are “uninspired” (p. 258). Lastly, Noël Hume documents the creation of a special commemorative ceramic for the Jamestown 2007 celebration that was presented as a gift to Queen Elizabeth II on May 4, 2007. Designed and created

by the internationally renowned potter Michelle Erikson, the history of its fabrication is detailed in “Fit for a Queen” (pp. 263-273, 10 figures, 13 notes).

The “New Discoveries Column” has an “Introduction” by Merry Abbitt Outlaw (pp. 275-277). The short contributions include: “A Roman Oil Lamp Illuminates Seventeenth-Century Jamestown” by Beverly A. Straube (pp. 278-284, 3 figures, 26 notes); “An Unusual Red Earthenware *Capuchine* from London” by Jacqueline Pearce (pp. 284-288, 4 figures, 12 notes); “Off the Shelf—a Footnote for English Delftware” by Troy D. Chappell (pp. 289-292, 4 figures, 10 notes); “Three Incised Mid-Eighteenth-Century Vessels from Philadelphia” by Mara Kaktins and David G. Orr (pp. 292-293, 4 figures, 1 note); “Indian at Stenton: A Trail Left in Slip on a Redware Bowl” by Laura C. Keim with David G. Orr (pp. 294-300, 6 figures, 13 notes); “A Sighting of the New Jersey Devil on a Stoneware Jug” by Peter Warwick and Leslie Warwick (pp. 301-305, 9 figures, 3 notes); “An Early Long Island Pot” by Christopher H. Pickerell (pp. 305-309, 3 figures, 7 notes); and “Long Island Teapots?” by Anthony W. Butera Jr., Robert S. Kissam, and Reginald H. Metcalf (pp. 309-312, 8 figures, 4 notes). The other contributions are: “An Early Anna Pottery Pig Flask” by Suzanne Findlen Hood (pp. 312-315, 6 figures, 12 notes); “The Smith/Fulper Stoneware Pottery Site in the Borough of Flemington, New Jersey” by William B. Liebeknecht, Nadine Sergejeff, and Rebecca White (pp. 316-322, 9 figures, 16 notes); “The ‘Filtre Chamberland’: A Late-Nineteenth-Century Water Filter” by Glenn Farris (pp. 322-325, 5 figures, 8 notes); “Ligowsky’s Red Clay ‘Mud Saucers’” by William B. Liebeknecht (pp. 326-328, 4 figures, 9 notes); “A Step Back in Time: Don Carpentier and the Ceramic Workshops at Historic Eastfield Foundation” by Merry Abbitt Outlaw (pp. 329-334, 11 figures, 11 notes).

There are seven “Book Reviews” edited by Amy C. Earls (pp. 335-352): Harold Holdway and Ruth Holdway, *Harold Holdway, 20th Century Ceramic Designer*, reviewed by Gordon Elliott (pp. 335-337); Pat Daniels, *The Origin and Development of Bow Porcelain, 1730–1747, Including the Participation of the Royal Society, Andrew Duché, and the American Contribution*, reviewed by Anton Gabszewicz (pp. 337-339); Lois Roberts, *Painted in Blue: Underglaze Blue Painted Earthenwares, 1775–1810*, reviewed by Robert Hunter (pp. 339-341); David R. M. Gaimster, *The Historical Archaeology of Pottery: Supply and Demand in the Lower Rhineland, A.D. 1400–1800; An Archaeological Study of Ceramic Production, Distribution, and Use in the City of Duisburg and Its Hinterland*, reviewed by Taft Kiser (pp. 342-345, 14 notes); Jacqueline Pearce, with contributions by Anthony Grey and Peter Tipton and petrology report by Alan Vince; *Pots and Potters in Tudor Hampshire*, reviewed by Beverly A. Straube (pp. 345-347, 3 notes); Jonathan Rickard, *Mocha and Related Dipped Wares, 1770–1939*, reviewed by Lynne Sussman (pp. 347-352, 6 notes); and Tom Walford and Roger Massey (editors), *Creamware and Pearlware Re-examined*, reviewed by George L. Miller (pp. 349-352, 6 notes). Lastly there is the annual “Checklist of Resources: Publications

on Ceramics for 2007” compiled by Amy C. Earls (pp. 353-366) and a very useful “Index” (pp. 367-383). The paradigms, descriptions, and historic data presented in this year’s volume make it an especially valuable resource.

Cultural Transmission and Material Culture: Breaking Down Boundaries, edited by Miriam T. Stark, Brenda J. Bowser, and Lee Horne; Tucson: University of Arizona Press, Tucson, 2008. xv + 317 pp., 12 photographs, 20 illustrations, 17 maps, and 17 tables; ISBN 978-0-8165-2675-8, \$49.95 US (hardcover). This volume contains papers given at an American Anthropological Association 2003 symposium entitled “Breaking Down Boundaries: Anthropological Approaches to Cultural Transmission and Material Culture,” held in honor of the late Carol Kramer. A majority of the presentations concerned ceramics and is especially valuable for ceramic ethnoarchaeologists and theoreticians of material culture. The geographic coverage ranges from the indigenous Americas to Sub-Saharan Africa, the Near East, and South Asia, with a chronological perspective from the prehistoric or precontact to colonial periods and up to the ethnographic present. Contributors include major scholars from the United States, Canada, the United Kingdom, and Europe. The chapters address questions a variety of questions: How and why people develop, maintain, and change cultural boundaries through time are central issues in the social and behavioral sciences in general and anthropological archaeology in particular. What factors influence people to imitate or deviate from the behaviors of other group members? How are social group boundaries produced, perpetuated, and altered by the cumulative outcome of these decisions? Answering these questions is fundamental to understanding cultural persistence and change. All references are conflated in a single “Bibliography” with 731 entries (pp. 263-302) accompanied by a seven-page index consisting of proper nouns and key topics.

The contributions include a “Forward: Cultural Transmission and Ceramic Sociology” by William A. Longacre, one of Carol’s long-time colleagues, and “Chapter 1: Why breaking down boundaries matters for archaeological research on learning and cultural transmission: An introduction” (pp. 1-16), written by Stark, Bowser, and Horne, which provides a context for the other papers and defines shared themes. Mark Collard and Stephen J. Shennan prepared “Chapter 2: Patterns, processes, and parsimony: studying cultural evolution with analytical techniques from evolutionary biology” (pp. 17-33) in which they consider population genetics, cultural evolutionary models, cladistic analysis, and phylogenetic comparative models. “Chapter 3: Gendered technology, kinship, and cultural transmission among Salish-speaking communities on the Pacific Northwest coast: A preliminary investigation” (pp. 34-62) by Peter Jordan and Thomas Mace employ cladistics and statistical approaches to cultural data on textiles. In “Chapter 4: Cultural transmission of copying errors and the evolution of variation in Woodland pots” (pp. 63-). Jelmer W. Eerkens and Carl P. Lipo consider cultural transmission, sources of variation, the process of variation generation, noncognitive variation, copying errors, and cultural transmission paradigms in their analysis of Woodland

ceramics from Illinois, noting the thinning of the vessel walls and pronounced variations in diameter measurements from 2500-1600 BP in their analysis of copying errors.

Valentine Roux’s “Chapter 5: Evolutionary trajectories of technological traits and cultural transmission: A qualitative approach to the emergence and disappearance of the ceramic wheel-fashioning technique in the southern Levant” (pp. 82-104) focuses on the fifth to second millennium BCE area of modern Israel and Jordan in a study of technological change using a dynamic systems approach. He reviews the approach, issues of continuity versus discontinuity, the Chalcolithic and Early Bronze period context, and the emergence of wheel-throwing in the creation of V-shaped bowls; all other wares continued to be hand-built by coiling. An analysis of 1,276 sherds and 35 complete vessels made at Abu Hamid reveals that the bowls were found in domestic as well as funerary contexts, and Roux proceeds with a postulate that the vessels were created for ritual purposes by specialized potters attached to an elite. He differentiates “fragile” (isolated vs. closed) and “robust” evolutionary trajectories. Missing from the analysis is evidence of what these vessels contained.

Brenda J. Bowser and John Q. Patton contributed “Chapter 6: Learning and transmission of pottery style: Women’s life histories and communities of practice in the Ecuadorian Amazon” (pp. 105-129) a report on ethnographic studies of indigenous communities in the Conambo River basin of the Ecuadorean Amazon focusing on approaches to social learning, situated learning theory, communities of practice and learners as legitimate peripheral participants. There is a brief but comprehensive section of the ethnographic background of the Conambo village, the division of labor, children’s roles and tasks, and potters (divided into young, middle-aged, and older). Of special interest are discussions of women’s political centrality to statuses and life stages, and alliances as reflected in the development of ceramic styles, attaining competency as a potter, group membership, the influence of kinship and marriage, and changes in potters’ stylistic networks during different life stages. In “Chapter 7: Translating ideologies: Tangible meaning and spatial politics in the Northwest Amazon of Brazil” (pp. 130-119), Janet Chernela examines the production of manioc grater boards (wood embedded with quartz chips) produced and exchanged by the Baniwa in the Icana River region at the boundaries of Venezuela, Colombia, and Brazil. These boards are seen as “eloquent carriers of cultural information” indicative of language and descent groups, marriage patterns, and processes of cultural transmission. Chernela emphasizes material culture as historic text in her two part study (1978-1980 and 1999) in considering styles, specialized manufacture, group identity, and diachronic changes in painted designs and in the insertion of the chips in geometric patterns.

Olivier P. Gosselain’s “Chapter 8: Mother Bella was not a Bella: Inherited and transformed traditions in southwestern Niger” (pp. 150-177) assesses the dynamics of pottery production based on fieldwork 2002-2004 using data collected on 130 women potters from 57 different villages. Bella is a

term used by the Zarma and Songhay peoples to indicate former slaves of the Tuareg, and indicative of the low status of potters. Gosselain examines the transmission of knowledge, the nature and distribution of materials added to the clays during processing, variations in shaping techniques, potters' mobility, the use of decoration, and the knowledge of other forming and decorative techniques. He critiques neo-Darwinian theory, concluding that researchers need to study what real people do and think in real contexts. "Chapter 9: The way of the potter's mother: Apprenticeship strategies among Dii potters from Cameroon, West Africa" (pp. 178-198) by H el ene Wallaert considers *cha nes op eratoires* in terms of the learning period of 218 potters (36 interviewed), focusing on the production sequence, five stages of apprenticeship, theoretical knowledge and manual ability, variability in cultural transmission, learning technical knowledge, and social identity. To my recollection, this is one of the few studies to examine "left-handers."

In "Chapter 10: Technical traditions and cultural identity: An ethnoarchaeological study of Andhra Pradesh potters" (pp. 199-222), Laure Degoy takes us to Hindu southern India and the coast of the Bay of Bengal where pottery making is a caste monopoly with no counterpart in northern India. The pottery caste, the Kummary, itself has subcastes. Degoy elaborates the contexts of production and distribution, the 2000-2002 field work, and interactions at the intra- and intersubcaste levels in relation to technical variation, distribution patterns, and sociological scaling; there are gender distinctions in four forming methods, vessel functions (ritual vs. utilitarian), and sizes. The study focuses in three regional patterns, technical variations and dialectic and linguistic parameters. Social mechanisms that govern spatial variability, sociological scales in the study of technological variation and cultural identities are noted; only some technical attributes were seen to covary. Ingrid Herbich and Michael Dietler's "Chapter 11: The long arm of the mother-in-law: Learning, postmarital resocialization of women, and material culture style" (pp. 223-244) contribution notes the 13 forms of pottery made by the Luo, an agrarian Niolithic-speaking people of the Lake Victoria area of western Kenya. The chapter focuses on postmarital resocialization and effects of pottery making, and is contrasted with a study of Rendille pastoralists. In "Chapter 12: Colonialism and cuisine: Cultural transmission, agency, and history at Zuni Pueblo: (pp. 245-262) Barbara J. Mills considers how transmission occurs between groups by looking broadly at foodways at Zuni from precontact through post-colonial data. She considers guided variation and three models of transmission, food adoptions, baking wheat bread, the hewe oven, and issues of adoption versus rejection.

The contributors to this volume report on research in the areas of cultural boundaries, cultural transmission, and the socially organized nature of learning. These boundaries are found within and between the societies in these studies but also within and between the various communities of scholars who study them. Hence, this work includes scholars who use multiple theoretical perspectives, including practice theory and evolutionary traditions, which are sometimes complementary and occasionally in opposition. There are data from

archaeological, ethnographic, ethnoarchaeological, experimental, and simulation studies and from micro-scale processes of cultural transmission to macro-scale processes of social group boundary formation, continuity, and diachronic change. This is worthy contribution to ceramic ethnoarchaeology and one that Carol Kramer would have enjoyed. Some chapters would have benefited from clearer locational maps and additional images of the ceramics and potters, but it is, nonetheless, a valuable contribution to the literature on material culture studies.

Early Farmers, Late Foragers, and Ceramic Traditions: On the Beginning of Pottery in the Near East and Europe, edited by Dragos Gheorghiu, Newcastle upon Tyne: Cambridge Scholars Publishing, 2009. xix + 275 pp., 87 figures, 5 tables; ISBN (10): 1-4438-0159-3, ISBN (13): 978-1-4438-0159-1, \$59.99 US (hardcopy). Dragos Gheorghiu (Department of Research, National University of Arts, Bucharest, Romania) is an anthropologist and experimental archaeologist whose studies focus on the process of cognition, and material culture, of the Neolithic and Chalcolithic societies of South Eastern Europe. His recent research is concerned with the reconstruction of prehistoric kilns and wattle and daub buildings. Gheorghiu is the author of multiple books on archaic technologies and editor and co-editor of a series of publications on pyrotechnologies. His five most recent works include: Dragos Gheorghiu (ed.), *Fire in Archaeology: Papers from a Session Held at the European Association of Archaeologists Sixth Annual Meeting in Lisbon 2000*, British Archaeological Reports International Series S-1089, Oxford: Archaeopress, 2002; 15 papers, from a session held at the European Association of Archaeologists Sixth Annual Meeting held in Lisbon in 2000, which reflect on the field of pyroarchaeology, investigating the remnants of fire in the archaeological record. The papers, which include several case studies, predominantly focus on sites and cultures in Europe between the Palaeolithic and Greek periods. Dragos Gheorghiu (ed.), *Chalcolithic and Early Bronze Age Hydrostrategies*, British Archaeological Reports International Series S-1123, Oxford: Archaeopress, 2004; papers from a result of a session organised at the XIVth UISPP Congress in Liege with a purpose to define water, generally insufficiently present in the archaeological literature, as a fundamental category for the study of prehistory societies. Dragos Gheorghiu (ed.), *Ceramic Studies: Papers on the Social and Cultural Significance of Ceramics in Europe and Eurasia from Prehistoric to Historic Times*, British Archaeological Reports International Series S-1553, Oxford: Archaeopress, Oxford, 2006; ten papers deriving from the session Ceramics in the New Millennium presented at the 2002 EAA Conference in Thessaloniki (reviewed in *SAS Bulletin* 30(3):18-20, Fall 2007). Dragos Gheorghiu (ed.), *Fire as an Instrument: The Archaeology of Pyrotechnologies*, Archaeopress, 2007; 3 papers based on a session held at the EAA meeting in St Petersburg in 2003, and offers a "material" perception of fire, approached as an artefact, together with its material support. Dragos Gheorghiu and George Nash (eds.), *The Archaeology of Fire Understanding Fire as Material Culture*, Budapest: Archaeolingua, 2007.

Early Farmers, Late Foragers, and Ceramic Traditions provides the reader with current views on a subject of significance for students of archaeology and ancient history: the understanding of humankind's process of becoming, viewed through the study of the beginnings of pottery in the late forager, and early farmer societies of Europe. The volume is a collection of ten essays, by some of the prominent European scholars whose works focus on the early European and Middle Eastern pottery, and is intended to present a new perspective on the rise of a new technology in prehistory. Each contribution has its own set of references and there is a double-column conflated topics and proper noun index (pp. 271-275). The book begins with a requisite "Preface" and "Acknowledgments" before Ghorghiu's "Introduction: Early Pottery: A Concise Overview" (pp. 1-21, 5 figures, 123 references). He covered unbaked clay figurines and vessels, skeuomorphs, plastered baskets, carved wooden cases, and *chaîne opératoire*, hunter-gatherer pottery, and the earliest ceramic traditions in Europe, differentiating diffusionism and integrationism.

"Chapter One: Earliest Use of Pottery in Anatolia" (pp. 22-43, 7 figures, 49 references) by Mehmet Özdoğan, Chair, Department of Prehistory, Istanbul University, Istanbul, Turkey. He discusses Pre-Pottery Stage vessels and the earliest pottery in the Near East, the transition between Pre-Pottery and Pottery Neolithic and issues in defining the earliest ceramics. Özdoğan also considers the westward expansion of the Pottery Neolithic. "Chapter Two: Variations on the Neolithic Transition in Eastern and Western Hungary" (pp. 44-62, 5 figures, 73 references) by Eszter Bánffy, Archaeological Institute, HAS, Budapest, Hungary. The Neolithization of the Carpathian Basin is reviewed and pottery produced in two geographic areas, Eastern Hungary and Western Hungary, is viewed as distinct and confined to small regions within these two larger entities.

"Chapter Three: Cultural Diversities: The Early Neolithic in the Adriatic Region and Central Balkans. A Pottery Perspective" (pp. 63-86, 6 figures, 91 references) by Michela Spataro, Conservation and Scientific Research Department, British Museum, London, UK. Spataro's chapter concerns the relationships between the earliest Neolithic in southeastern Europe: Impressed Ware (found along the Adriatic coastlines) and Starčevo-Criș (confined to the central Balkans). She characterizes cult objects (figurines and *rhyta*) as well as *figulina* ware. Based on her dissertation research, she briefly reports scientific analyses of two sets of materials employing minero-petrographic thin section studies and the use of SEM/EDS for chemical composition and XRD for mineral identification. One data set included 35 sherds of "everyday" pottery from 11 sites and she reports localized production and general patterns for the Adriatic area. A second data set on Starčevo-Criș also characterized cult objects (figurines) and records an analysis of 514 fired clay objects from 18 sites. For the latter, she interprets modifications in manufacturing techniques, particularly the adoption of levigated clay without temper and the use of kiln firing later in the sequence. There are some very fine illustrations accompanying this chapter: Micrograph of a thin section of a potsherd from the site of

Konjevrate (Croatia) that illustrates a red iron-rich fabric with some quartz inclusions and abundant added crushed calcite; concentrations of magnesia (MgO) and potash (K₂O) in sherd samples from IW sites on the Adriatic coasts of Italy and Croatia measured by SEM/EDS; a micrograph of a thin section of a *figulina* potsherd from the site of Smilèæ, Danilo phase (Croatia) showing a very fine red fabric with some fine inclusions of quartz and iron oxides; and a micrograph of a thin section of a potsherd from the site of Fratelia (Banat, Romania) showing a non-micritic and micaceous fabric rich in naturally present fine quartz sand and abundant added organic matter.

"Chapter Four: Early Neolithic Ceramics in Southern Italy: Relationships between Pottery Technology and Production Organization" (pp. 87-115, 8 figures, 1 table, 38 references) by Italo M. Muntoni, Museo delle Origini, Università di Roma "La Sapienza," Rome, Italy. Muntoni reports on Mesolithic hunter-gatherer subsistence and a shift to early Neolithic technology, discusses the organization of production (following Peacock 1981 and Costin 1991), and documents the Early Neolithic on the Tavoliere Plain and the Murge Plateau: Pulo di Miolfetta (3 fabrics), Balsignano (2 fabrics) and Ruligliano area (2 fabrics). The Early Neolithic on the Sibari Plain (2 wares) and the Early Neolithic in southern Italian communities are characterized. Table 4-1 provides a useful summary. "Chapter Five: From Galicia to the Iberian Peninsula: Neolithic Ceramics and Traditions" (pp. 116-149, 10 figures, 3 tables, 71 references) by M. Pilar Prieto-Martínez, Parga Pondal Program, Heritage, Paleoenvironment and Landscape Laboratory (IIT, USC), Associated Unit: Landscape Archaeology Laboratory, Padre Sarmiento Institute of Galician Studies, Spain. Fourteen c14 dates from northwest Iberian Neolithic sites help define two stylistic levels and lead to five hypotheses. Stylistic "tendencies" are reported for the Early Neolithic and Middle Neolithic in Galicia, which is differentiated from the rest of the Iberian Peninsula. The same division is seen in the Late Neolithic but Galicia can now be divided into eastern and western pottery-producing zones. "Chapter Six: The Pottery of Hunter-Gatherers in Transition to Agriculture, Illustrated by the Swifterbant Culture, the Netherlands" (pp. 150-166, 8 figures, 36 references) by Jutta Paulina de Roever, Groningen Institute of Archaeology, Groningen, The Netherlands. The author defines the regional geography for this 5th millennium BCE pottery and discusses vessel construction and associated technologies. She contrasts hunter-gatherer and farmer pottery from elsewhere in Europe and reviews the point-base vessels, which she believes derived from the hunter-gatherers who found it a useful form when moving the pottery in log-boats.

"Chapter Seven: First Appearance of Pottery in Western Europe: The Questions of La Hoguette and Limbourg Ceramics" (pp. 167-188, 10 figures, 1 table, 47 references) by Anne Hauzeur, Musée National d'Histoire et d'Art de Luxembourg, Section Préhistoire, Marché-aux-Poissons, Luxembourg and Société Royale Belge d'Anthropologie et de Préhistoire, Brussels, Belgium. Hauzeur documents the state of research concerning the chronology and cultural positions of two indigenous ceramic wares, provides historical contexts,

and characterizes the two wares. She also ponders to question: “Who were the first Neolithic people?” and considers the northern and southern parts of western Europe in her assessment. “Chapter Eight: What Is the Evidence and Consequences of Exchanging Bone and Antler and Pottery Designs Between Ertebølle and TRB Danubian Communities?” (pp. 189-214, 9 figures, 61 references) by George Nash, Department of Archaeology and Anthropology, University of Bristol and SLR Consulting, Bristol. Focusing on Northwestern Europe, Nash discusses the increasing complexity of contact and exchange in his consideration of the change from LBK to TRB pottery (Linearbandkeramik and Trichlerrandbecher) and Ertebølle culture. He views ceramic and other artifacts as helping bind communities and landscapes. “Chapter Nine: Early Pottery among Hunter-horticulturalists and Hunter-gatherers in Central Fenno-Scandinavia” (pp. 215-238, 11 figures, 92 references) by Fredrik Hallgren, Centre for the Humanities, Uppsala University, Uppsala, Sweden. The Early Neolithic Funnel Beaker Culture of Mälardalen (with calibrated C14 dates), the Eastern Neolithic Slate cultures in central and northern Scandinavia, and Late Mesolithic and Neolithic Comb Ware culture are described and the blending of cultural traditions reported. “Chapter Ten: Pots, Pits and People: Hunter-Gatherer Pottery Traditions in Neolithic Sweden” (pp. 239-270, 8 figures, 75 references) by Åsa M. Larsson, Department of Archaeology and Ancient History, Centre for the Humanities, Uppsala University, Uppsala, Sweden. Larsson defines the Neolithic as documented in Sweden, particularly the Pitted ware culture, in terms of vessel styles and shapes, use and contexts of deposit, as well as local and regional variants. There is also a discussion of clay and temper selection. He concludes with a reconstruction of the pottery-making community, postulating hybridization and changes at the end of the Middle Neolithic B period.

This is a very fine English-language volume that provides new data and summarizes current thoughts on the early Neolithic pottery of Southern and Western Europe. Papers on Northeastern Europe would have been valuable contributions, especially reporting German, Polish, and Swiss research. The work would also benefit from a concluding synthesizing essay that evaluates these important contributions and suggests new directions for research. Nonetheless, it provides a current illustration of the types of research that European scholars are producing and sets standards and suggests future research.

Prehistoric Europe: Theory and Practice, Andrew Jones (ed.), Blackwell Studies in Global Archaeology. Chichester, UK and Malden, MA : Wiley-Blackwell, 2008. xiv + 378 pp., illustrations, maps, and plans; ISBN-10: 1405125977 9781405125970 (hardback) \$92.95, ISBN-13: 978-1405125970 1405125969 (paperback) \$44.95 US. This new book provides a comprehensive introduction to the range of critical contemporary thinking in the study of European prehistory. Important interdisciplinary themes are addressed in innovative ways by well-published scholars who have with active field projects and there are essays by some of the leading researchers and scholars in the field today. The 14 essays,

grouped into seven themes with two contributions each, range topically from the Neolithic period to the early stages of the Iron Age, and from Ireland and Scandinavia to the Urals and the Iberian Peninsula. There are scattered references to ceramics throughout and one chapter (4a) devoted to pottery. This tome is a refreshing break from the traditional chronological approach to European prehistory.

Briefly, Chapter 1 has two components that provide a framework for the analysis of European prehistory: “Hunter-Gatherers to Farmers?” by Mark Pluciennik and “The Celts as ‘Grand Narrative’” by John Collis; Chapter 2 contains two offerings on landscape: “From Monuments in Landscape to Landscapes in Monuments: Monuments, Death and Landscape in Early Bronze Age Scandinavia” by Joakim Goldhahn and “Everything in its Right Place? On Selective Deposition, Landscape and the Construction of Identity in Later Prehistory” by David Fontijn; Chapter 3 with two parts on “The Living House” - architecture, the everyday and the human lifecycle: “First Households and ‘House Societies’ in European Prehistory” by Dusan Boric and “Domestic Times: Houses and Temporalities in Late Prehistoric Europe” by Fokke Gerritsen.

Chapter 4: “Materiality, Technology and Transformation - The Emergence of Novel Technologies” features two essays: “The Emergence of Pottery” by Dragos Gheorghiu (pp. 164-192, 164 references, 5 illustrations [alas]) and “The Emergence of Metalworking” by Barbara S. Ottaway and Ben Roberts. Gheorghiu provides a lucid general overview of early European ceramics that, for a short essay, is comprehensive. He defines ceramics, discusses the emergence of ceramic technology in the European Paleolithic and Neolithic, comments on the roles of ceramics, and *chaînes opératoires*. Five pottery technocomplexes are defined: 1) Continental Mediterranean Technocomplex, including Greece; 2) First Temperate Neolithic Technocomplex, including Starčevo; 3) Coastal Mediterranean Technocomplex, incorporating an impressed ware tradition, the Danilo/Hvar tradition, the rapid colonization of the northern Mediterranean coast, and south Italian impressed ware; 4) Linear Pottery or the second Temperate Neolithic Technocomplex; and 5) the Continental Ceramic Mesolithic.

Chapter 5: “Death, Remembrance and the Past” contains two contributions: “Engaging Memories of European Prehistory” by Katina T. Lillios and “The Past in Later Prehistory” by Bryan Hanks. Chapter 6: “Identity, Community, the Body and the Person” has: “Neolithic Bodies” by Daniela Hofmann and Alasdair Whittle and “Bodies and Identities in the Scandinavian Late Iron Age” by Ing-Marie Back Danielsson. The final essays, Chapter 7: “Interaction, Trade and Exchange” focus on: “Approaches to Trade and Exchange in Earlier Prehistory (Late Mesolithic-Early Bronze Age)” by John Chapman and “Trade and Exchange in Later Prehistory” by Peter Wells. There is a good deal of new information presented in novel ways that will engage the reader. This compendium would make a good – but expensive – textbook on early European archaeology but the chapters on ceramics and metallurgy may be read in the content of courses on ancient technologies.

The Grove Encyclopedia of Materials and Techniques in Art, Gerald W. R. Ward (ed.), Oxford and New York: Oxford University Press, 2008. 864 pp., 45 color plates, 97 halftones, 43 line drawings. ISBN13: 978-0-19-531391-8, ISBN10: 0-19-531391-7864, \$125.00 US. Ward is Katharine Lane Weems Senior Curator of Decorative Arts and Sculpture, Art of the Americas, at the Museum of Fine Arts, Boston, Massachusetts, USA, and earlier in his career served as curator at the Yale University Art Gallery and the Henry Francis du Pont Winterthur Museum. The current volume edited by Ward has more than 400 entries in an alphabetical form and is a companion to Gordon Campbell's edited *The Grove Encyclopedia of Decorative Arts* (Oxford University Press, 2006) with 3,000 entries. Ward has prepared an up-to-date volume that incorporates recent changes in conservation, restoration, as well as new materials and techniques in video and digital art. It provides information on historical and current uses of materials and techniques in a wide range of areas from painting and sculpture to non-traditional media. *Materials and Techniques* includes materials in art practice (e.g., ink, enamel, digital materials); materials in conservation (e.g., adhesives); classes of artifacts (e.g., mosaics, ceramics); techniques and methods (e.g., book binding, gilding, printing, weaving), terminology (e.g., rustication), tools (e.g., easel, laser), theory (e.g., technical examination, conservation controversies), fakes and forgeries, and essays on conservation theorists and practitioners. Museum curators, conservators, collection managers, and practicing archaeologists are likely to find the discussions of new procedures in artifact conservation useful in their work. Entries such as adobe, earthenware, porcelain, and terracotta are written to be accessible to a range of readers, and this work is designed as a reliable and convenient one-volume resource.

Previous Meetings

Science and Ceramics: Recent Developments in Analysis and Interpretation, a one-day meeting of the Medieval Pottery Research Group was held at the British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham, on 6 June 2009. The program included: "Welcome and Introduction to the BGS" by Simon Chenery; "Microanalysis of Later Prehistoric and Early Medieval Granodiorite-tempered Pottery from the East Midlands" by Edward Faber and David Knight; "Recent Projects on ICP Analysis of Medieval and Later Ceramics" by Michael Hughes; "Unravelling 17th and 18th-century Slipwares: A Scientific Approach" by Andrew Watts; "Tobacco Pipes and Pipe Clays: A Review of 25 Years Research" by Peter Davey; "Understanding and Interpreting the Medieval Pottery from Gásir, Northern Iceland" by Torbjorn Brorsson; "Luminescence Dating of Bricks" by Ian Bailiff; "Scientific Dating of Carbonised Residues on Ceramics from England, Scotland and Norway" by Derek Hall; "Reconstructing Foodways from Ancient Residues in Roman Pottery" by Lucy Cramp; and "Fragmentation in Action" by Imogen Wood.

Webinar: Ceramics in Mainland Southeast Asia: An Invitation to Celebrate and Learn with a Worldwide

Community was successfully held on 23 June 23, 2009, 8:00 PM (Eastern Daylight Time) with more than on hundred participants. Ceramics of Mainland Southeast Asia, <http://www.asia.si.edu/CeramicsForum>, launched in December 2008, is a valued online resource in a field where published scholarship is scarce. It allows specialists in ceramics, archaeology, anthropology and other fields' free and on-demand access to the Sackler Gallery's Hauge Collection of Southeast Asian Ceramics, unparalleled in the world for its size and diversity. Curator of Ceramics, Louise Cort hosted this interactive Webinar explaining the catalogue's goals for serving an international virtual community and demonstrated its features, including many layers of scholarship. This Webinar was pertinent to anyone interested in Southeast Asia; ceramics; and the use of technology to deliver content, foster dialogue and create virtual communities. Guests were invited to participate by submitting their questions online. It was held in collaboration with the Johns Hopkins University Museum Studies program, <http://connect.johnshopkins.edu/AsiaCeramicsForum>.

Internet Sites and Databases

Digital Type Collections: The On-line Type Collections of American Historic Period Ceramics. http://www.flmnh.ufl.edu/histarch/gallery_types/how-to.asp. The historical archaeology collections of the Florida Museum of Natural History (FMNH) consists of more than 2.0 million excavated specimens from more than 100 sites throughout Florida and Latin America. They include the largest known systematic collection of Spanish colonial archaeological specimens in the country, representing sites of domestic, military, religious and commercial sites dating from 1492 through the nineteenth century. The FMNH's on-line type collections of historic period archaeological ceramics (1492-1850) are a fully searchable digital resource: http://www.flmnh.ufl.edu/histarch/gallery_types. The digital database collection includes thousands of color images of individual sherds, representing hundreds of different ceramic types and is based exclusively on the specimens in the FMNH Historical Archaeology Type Collections. Hence, it may not encompass the entire range of variation known for some pottery types. The site also includes an extensive searchable database of information about these specimens. This ceramic type collection and associated database are organized around the concept of "ceramic type," which is a concept typically used by historical archaeologists to identify, classify and compare pottery. Type definitions also incorporate additional information about dates, origins, costs and functions of pottery. Most types of historic ceramics (post-1492 ceramics of European origin or inspiration) are classified according to three primary attributes: Paste, Surface Treatment, and Decoration. Each piece of pottery found in this site has been classified according to the set of attributes one will find in the drop-down search menus on the search pages: Paste Color, Surface Finish/Glaze, Decorative Technique, Background Color, Paste Temper, Design Motifs, Rim Motif, Design Colors, Collection (the FMNH's sub-collection), Location of Recovery, Site, Type Name, Alternate Type Name, Design Distribution,

Vessel Form, and Production Origin. The homepage has seven links: How to Use, Introduction to Ceramics, List of Types (n = 205 types [Abo Polychrome to Yucatan Colonial], Search & Browse, Glossary (9 categories), About, and Bibliography (93 entries). The descriptions and color illustrations are superb.

Maiolica Studies: Northern New Spain. Anita G. Cohen-Williams and Jack S. Williams maintain this Web site at the Center for Spanish Colonial Research, San Diego, CA. <http://www.colonialmaiolica.com/index.html>. Tin-enameled earthenwares are an important class of material culture remains commonly recovered from Spanish colonial archaeological sites in the Americas. These ceramics are referred to as maiolica, majolica, mayolica and even sometimes Spanish faience and Spanish delft. In colonial times, the ceramics were usually called “loza blanca, loza de Puebla,” or “loza de Talavera.” This Internet site provides some of the results of ongoing investigations being conducted by the Center for Spanish Colonial Research and is designed to help facilitate communication between scholars interested in research on maiolica topics. The home page includes a PowerPoint presentation by Cohen-Williams and Williams, “Reconstructing Maiolica Patterns from Spanish Colonial Sites in Southern California” (2004) with 55 slides. Linked is an 88-page monograph with color images by Anita G. Cohen-Williams and Jack S. Williams are the authors of *Reconstructing Maiolica Patterns from Spanish Colonial Sites in Southern California*, 2004, California Mission Studies Association, San Luis Obispo, CA; see <http://www.colonialmaiolica.com/maiolica01.pdf>. The latter presents archaeological ceramic data from the San Diego Presidio, San Diego Mission, and San Luis Rey Mission.

Diagnostic Artifacts in Maryland: The homepage has links to Prehistoric Ceramics, Colonial Ceramics, Post-Colonial Ceramics, and Small Finds; see <http://www.jefpat.org/diagnostic/index.htm>. For Prehistoric Pottery there are discussions of Maryland’s prehistory, Sherd identification, Ware Description, Radiocarbon Dates (n = 47), Glossary (31 items), and Bibliography (104 references). Ware Description includes: Defining Attributes, Chronology, Distribution, Description (paste/temper, surface treatment, decoration, morphology), Defined in the Literature, Type Site, Maryland sites, and References. There are maps of geographic regions, county maps, and maps of Prehistoric Type sites. Twenty-two Prehistoric Wares are defined (Accokeek to Yeocomico), 15 Historic Wares described (Astbury to white Galt Glazed), and there are 37 entries in the Photo Gallery. In Colonial ceramics, 10 types of earthenwares and 5 stonewares are defined, while the Glossary for Historic ceramics includes 71 entries and the Bibliography has 62 citations. Sara Rivers Cofield at the Maryland Archaeological Conservation Laboratory reports that they now adding Post-Colonial (19th century) ceramics to the Web page. Colonial ceramics (including creamware) are live, as are shell-edge ceramics and relief molded jugs, and they anticipate adding transfer prints and annular decorated wares soon. The artifacts included in the photo galleries that accompany each ceramic web page (with the exception of relief molded stonewares) are curated at the Maryland Archaeological Conservation

Laboratory (MAC Lab). These materials are from the following sites: Bulls Head Tavern 18BC139, c. 1750-1950; Schifferstadt 18FR134, 1756-1900; North Pearl Street 18BC162, 1780-1930; Federal Reserve 18BC27, c. 1800-1930; Artisan’s House 18AP13, c. 1810-1900; Mechanic Street, 18AG206, 1813-1912; and Camden Yards 18BC79, c. 1820-1930.

Archaeology/Historic Preservation: Historic Ceramic Typology: *Historic Ceramic Typology with Principal Dates of Manufacture and Descriptive Characteristics for Identification.* Ann R. Brown is the author of this 1982 report; DeIDOT [Delaware Department of Transportation] Archaeology Series 15. Delaware Department of Transportation, Dover. http://www.deldot.gov/archaeology/ceramic_typology/index.shtml DeIDOT Archaeology Series No. 15 has a typology of historic period ceramics that are commonly found on archaeological sites in Delaware. The typology is intended for use in identification and description of ceramic artifacts by archaeologists. A short version and a longer, more detailed and descriptive version are included. The typology is divided by wares and decorative types. The manufacture dates of ceramic wares and types are provided to assist in the dating of archaeological sites. Typical vessel forms associated with various ceramic wares are also illustrated.

The Anatolian Iron Age Ceramics Project/Anadolu Demir Çagi Seramik Projesi, <http://aia.une.edu.au/>, directed by Peter Grave (University of New England, Armidale, New South Wales, Australia) and Lisa Kealhofer (Santa Clara University, California USA), pgrave@une.edu.au and lkealhofer@scu.edu, is funded by the Australian Research Council and the National Science Foundation (US). The Anatolian Iron Age Ceramics (AIA) Project (2005-2009) collaborates with excavators of ca. 25 currently (or recently) excavated sites in Central and Western Anatolia, and involves analysis of several thousand ceramic samples. The scale of the AIA project aims to facilitate a new level of understanding for Iron Age economies across this region. Societies in Central and Western Anatolia were major players in the political and economic changes that transformed both Southwest Asia and the Mediterranean after the Bronze Age. Within Anatolia these transformations remain poorly defined. The research goal is to understand the changing dynamics of trade and exchange in this region for the period 1200-200 BCE. To understand the scale and nature of regional economic and political interaction the project required: 1) a geographically wide selection of sites with well dated Iron Age contexts and 2) a sufficient sample population (of both sherds and sites) to represent the major trade wares through this period. The database includes these sites: Ali’ar Höyük, Boğazköy, Çadır Höyük, Cyprus, Eskisehir Survey, Gordion, Kaman-Kalehöyük, Kerkenes Dağ, Kilise Tepe, Kinet Höyük, Limyra, Oylum Höyük, Sagalassos, Sardis, ar Höyük, Seyitömer, Tarsus, and Troy. The strengths of ceramic compositional analysis in modeling exchange networks are well established. They combine a robust technique (INAA) with more sensitive but also more time consuming ones (ICP-MS, TIMS), for elemental and isotope species characterization. The resulting compositional datasets, in combination with

other archaeological criteria, will be used for high resolution mapping of the distribution, density, and variability of Iron Age trade patterns. An integral part of the AIA methodology is to establish a relationship between production and location. An important aspect of this work is the identification and analysis of sediments from which the clays used for ceramics in antiquity derive. The investigators do not seek to identify the clays themselves for problems too numerous to enumerate.

Book Reviews

Deborah L. Huntley, Associate Editor

Earth Architecture: From Ancient to Modern. William N. Morgan, University Press of Florida, Gainesville: 2008. xvi + 195 pp., 152 figures, 1 appendix, index. Price: \$34.95 USD (hardback). ISBN: 978-0-8130-3207-8.

Reviewed by Elizabeth A. Bagwell, *Desert Archaeology*, 509 South 48th St., Suite 104, Tempe, Arizona 85281, USA.

Earth Architecture is the most recent book written by William N. Morgan, a practicing architect and former Beinecke-Reeves Chair in Architectural Preservation at the University of Florida. Morgan has had a lifelong fascination with prehistoric architecture, an interest which has been reflected in several other publications including *Pre Columbian Architecture in Eastern North America*, *Ancient Architecture of the Southwest*, and *Prehistoric Architecture in Micronesia*.

Unlike his previous books where he examines a particular region or culture *Earth Architecture* focuses on the “architectural uses of earth in shaping the environment of humankind” (p. 1). In essence, Morgan hopes to artistically influence the designs of future architects towards “sustainable design, energy conservation, and environmental adaptation” (p. 1).

The book consists of nine chapters which explore nine types of structures that can be constructed using earth - mounds, shaped hills, earth retained, terraces, platforms, excavations, modified earth, water retained, and cities. Each structural type is illustrated by six examples drawn from outstanding world wide examples ranging from prehistoric to modern in age. For each example Morgan provides photographs, plans, or perspective drawings as well as a short paragraph describing the structure.

In Chapter 1, Morgan provides examples of artificial mounds or hills such as Avebury Circle, England. These structures contrast with those in Chapter 2, where the existing landscape is sculpted to create architectural spaces as in the case of a Greek hillside theater in Epidaurus, Greece. Chapter 3 illustrates structures that retain earth, “a wall or other structure to hold the earth in place above or below the level of adjacent ground” (p. 44) such as Machu Picchu, Peru. Terraces, the

subject of Chapter 4, are defined as “level surfaces of earth with sloping or vertical sides rising one above the other” (p. 63). Surfaces with agricultural or residential functions are the focus here. In Chapter 5, Morgan defines as “horizontal planes that often are higher than their adjoining surfaces” citing Monte Alban, Mexico as an important example (p. 80). The subject of Chapter 6 is excavations, which refer to “the systematic removal of material from the earth” (p. 98) usually to create living and working areas underneath the ground to avoid harsh desert environments, as in the case of Safadi, Israel. Modified earth, the subject of Chapter 7, refers to the alteration of earth for architectural uses including “drying mud bricks in the sun, combining soil with straw or grass, compacting earth under pressure, adding water to earth to achieve plasticity, or combining different soils for increased strength” (p. 116). Many prehistoric structures, for example Casa Grande, Arizona, were built using these techniques. Chapter 8 illustrates water retained, which Morgan defines as “bodies of water integrated with earthworks that are created to reshape the human environment” including moats, canals, dams, lakes, and reservoirs (p. 134). Finally, Chapter 9 explores cities made of earth, including Taos, New Mexico and Paquimé, Chihuahua. For Morgan, cities are defined as “dense populations, urban planning, and often impressive institutional structures” (p. 152).

This book was written by an architect for other architects. Within this context, the book is well illustrated, and provides an interesting variety of structures as sources of inspiration for the sustainable design of structures and cities. However, as an archaeologist who specializes in the study of architecture, I was hoping for more detail and discussion.

The examples that were chosen were fascinating, and the book would have benefited from more detailed descriptions of the structures and the cultures that built them, including the relevant citations. Archaeologists who study architecture often examine the use of space, labor investment, the organization of production, and questions of structural stability. In this vein, detailed architectural renderings of each building - showing doorways, the volume of materials used to build the structure, the specific construction techniques used to build each structure, and discussions of how the structure builders were organized – would have been valuable additions to the book.

In addition, while the presentation of types of earthen architecture was useful, these types overlapped in a confusing manner. For example, the difference between terraces and retaining walls was not explicit. A clarification of these types would be helpful. Finally, very little archaeological information was included in the text. To my disappointment, some of the archaeological details that *were* included were inaccurate or were so generalized as to be misleading.

In conclusion, this book is an inspirational piece written by an architect for other architects. Although its images are lovely, this book does not provide enough detail about the structures or the cultures that built them to be useful from an archaeological perspective.

Historic Pensacola. John J. Clune, Jr., and Margo S. Stringfield. University Press of Florida, Gainesville: 2009. xi + 160 pp., 10 figures, 39 color plates, notes, bibliography, index. Price: \$27 USD (cloth). ISBN: 978-0-8130-3256-6.

Reviewed by Nancy Marie White, Department of Anthropology, University of South Florida, Tampa, 33620 USA

This book initiates the series “Colonial Towns and Cities of the Atlantic World,” which blends archaeology and history, local-to-global perspectives, and interpretations of economic, political and natural processes and events to tell the stories of European colonization in the New World.

At the western end of northwest Florida, Pensacola Bay’s natural harbor was the first place intended for a real, urban colony after the early sixteenth-century Spanish expeditions through the southeastern U.S. Tristán de Luna headed the 11-ship fleet that sailed from Veracruz, Mexico, in 1559 and carried 1500 people and abundant provisions for the settlement. After establishing a coastal town, he was to venture inland seeking wealth, baptizing Indians, founding more towns, and checking the French presence on the Atlantic coast. He arrived to find the Indians gone (probably wiped out by germs from earlier Spanish explorers); then he lost nearly everything to a devastating hurricane.

Luna’s settlement was abandoned in two years. The French did make it to the U.S. Atlantic coast, by 1562, only to be wiped out by the Spanish, who then (1565) founded St. Augustine, the oldest continuously existing U.S. city. Pensacola was forgotten until the Spanish returned 37 years later to establish a new colony, which then moved into French, then British, then back to Spanish domination over the next century until it was grabbed by Americans 1821. All of this made for exciting drama as conflicting ambitions of European nations played out in a faraway land. Historical records are expanded by the details of material culture that give insights into religious practices, foodways, social systems, and everyday life.

Fascinating shipwreck evidence from Luna’s destroyed fleet in Pensacola Bay includes parts of a galleon and its contents: farm animals, rodent and insect stowaways, Aztec jars and obsidian, domestic items, New and Old-World nuts and fruits. The next fort and village complex of Santa María de Galve, begun in 1698, was located on the high bluffs overlooking the bay entrance, today on the Naval Air Station. Excavations there and also in a 1705 shipwreck uncovered burials in the cemetery with religious artifacts, colonoware ceramics fusing European with Indian and/or African traditions, and items of clothing and jewelry indicating women’s activities. Combinations of deer and pig bones, corncobs and coffee beans, show the blending of Old and New World practices. Piles of expensive Chinese porcelain constitute intriguing evidence of illicit or at least undocumented trade with enemy French and others, as well as the global connections of this remote frontier outpost.

Charred remains of fort walls and buried artillery document the French takeover of Pensacola from 1719 to 1722 as war raged in Europe. Spanish reclamation then included Santa Rosa Pensacola, built on the barrier island to be safer from attack, but destroyed by a 1752 hurricane. San Miguel, built after that on the mainland in the location of the modern city, suffered attacks by Creek Indians (English allies), as attested by the burned building foundations excavated under a standing historic church.

During the French and Indian war (Seven Years War in Europe), the Spanish allied with the French, but England prevailed, acquiring Pensacola as a war prize in 1763. The Spanish, their Indian allies, and free blacks left Pensacola for Mexico. But the English brought Creeks, French Huguenots, Scotsmen, Irish, Germans, and black slaves from the Caribbean. A town lot owned by a freed slave during the British period produced a Spanish olive jar at the bottom of a well that also contained fine glass and European ceramics, beans, watermelon seeds, peanut hulls, peach pits, wild and domestic animal bones. The English promoted the naval stores industry (turpentine, timber), making Pensacola a prominent Gulf port. This brought luxury goods of international origin, even through then-illegal trade with the Spanish.

More hurricanes, diseases such as yellow fever and scurvy, and ultimately, the war and politics of the American Revolution, led to Spain’s recapture of Pensacola in 1781. Two standing structures and a cemetery remain from this second Spanish period. At this time the good-sized, even more multiethnic town still included the major British (Scottish) traders Panton, Leslie & Company. By 1821, the continual conflict of the War of 1812 and the Americans’ desire to annex this valuable territory led Andrew Jackson to take over Pensacola for the new United States.

The often-sad story of the colonists’ aims, accomplishments, and failures is punctuated by the hard-luck facts they encountered. There were epidemics, sandy infertile soil, and the storms and other natural forces that constantly reshape the dune landscape of the mainland coast and the barrier islands that people unwisely chose for habitation. With their ethnic traditions of raising crops and animals in the continental interior, settlers of European, Mexican, mestizo, and mulatto origin often ignored the wealth of seafood easily available on the coast. Though elites – bureaucrats, military, priests – ran things, colonists were often convicts or other undesirables, laborers attempting to escape poverty in Mexico, unruly soldiers in large numbers, and later mercantile folks uninterested in keeping the laws of distant European powers. The archaeological record brings alive the tiniest details supporting or contradicting official histories of these groups and sometimes of individuals.

Targeting a popular audience, this book has both benefits and frustrations for scholars. Its beautiful production includes lush color plates of everything from artifacts and ecofacts to old photographs, maps, and paintings. The engaging narrative moves nicely back and forth between historic facts and

archaeological findings. Delightful additions to each chapter are traditional recipes from the corresponding settlement period, with illustrations and background material, by Catherine Parker. However the content of many figures and plates is not well explained or referred to in the text. Also lacking is a single clear reference map, with named rivers and other geographic features as they appear today correlated with historic site locations. The natives who inhabited the region for some 12 millennia, as well as historic Pensacola after it became American, are subjects outside the book's scope. Though there is a small amount of repetition, the writing is mostly clear and flowing and (blissfully) free of detailed artifact tables or complex archaeological analysis. The book is a fitting tribute to the 450th anniversary of the first settling of Pensacola, and a wonderful example of what historians and archaeologists can fit together to tell the tales of grand human endeavors.

Upcoming Conferences

Rachel S. Popelka-Filcoff, Associate Editor

2009

16-21 August. 2nd Latin-American Symposium on Physical and Chemical Methods in Archaeology, Art and Cultural Heritage Conservation; Cancun, Mexico. General information: <http://www.mrs-mexico.org.mx/webimrc09/inicio.htm>.

16-21 August. Symposium on Archaeological and Arts Issues in Materials Science of the International Material Research Congress 2009; Cancun, Mexico. General information: <http://www.mrs-mexico.org.mx/webimrc09/inicio.htm>.

17-20 August. International Conference on Remote Sensing in Archaeology; Tiruchirappalli, India. General information: <http://www.spacetimeplace2009.org>.

25-28 August. Quaternary Research Association's 8th International Postgraduate Symposium; Manchester, England. General information: <http://www.sed.manchester.ac.uk/QRA>.

30 August-3 September. Colloquium Spectroscopicum Internationale XXXVI; Budapest, Hungary. General information: <http://www.csixxxvi.org>.

6-11 September. 24th International Meeting on Organic Geochemistry; Bremen, Germany. General information: <http://www.marum.de/imog2009>.

9-12 September. Mémoire du sol, Espace des hommes: 8th International Conference on Archaeological Propection; Paris, France. General information: <http://www.archeorient.mom.fr/colloqueap2009eng/indexeng.html>.

9-12 September. Luminescence in Archaeology International Symposia; Delphi, Greece. General information: <http://kalamata.uop.gr/~lais2009>.

10-13 September. From Craft to Science: EMAC '09; London, England. General information: <http://www.ucl.ac.uk/EMAC09>.

14-19 September. 5th International Congress on the Application of Raman Spectroscopy in Art and Archaeology; Bilbao, Spain. General information: <http://www.quimica-analitica.ehu.es/RAA2009>.

25-27 September. International Aerial Archaeology Conference: AARG 2009; Siena, Italy. General information: <http://aarg.univie.ac>.

2-4 October. Archaeological Sciences of the Americas Symposium 2009; Tampa, Florida, USA. General information: <http://www.anthro.fsu.edu/news/asas2009>.

18-21 October. The Geological Society of America National Meeting, "From Volcanoes to Vineyards: Living with Dynamic Landscapes;" Portland, Oregon, USA. General information: <http://www.geosociety.org/meetings>.

19-23 October. International Symposium on Paleoanthropology and the First Conference on Quaternary Research of Asia; Beijing, China. General information: http://www.ivpp.ac.cn/en/news/2009-05/05/news_2062.html.

18-21 November. American Schools of Oriental Research Annual Meeting; New Orleans, Louisiana, USA. General information: <http://www.asor.org/am/index.html>.

30 November- 4 December. The 4th Asia-Pacific Symposium on Radiochemistry; Napa, California, USA. General information: <http://apsorc2009.berkeley.edu>.

2-6 December. American Anthropological Association Annual Meeting; Philadelphia, Pennsylvania, USA. General information: <http://aaanet.org/meetings>.

2-6 December. Ceramic Ecology XXIII (as part of the American Anthropological Association meetings); Philadelphia, Pennsylvania, USA. General information: <http://www.aaanet.org>, contact: Charlie Kolb, ckolb@neh.gov.

14-18 December. American Geophysical Union Fall Meeting; San Francisco, California, USA. General information: www.agu.org/meetings.

2010

6-9 January. 111th Joint AIA/APA Annual Meeting, Anaheim, California, USA. General information: <http://www.archaeological.org/webinfo.php?page=10096>.

21-25 March. 239th ACS National Meeting, San Francisco, California, USA. General information: <http://acs.org>.

6-9 April. Annual Conference on Computer Applications and Quantitative Methods in Archaeology: "Fusion of Cultures;" Granada, Spain. General information: <http://www.caa2010.org>.

Department of Anthropology
University of South Florida
4202 E. Fowler Ave., SOC 107
Tampa FL 33620-8100 USA

Non Profit Org.
U.S. POSTAGE PAID
Tampa, FL
Permit No. 257

ADDRESS SERVICE REQUESTED

Please send subscription address changes to SAS Administration

SAS Bulletin

Newsletter of the Society for Archaeological Sciences

SAS Bulletin Staff

Editor: **E. Christian Wells**, Department of Anthropology, University of South Florida, 4202 E. Fowler Ave., SOC 107, Tampa, FL 33620-8100, USA; tel 813-974-2337; fax 813-974-2668; email cwells@cas.usf.edu

Associate Editor, Archaeological Ceramics: **Charles C. Kolb**, Division of Preservation and Access, National Endowment for the Humanities, Room 411, 1100 Pennsylvania Avenue, NW, Washington, DC 20506, USA; tel 202-606-8250; fax 202-606-8639; email ckolb@neh.gov

Associate Editor, Archaeological Chemistry: **Nora A. Reber**, Anthropology Program, University of North Carolina, 601 S. College Rd., Wilmington, NC 28403, USA; tel 910-962-7734; email rebere@uncwil.edu

Associate Editor, Bioarchaeology: **Gordon F.M. Rakita**, Department of Sociology, Anthropology, & Criminal Justice, University of North Florida, 4567 St. Johns Bluff Rd., South Jacksonville, FL 32224-2659, USA; tel 904-620-1658; fax 904-620-2540; email grakita@unf.edu

Associate Editor, Book Reviews: **Deborah L. Huntley**, Center for Desert Archaeology, 300 E. University Boulevard, Suite 230, Tucson, AZ 85705, USA; tel 520-882-6946; fax 520-882-6948; e-mail dhuntley@cdarc.org

Associate Editor, Dating: **Gregory W.L. Hodgins**, Physics and Atmospheric Sciences, NSF Arizona AMS Facility, 1118 E. 4th Street, University of Arizona, Box 0081, Tucson, AZ 85721, USA; tel 520-626-3619; fax 520-626-4721; email ghodgins@physics.arizona.edu

Associate Editor, Geoarchaeology: **Jane A. Entwistle**, Geography, School of Applied Sciences, Northumbria University, Sandyford Road, Newcastle upon Tyne NE1 8ST, UK; tel 44(0)191-227-3017; fax 44(0)191-227-4715; email jane.entwistle@northumbria.ac.uk

Associate Editor, Meeting Calendar: **Rachel S. Popelka-Filcoff**, National Institute of Standards and Technology, 100 Bureau Drive, Stop 8395, Gaithersburg, MD 20899-8395 USA; tel 301-975-4611; fax 301-208-9279; email rachel.popelka-filcoff@nist.gov

Associate Editor, Remote Sensing and GIS: **Apostolos Sarris**, Laboratory of Geophysical-Satellite Remote Sensing & Archaeoenvironment, Foundation of Research & Technology Hellas, Melissinou & Nikiforou Foka 130, P.O. Box 119, Rethymnon 74100, Crete, Greece; tel (30)-831-25146; fax (30)-831-25810; e-mail asaris@ret.forthnet.gr

SAS Administration

General Secretary: **Robert S. Sternberg**, Department of Earth and Environment, Franklin & Marshall College, Lancaster, PA 17604-3003, USA; tel 717-291-4134; fax 717-291-4186; email rob.sternberg@fandm.edu

SAS Executive Officers, 2007-2009

President: **Sandra L. López Varela**, Departamento de Antropología, Universidad Autónoma del Estado de Morelos, Av. Universidad 1001, Col. Chamilpa, Cuernavaca, Morelos 62209 México; tel & fax 01-777-329-7082; email slvarela@buzon.uaem.mx

Vice President/President-elect: **Patrick Degryse**, Geology, Katholieke Universiteit Leuven, Celestijnenlaan 200 E, B-3001 Heverlee, Belgium; tel +32-16-326460; fax +32-16-322980; email patrick.degryse@ees.kuleuven.be

Past President: **Aaron N. Shugar**, Art Conservation Department, Buffalo State College, 1300 Elmwood Ave., Buffalo, NY 14222, USA; tel 716-878 5031; fax 716-878-5039; email shugaran@buffalostate.edu

SASweb: **Destiny L. Crider**, Archaeological Research Institute, Arizona State University, Tempe, AZ 85287-2402, USA; tel 602-965-9231; fax 602-965-7671; email destiny.crider@asu.edu

SASnet: **Destiny L. Crider**, Archaeological Research Institute, Arizona State University, Tempe, AZ 85287-2402, USA; tel 602-965-9231; fax 602-965-7671; email destiny.crider@asu.edu

SASblog: **Robert S. Sternberg**, Department of Earth and Environment, Franklin & Marshall College, Lancaster, PA 17604-3003, USA; tel 717-291-4134; fax 717-291-4186; email rob.sternberg@fandm.edu

Vice President for Intersociety Relations: **Adrian L. Burke**, Département d'Anthropologie, Université de Montréal, C.P.6128, succursale Centre-ville, Montréal QC H3C 3J7, Canada; tel 514-343-6909; email adrian.burke@umontreal.ca

Vice President for Membership Development: **A.J. Vonarx**, Department of Anthropology, University of Arizona, Tucson, AZ 85721-0030; tel 520-881-3407; fax 520-621-2088; email ajvonarx@email.arizona.edu

Publications Coordinator: **Robert H. Tykot**, Department of Anthropology, University of South Florida, 4202 E. Fowler Ave., Tampa, FL 33620-8100, USA; tel 813-974-7279; fax 813-974-2668; email rtykot@cas.usf.edu

SAS Editor for Archaeometry: **James H. Burton**, Department of Anthropology, University of Wisconsin, Madison, WI 53706-1393, USA; tel 608-262-4505; fax 608-265-4216; email jhburton@facstaff.wisc.edu

Editor, Journal of Archaeological Science: **Thilo Rehren**, Institute of Archaeology, University College London, 31-34 Gordon Square, London, WC1H 0PY, UK; tel 44(0)20-7679-4757; fax 44(0)20-7383-2572; email th.rehren@ucl.ac.uk

SAS Representative on the International Symposium on Archaeometry Committee: **Sarah U. Wiseman**, Program on Ancient Technologies and Archaeological Materials, University of Illinois at Urbana-Champaign, 78 Bevier Hall, 905 S. Goodwin, MC 187, Urbana, IL 61801, USA; tel 217-333-6629; fax 217-333-8479; email wisarc@uiuc.edu

Published quarterly by the Society for Archaeological Sciences

Distributed to subscribers: \$20/yr regular membership; \$15.00 student & retired; \$30.00 institutional; \$300 lifetime. Individuals add \$110.00/yr for *Journal of Archaeological Science*; \$40/year for *Archaeometry*. ISSN 0899-8922.