



# SAS Bulletin

*Newsletter of the Society for Archaeological Sciences*

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## Close Call

At the moment this issue of the *SAS Bulletin* was going to press, members of the American Anthropological Association received a last-minute plea from its administration asking members to contact their U.S. congressional representatives. The annual funding authorization bill for the National Science Foundation was under seige in Congress and two U.S. Representatives (John Campbell [California] and Scott Garrett [New Jersey] had submitted proposed amendments that would cancel funding for a number of archaeological projects already slated for funding by NSF, one of which proposes to use specific archaeometric techniques (bone isotope chemistry and other methods) to answer anthropological problems.

It was reported that the Representatives had decided that the titles of the archaeological projects sounded too “silly” to merit funding. Mr. Garrett of New Jersey proposed that “none of the funds authorized under this section [NSF] may be used for research related to...the diet and social stratification in ancient Puerto Rico.” Mr. Campbell of California proposed prohibiting funding for two projects, “Study of the Archives of Andean Knotted-String Records: The Khipu Database Project” and a doctoral dissertation improvement grant for “Bison Hunting on the Late Prehistoric Great Plains: Seeking an Explanation for Variability in the Kill Record.”

I suppose that to “non-scientists” these project titles might appear “silly” (if “silly” means irrelevant). But even a casual glance at the abstracts of the projects (available on the NSF website) clearly shows that this is important and relevant research. Still, a broader issue of concern here is the extent to which we, as archaeological scientists, are doing a good enough job of demonstrating to the public the relevancy of our work. Maybe this is just an isolated incident of government meddling in the peer review process of the scientific community. Maybe not.

In this issue of the *Bulletin*, Thilo Rehren (Guest Associate Editor for Archaeometallurgy) and Charles Kolb (Associated Editor for Archaeological Ceramics) do a particularly good job of drawing our attention to some of the ways in which our work is relevant. I encourage you to look at what they cover in their columns. As well, Felicia Beardsley’s review of *Archaeology, Cultural Heritage, and the Antiquities Trade*, highlights the links between archaeology, science, public policy, and legal and ethical issues.

Postscript: by day’s end, the proposed amendments to the NSF authorization bill were defeated in Congress, thanks in no small part to the surge of advocacy activity of archaeologists, anthropologists, and other scientists. We won the battle, but will we win the war?

*E. Christian Wells*



Lawmakers ask, Why study the American Bison? Pictured above, the “silly” bison, as it appears on the reverse side of the U.S. “buffalo nickel” from 1913 to 1938.

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## Employment Opportunities

**The Leverhulme Centre for Human Evolutionary Studies, University of Cambridge, seeks a postdoctoral fellow in archaeology.** The base salary is £25,134 and steps up to £26,666. The appointment will be for a fixed term of three years. Please visit [www.human-evol.cam.ac.uk](http://www.human-evol.cam.ac.uk) for a detailed job description and contact information.

**The Department of Earth Sciences at Montana State University** invites applications for a two year post-doctoral position to participate in an international research project examining human and natural influences on the fire history of South Island, New Zealand. For a complete position announcement and application procedures go to <http://www.montana.edu/msuinfo/jobs/prof/>. Applications (including hard copy) should be submitted to: Dr. Cathy Whitlock, Department of Earth Sciences, Montana State University, Bozeman, MT 59717 USA; email [whitlock@montana.edu](mailto:whitlock@montana.edu).

**Graduate student positions in environmental micropaleontology at the University of Victoria, School of Earth and Ocean Sciences.** Two graduate student positions in marine palynology, both at Ph.D. and M.Sc. levels, are available at the University of Victoria, British Columbia, Canada. Students will be working under the supervision of Dr. Vera Pospelova at the School of Earth and Ocean Sciences. There are several research projects available involving applications of palynomorphs (dinoflagellate cysts, foraminiferal organic linings, spores and pollen) for climatic and environmental reconstructions of modern and Late Quaternary conditions in the Pacific region. Research would include both field and laboratory components. Applications from well-motivated students, preferably with a background in geology and/or biology, and with an excellent academic standing (GPA > 6/9) will be given priority. Knowledge of palynology is desirable, but not essential. Interested individuals are encouraged to contact Dr. Pospelova as soon as possible and submit a CV, unofficial copy of university transcripts (undergraduate and graduate as appropriate), and a brief statement of scientific interests to [vpospe@uvic.ca](mailto:vpospe@uvic.ca).

**The French CNRS is looking for applicants for a one year post-doctoral position at the National Museum of Natural History** starting between September 1, 2007 and January 1, 2008. Candidates must have a strong publication record and previous expertise in stable isotope measurements performed in organic matter or biomineralizations applied to paleontology and archaeology. The net salary will be approximately 1750 euro per month. Candidates must fill the application form that can be downloaded from the CNRS website (<https://www2.cnrs.fr/DRH/post-docs07/?pid=8&lang=en>). Please send application along with CV to Jean-Denis Vigne ([vigne@mnhn.fr](mailto:vigne@mnhn.fr)) and/or Sebastien Lepetz ([lepetz@mnhn.fr](mailto:lepetz@mnhn.fr)). The details of the research program can be adjusted based on the background and expertise of the successful candidate. For additional information contact: Jean-Denis Vigne, Dr HDR, Head researcher at the CNRS, Director

of the Lab: Archaeozoology, history of human societies and animal communities, CNRS—Muséum national d'Histoire naturelle, Dpt Ecology and Biodiversity Management, USM 303, Case postale N° 56 (Bâtiment d'anatomie comparée), 55 rue Buffon, F-75231 Paris cedex 05, France; tel: 33 (0)1 40 79 33 10; fax: 33 (0)1 40 79 33 14; email: [vigne@mnhn.fr](mailto:vigne@mnhn.fr) or [lepetz@mnhn.fr](mailto:lepetz@mnhn.fr).

**The Program in Archaeology and the Department of Sociology/Anthropology of the College of Wooster invite applicants for a full-time visiting assistant professor position** for the academic year 2007-2008 to teach three classes each semester. The successful applicant must be able to teach an introductory course in archaeology (world prehistory with some methods) and an introductory (four-field) anthropology course. In addition, the applicant will be asked to teach a mid-level topics course in archeology (topics could include spatial analysis using GIS, bioarchaeology/forensics, or the prehistory of a world region). Other courses are open but preference will be given to candidates who can teach at least one of the following: introductory physical anthropology, contemporary human variation, a peoples and cultures course, political economy/globalization, or cultural ecology. Ph.D. in anthropology and teaching experience are desirable. Send cover letter, CV, two reference letters, official graduate transcripts, and any relevant supporting material (e.g., teaching evaluations) to Anne Nurse, Chair, Department of Sociology and Anthropology, The College of Wooster, 1189 Beall Avenue, Wooster, Ohio 44691 USA.

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## Awards, Fellowships, and Training

**XVIII Summer School in Archaeology, 1st International School on the Characterization of Organic Residues in Archaeological Materials, Grosseto (Italy), June 24-29, 2007.** Identification and characterization of organic residues in archaeological materials, such as ceramics, is a fascinating field of modern archaeology and archaeometry. These residues allow one to obtain information on the original content of the materials, as well as their function and use. They can also give information on the diets and customs of people who used them. Several chemical methodologies can be used for the characterization of organic materials. The 1st-ISCORAM school is aimed at giving participants the background and "state of the art" on the characterization of organic residues in archaeological materials, in particular in ceramic vessels. Different approaches, such as gas chromatography, mass spectrometry, and spot tests will be presented together with examples of their applications in archaeology. Laboratory practice will have an important role in the school. Teachers are qualified scientists worldwide. Lecturers include Luis Barba (National University of México,) Francesca Modugno (University of Pisa, Italy), Maria Perla Colombini (University of Pisa, Italy), Alessandra Pecci (University of Siena, Italy), Richard Evershed (University of Bristol, UK), Martine Regert (C2RMF, Paris, France), Gianluca

Giorgi (University of Siena, Italy), and Laura Salvini (University of Siena, Italy). For more information, contact Prof. Gianluca Giorgi, Department of Chemistry, University of Siena, via Aldo Moro, 53100 Siena, Italy; e-mail: [gianluca.giorgi@unisi.it](mailto:gianluca.giorgi@unisi.it), website: <http://archeologiamedievale.unisi.it/ISCORAM/>.

**Sir Nicholas Shackleton Medal for Outstanding Young Quaternary Scientists.** INQUA has established the Sir Nicholas Shackleton Medal in recognition of the many contributions of Nick Shackleton, a giant in the field of Quaternary science. The medal will be awarded once every four years to an outstanding young Quaternary scientist chosen by his or her peers and evaluated by a blue-ribbon committee of distinguished scientists. The medal, INQUA's first, honors Nick's distinguished career in Quaternary geochronology and paleoclimatology, which spanned 40 years and was based on isotopic studies of deep-sea sediment. Shackleton was showered with honors by his peers and the wider scientific community, thus a medal in his name seems appropriate and necessary. Nick served INQUA for 12 years, first as a Vice-President, then, from 1998 to 2003, as President, and most recently as Past-President. Nomination forms are available directly from INQUA's web site at <http://www.inqua.tcd.ie/index.html>.

**The Richard Hay Student Paper/Poster Award** is a travel grant awarded to a student presenting a paper or poster at the annual meeting of the Geological Society of America. The grant is competitive and will be awarded based on the evaluation of the scientific merit of the research topic and the clarity of an expanded abstract for the paper or poster prepared by a student for presentation in the Division's technical session at the meeting. The deadline for receipt of the application is September 20, 2007. For more information and to begin the application process, see <http://rock.geosociety.org/arch>. For more information contact: Loren Davis (Chair), Department of Anthropology, Oregon State University, Corvallis, or [loren.davis@oregonstate.edu](mailto:loren.davis@oregonstate.edu).

**Research Awards for Graduate Students in Archaeology,** Laboratory for Archaeological Chemistry, University of Wisconsin-Madison. The Laboratory for Archaeological Chemistry at the University of Wisconsin-Madison has an annual program of research award grants to graduate students in archaeology programs around the world. The awards are offered to support and encourage the application of chemical analyses in solving archaeological problems. The primary focus of research in the laboratory is on the characterization of prehistoric bone, soils, and pottery. A variety of other materials including stone, dyes, organic residues, metals and glass are also investigated in the laboratory. Instrumentation in the lab includes an Inductively Coupled Plasma - Atomic Emission Spectrometer for the rapid elemental characterization of a variety of materials with a resolution in parts per million, and a Finnigan Element Inductively Coupled Plasma High-Resolution Mass Spectrometer for isotopic and elemental characterization of many materials, often at the parts per billion level. This instrument incorporates laser ablation as a sample introduction technique appropriate for many solids

and for small or fragile samples. In addition the lab has access to a variety of other instrumentation and equipment on campus that is often used in our research. Discussions with the lab staff are recommended prior to application to ensure that the project meets award criteria and employs services available in the Laboratory for Archaeological Chemistry. The award will be made by the staff of the Laboratory for Archaeological Chemistry and major criteria for selection will be the significance of the research question, feasibility of the project, and impact on the student and the field. Deadline: 1 January for awards beginning in 1 September of the same year. One award will be made each year consisting of analytical services involving elemental or isotopic measurements available with Laboratory for Archaeological Chemistry instrumentation. The lab encourages students to participate in analyses, where possible, in order to learn and understand the methods employed. Questions and applications should be addressed to T. Douglas Price or James H. Burton, Laboratory for Archaeological Chemistry, University of Wisconsin-Madison, 1180 Observatory Drive, Madison WI 53706 USA. Phone: 608-262-2575 (tdp), 608-262-0367 (jhb), 608-265-4216 (fax). Email: [tdprice@facstaff.wisc.edu](mailto:tdprice@facstaff.wisc.edu) or [jhburton@facstaff.wisc.edu](mailto:jhburton@facstaff.wisc.edu). For further information on the Laboratory for Archaeological Chemistry, please see our web site at <http://www.wisc.edu/larch/aclab/larch.htm>.

**Ph.D. in the chronology of human adaptation and climate change in Morocco—Upper Palaeolithic to the Neolithic at the University of Oxford, Research Laboratory for Archaeology and the History of Art.** The aim of this Ph.D. program is to examine the hypothesis that environmental forcing has induced a number of punctuated occupation episodes by modern humans in North Africa during the Later Pleistocene and early Holocene (~25,000 to 6,000 BP). This hypothesis is currently based on a correspondence between the dates of human occupation in a key extended cave sequence in Taforalt, northeast Morocco, and cooling events recorded in nearby Mediterranean marine cores. There are, however, a number of research avenues that need to be explored to test this hypothesis, including the extension of a radiocarbon dating program (potentially supported by OSL dating and tephrochronology) to other identified sites in northern Morocco and extending west into Tangier. Additionally, it would be desirable to develop terrestrial environmental proxy records in the local area to test the correlation found with the marine records. Although the primary focus of the Ph.D. will be dating the archaeological sites, we would be very keen to see students with an interest in palaeoenvironmental reconstruction develop this theme as part of the Ph.D. It would also provide an opportunity to examine the question of the potentially early onset of the Neolithic in this region, via dating and palaeoenvironmental studies. Also, this research could act as a key plank in understanding the environmental context of modern human migrations. The Ph.D. would give the student the chance to work in a dedicated team of researchers, studying the chronology of human interaction with environmental change in the Mediterranean region, on a number of sites and using a variety of methods. The student would be directly involved

with the field sampling of several sites in northern Morocco, and the development, implementation, and interpretation of a sound dating strategy. The proposed Ph.D. would suit candidates with a background in either: chronology, palaeoenvironmental reconstruction, Palaeolithic or Mesolithic/Neolithic archaeology. This is a necessarily multidisciplinary study, so candidates from related fields in geography, geology and the physical sciences would also be suitable. The Ph.D. student will work closely with Dr. Simon Blockley, who is a specialist in geochronology and Late Palaeolithic archaeology, and Professor Nick Barton, who is the Principal Investigator of project excavations in Morocco and has expertise in Palaeolithic archaeology of the Western Mediterranean. Further expertise is provided by collaboration with Dr. Tom Higham and Professor Christopher Ramsey of the AMS facility in the Research Laboratory for Archaeology & the History of Art. The student would also be encouraged to collaborate with palaeoenvironmental specialists in other departments in the university. Please contact Dr. Simon Blockley (01865 285202) or Professor Nick Barton (01865 278240) for any further information and see NERC website for funding eligibility. Applications including a covering letter, C.V., and names and addresses of two referees should reach Mrs. J Simcox at the Research Laboratory for Archaeology by the 1st of May. Applicants will be notified in two to three days, and interviews will be held on the 14th of May.

**Marie Curie Fellowships in Archaeological Science at the UCL Institute of Archaeology, London.** The UCL Institute of Archaeology invites applications for a number of fellowships, funded under FP6 Marie Curie Action EST, for its material-science based postgraduate archaeology programs. Two different types of fellowships are available: short-term visits of three months and one-year fellowships for Master's programs. All fellowships are aimed at training students to become academic researchers and teachers in material-science based archaeology. Fellows will be trained to use scientific instrumental methods for an archaeological research agenda, with particular emphasis being placed on using the Institute's facilities available in the Wolfson Archaeological Science Laboratory and the GIS Laboratory. The positions offered for the 2007-2008 program are as follows: four three-month fellowships, specifically aimed at students in existing Ph.D. programs elsewhere who would benefit from the additional training and research experience available at the Institute; and four one-year Masters fellowships for one of the following Masters programs: M.A. in Artefact Studies; M.A. in Principles of Conservation; M.Sc. in Conservation for Archaeology and Museums (which is a 2 year program); M.Sc. in GIS and Spatial Analysis in Archaeology; M.Sc. in Technology and Analysis of Archaeological Material; and M.A. in Research Methods for the Humanities. The program aims at emerging researchers with less than four years of research experience and prior to obtaining their Ph.D. The action aims to promote transnational mobility within the EU, as well as to attract the best students from outside the EU. Fellows should not have lived more than 12 months during the previous four years in the UK and should be EU citizens. A very limited number of non-EU applicants

can be funded under the rules of FP6, most likely for one or two of the three-month fellowships. Funding is in accordance with EST rules and includes a monthly living allowance in excess of € 1,400, plus a monthly mobility allowance of € 500. In addition, a one-off travel allowance will be available, and a further allowance for fellows staying 12 months or more. A contribution to UCL fees is also likely to be part of the fellowship. There is no set application form for these fellowships. However, all applicants will have to set out in writing (mail or email, including C.V.) their eligibility and their research plans and interests. Applicants for the three-month fellowships should explain how this will benefit their current training and research program. Applicants for the degree programs need to apply separately to UCL for a place in one of the eligible programs. The cover letter should contain the application for the Marie Curie funding and state how their research interests and career plans match the aims of this particular EST action. Fellows will be selected on the basis of academic merit and the suitability of their planned research and training for the EST program, as well as the availability of appropriate facilities and expertise at the Institute of Archaeology, UCL. The deadline for applications is June 30, 2007, but applicants are encouraged to express their interest in EST funding before this date. Note that applications for funding will only be considered once the applicant has been offered a place in the academic program by University College London. This is the final year of this four-year program. For more information, contact Thilo Rehren (th.rehren@ucl.ac.uk) or Lisa Daniel (l.daniel@ucl.ac.uk), or visit the following websites: <http://mc-opportunities.cordis.lu/>; <http://www.ucl.ac.uk/archaeology>.

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## Conference News and Announcements

**The Hercules Specialized Course (HSC5) on "Synchrotron Radiation and Neutrons for Cultural Heritage Studies"** will take place at the ESRF in Grenoble from October 7-13, 2007. The deadline for registration is June 4, 2007. The purpose of this Hercules Specialized Course, which is part of the Marie Curie Conferences and Training Courses, is to give the participants an introduction to the basic principles of SR and neutron techniques (imaging, microscopy, diffraction, absorption and fluorescence, IR spectroscopy). The school will also provide cross-disciplinary examples illustrating the abilities of these techniques in a representative range of scientific cases in relation to the European cultural heritage. The lectures will cover both theoretical and experimental aspects to the attention of a non-expert audience. They will be complemented by tutorials (diffraction and XAS data processing), and practicums on a selection of artifacts taking place at several ESRF and ILL beamlines. Young scientists and newcomers at the interfaces of the disciplines of archaeology, archaeological science, art conservation and materials science are welcome. The attendance will be limited to 20 participants. You will find

all necessary information on the course and on the registration procedure on our website: <http://www.esrf.fr/NewsAndEvents/Conferences/HSC/HSC5/>.

**Conference on Surface Modification Technologies, Session on "Arts and Surfaces."** The 21st edition of the Conference on Surface Modification Technologies (SMT 21) will be held in Paris, September 24-26, 2007 with a session on "Arts and Surfaces." The purpose is to provide an interactive forum for multidisciplinary discussion on the science and technology of surface-related phenomena for all artistic and archaeological materials. The proceedings of the previous session on "Arts and Surfaces," held in Dijon in 2004, have been published in a double special number of the review "Surface Engineering." For the contents see: [www.maney.co.uk/SUR/contents](http://www.maney.co.uk/SUR/contents). The session on "Arts and Surfaces" will be scientifically coordinated by Dr. Alessandra Giumlia-Mair who may be emailed at [giumlia@yahoo.it](mailto:giumlia@yahoo.it). For more information on the SMT21 Conference see the website: <http://www.c2s-organisation.com/smt21>.

**Fifth New World Luminescence Dating and Dosimetry Workshop.** The fifth New World Luminescence Dating and Dosimetry Workshop will be held at the Department of Earth and Environmental Sciences at the University of Illinois at Chicago. This workshop will follow the "tradition" set in Tulsa, Oklahoma; Albuquerque, New Mexico; Halifax, Nova Scotia; and Denver, Colorado. Workshop presentations are planned for October 12 to 13, 2007 at the University of Illinois-Chicago. We anticipate two days of presentations and some time for enjoying the University of Illinois campus and the surrounding city. There will be a banquet Saturday night (October 13) and all are welcome to stay into Sunday to enjoy the many fine museums and sites of Chicago. If there is sufficient interest, we can organize an architectural tour of Chicago by boat on the Chicago River for Sunday morning. All presentations will be oral. The registration fee will be \$100 for professional and \$50 for students. Please direct your questions to Steve Forman, University of Illinois at Chicago, Director of Luminescence Dating Research Laboratory, Director of Undergraduate Studies, Department of Earth & Environmental Sciences, 845 W. Taylor Street, Chicago, IL 60607-7059 USA; Email: [slf@uic.edu](mailto:slf@uic.edu); Phone: 312-413-9404; Fax: 312-413-2279.

**II Congreso Centroamericano de Arqueología,** 23-26 octubre 2007, "Interrelaciones culturales prehispánicas en Centroamérica", Museo Nacional de Antropología "Dr. David J. Guzmán." El Salvador. El desarrollo del I Congreso de Arqueología realizado en octubre de 2005, fue un acontecimiento intelectual sin precedentes en El Salvador, tanto por el número de participantes como por la variedad y calidad de sus contribuciones. Se presentaron 39 ponencias de académicos de 34 instituciones, entre ellas 18 universidades de 10 países, incluyendo Europa, Canadá, Estados Unidos, México, además de los países centroamericanos. También se llevaron a cabo cinco conferencias magistrales y dos mesas redondas. Después de un diagnóstico general, contabilizamos

un total de 206 participantes, entre ponentes, estudiantes, docentes, investigadores y oyentes, además de un buen número de invitados especiales y otros interesados. El primer Congreso, despertó grandes expectativas en el mundo intelectual, las cuales contribuyeron a indicarle al público en general la importancia de la reflexión sobre nuestra historia prehispánica, elemento esencial en la permanente construcción de una Centroamérica que reconoce su diversidad y valora las contribuciones de todos sus ciudadanos. La realización del II Congreso Centroamericano de Arqueología en El Salvador permitirá actualizar y conocer los últimos avances producidos en la investigación arqueológica, lingüística, etnohistórica y antropológica de la región. Además creará un espacio propicio para la discusión y el debate de los trabajos producidos; como resultado de ello se enriquecerá el conocimiento arqueológico regional y se fomentará el intercambio académico entre los diferentes países de la región e incluso con investigadores de otras nacionalidades. Asimismo el congreso permitirá la planificación de otras actividades regionales vinculadas con la arqueología, tales como cursos, seminarios, intercambios, publicaciones, etc. Estamos seguros de que con su participación, el II Congreso se convertirá en el centro de atención de la vida académica y de convivencia fraternal centroamericanista. Mayor información: [gbellosuazol@concultura.gob.sv](mailto:gbellosuazol@concultura.gob.sv), [www.munaelsalvador.com](http://www.munaelsalvador.com), Telfax: (503) 243-3750, (503) 243-3827, (503) 243 3927 y (503) 243-3928.

**Materials Issues in Art and Archaeology VIII,** Materials Research Society Fall Meeting, November 26 - 30, 2007, Hynes Convention Center and Sheraton Hotel, Boston, Massachusetts. Abstract Deadline: June 20, 2007. Our goal is to present cutting-edge and interdisciplinary research used to characterize (1) cultural materials, (2) the technologies of selection, production, and usage by which materials are transformed into objects and artifacts, (3) the science underlying their deterioration, preservation and conservation, and (4) the development of sensors and tools for nondestructive in-situ examination of artifacts, as well as innovative analytical technology for their characterization. Studies are solicited that use the methods and techniques of materials research to understand degradation and design strategies to promote long-term preservation of material culture and cultural heritage, e.g., works of art, culturally significant artifacts, and archaeological sites and complexes. Preserving cultural heritage extends beyond artifact preservation. It includes developing a critical understanding of how ancient people used technology and crafts to solve problems of survival and organization and to make symbols or representations of what was important to them. It discloses patterns of technology transfer from one field to another and allows us to gain insights into artists' intentions and processes. It involves evaluation of performance criteria and life histories of the constituent materials to determine the optimum preservation conditions. Invited speakers include: Katherine Eremin (Harvard University Art Museums), Jennifer Mass (Winterthur Museum), Chris McGlinchey (Museum of Modern Art), and Chandra Reedy (University of Delaware). For more information, contact meeting website at [www.mrs.org/fall2007](http://www.mrs.org/fall2007), or symposium organizers: Pamela Vandiver (email:



vandiver@mse.arizona.edu), Robert H. Tykot (tel: 813-974-7279, email: rtykot@cas.usf.edu), Francesca Casadio (email: fcasadio@artic.edu), Jose Luis Ruvalcaba Sul (tel: 52-55-5622-5162), or Blythe McCarthy (email: mccarbl@si.edu).

**37th International Symposium of Archaeometry** will be held in Siena, Italy, from May 12-16, 2008. The aim of the symposium is to promote the development and use of scientific techniques in order to extract archaeological and historical information from the cultural heritage and the paleoenvironment. In general, papers submitted should deal with the development and/or application of scientific techniques for extracting information related to human activities of the past, including the biological nature of humans and the environment in which they lived. Papers that deal with weathering and deterioration of archaeological objects or monuments will be welcome provided they are relevant to one of the main themes of the symposium. For more information, please visit our website at [www.unisi.it/eventi/isa2008/](http://www.unisi.it/eventi/isa2008/). Please note that the deadline or abstract submission is December 1, 2007.

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## Managing Change: Preserving History

Mark Benvenuto

Department of Chemistry & Biochemistry,  
University of Detroit Mercy

The journal *Materials Today* may not be a source that conservation scientists and others in the field of archaeological science immediately think of when it comes to articles describing the preservation of important, historical objects. However, in a recent article in this journal, Nancy Bell (The National Archives, Kew, Richmond, Surrey, UK) and David McPhail (The Materials Department, Imperial College, London, UK) have done an excellent job of describing the challenges facing those professionals working in what they call 'heritage science,' and how to meet and overcome such challenges. The present article is a review of Bell and McPhail's

piece that appeared in *Materials Today*, Vol.10, Number 4, April 2007, pp. 50-56.

The article gives a brief overview of some of the objects and documents housed in the National Archives of Britain, and points out that one of the first difficulties in front of those who wish to preserve them without denying all access, is the lack of information about the materials from which these historical objects are made. They discuss various non-invasive or minimally invasive techniques used by scientists to examine, characterize, and ultimately preserve such artifacts. The authors discuss optical interference microscopy, Raman spectroscopy, Fourier transform infrared spectroscopy attenuated total reflection (FTIR-ATR), particle induced X-ray emission (PIXE), environmental scanning electron microscopy (ESEM), and energy dispersive X-ray spectroscopy (EDX). The article assumes a certain level of technical understanding from the reader, as this alphabet soup of acronyms is explained rather briefly.

Bell and McPhail look in some detail at a few specific objects of concern in the National Archives. The well-known Domesday Book is presented, and mention is made of a recent project to more fully understand how it was created, including amino acid testing of the pages to ascertain fully of what type of animal skin they are made. But the authors also examine some much more recent objects, such as the archived photographs of Eadweard Muybridge. In the 19<sup>th</sup> century, Muybridge's rapid action photos were the forerunner of what would ultimately become motion pictures.

The authors conclude by pointing out that, while conservation efforts are well underway at many museums, the practice of conservation science or heritage science remains lacking in archival facilities. They call for greater collaboration among interested parties to ensure the best possible conservation of archival materials for future generations.

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## North American Surface Pollen Atlas and Dataset

John (Jack) W. Williams<sup>1</sup> and Konrad Gajewski<sup>2</sup>

<sup>1</sup>Department of Geography, Univ. of Wisconsin-Madison

<sup>2</sup>Department of Geography, Univ. of Ottawa

We announce here the recent publication of "An Atlas of Pollen-Vegetation-Climate Relationships for the United States and Canada" (Williams et al. 2006). This atlas is intended to aid paleoclimatic and paleovegetational interpretations of fossil pollen diagrams by providing Quaternary scientists with a comprehensive series of visualizations of the distribution of modern pollen abundances both geographically and along various climatic and vegetational gradients.

The atlas is based upon a recent compilation of surface pollen samples from surface sediments and moss polsters (Whitmore et al. 2005; Figure 1). The surface sample dataset currently contains counts for 134 pollen types for 4634 samples.



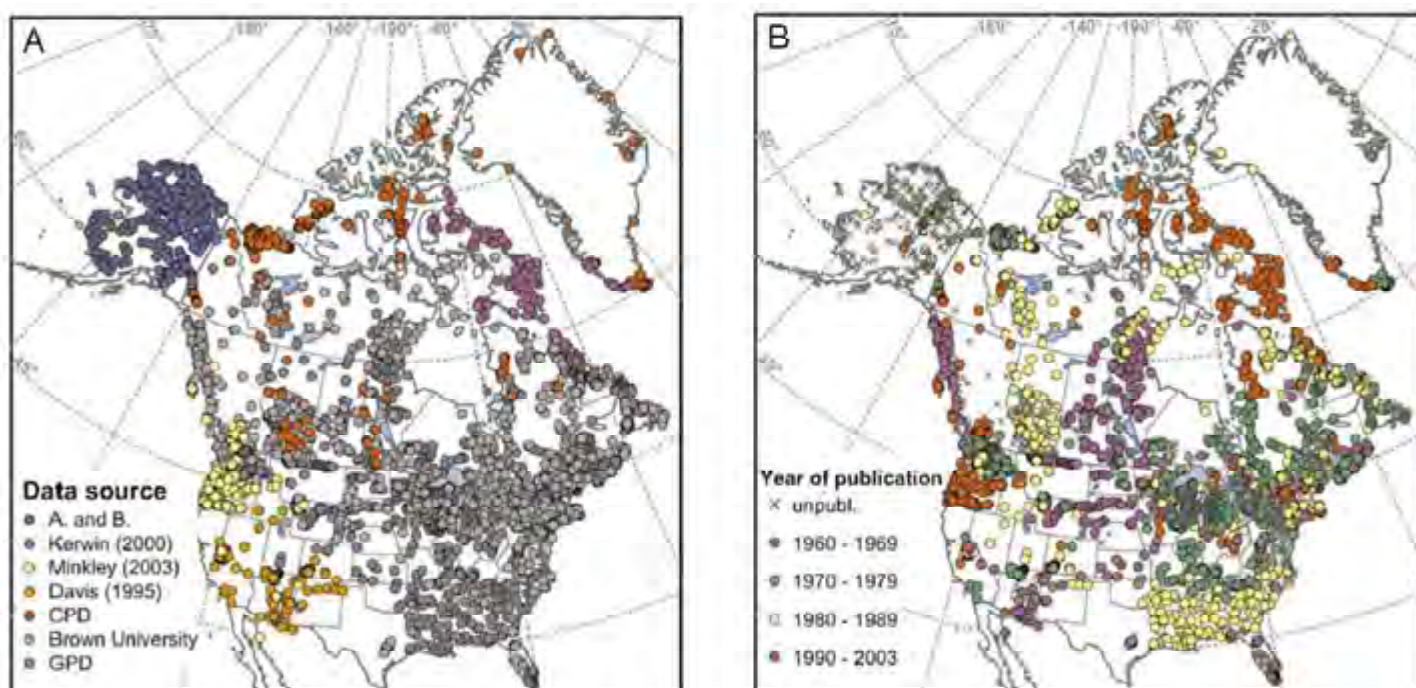


Figure 1. Distribution of modern pollen samples classified by a) database origin and b) year of data publication. Abbreviations: A&B=Anderson and Brubaker, CPD=Canadian Pollen Database, GPD=Global Pollen Database (from Whitmore et al. 2005).

All surface samples have been cross-referenced with climate and vegetation attributes, based upon 1961-1990 monthly means from the Climate Research Unit (New et al. 2000, attributions by Bartlein and Shafer), 'potential' biomes (i.e., the vegetation that would occur in the absence of human land-use, Fedorova et al. 1990, attributions by Sawada), biome maps based upon the satellite-based AVHRR remote sensor (Loveland et al. 2000), and AVHRR-based maps of fractional tree cover (DeFries et al. 1999, all AVHRR attributions by Williams). The cross-referencing of pollen abundances with climatic and vegetational attributes enables applications of the modern pollen dataset to multivariate statistical reconstructions of past environments from fossil pollen data.

The surface pollen dataset is available online as a zipped Excel workbook and can be downloaded from either the University of Ottawa ([www.lpc.uottawa.ca/data/index.html](http://www.lpc.uottawa.ca/data/index.html)) or the University of Wisconsin ([www.geography.wisc.edu/faculty/whitmore/web/data.htm](http://www.geography.wisc.edu/faculty/whitmore/web/data.htm)). We ultimately intend to integrate the surface pollen data with the North American Pollen Database. The Atlas displays the relative abundances of 106 pollen types, as North American maps and as a series of pollen-climate and pollen-vegetation plots. The visualizations for a sample taxon (*Picea*) are shown in Figure 2. The Atlas also includes maps of the major climatic and vegetational variables attributed to the surface pollen samples and the distribution of pollen abundances among biomes. Ten taxa are split into eastern and western sets of species, based upon range maps for the corresponding species. The Atlas is published by the Association of American Stratigraphic Palynologists and may be purchased on-line at <https://payment.palynology.org/#Contribution> (U.S. \$48, scroll to bottom of 'Contribution' list). Electronic versions of all Atlas pages (Adobe PDF format) may be viewed and

downloaded at the NOAA Paleoclimatology website (<http://www.ncdc.noaa.gov/paleo/pubs/williams2006/williams2006.html>).

In addition to our co-authors, listed below, we thank the many individual palynologists who have contributed their data to the surface pollen datasets. Recent contributors of note include Jim Wanket, Mike Kerwin, and Marlow Pellatt. We are committed to maintaining and updating the surface pollen dataset as a community service, and encourage palynologists to continue submitting their surface samples. As a small carrot for data contributors, we can provide, in return, the climatic and vegetational attributes for their samples. We are particularly interested in improving data coverage in the southwestern US and Mexico, and expanding the dataset to include recent samples from depositional environments relevant to archaeological investigations (e.g., caves, middens, soil samples).

## References

- Whitmore, J., Gajewski, K., Sawada, M., Williams, J.W., Shuman, B., Bartlein, P.J., Minckley, T., Viau, A.E., Webb, T., III, Anderson, P.M., Brubaker, L.B. 2005. North American and Greenland modern pollen data for multi-scale paleoecological and paleoclimatic applications. *Quaternary Science Reviews* 24:1828-1848.
- Williams, J.W., Shuman, B., Bartlein, P.J., Whitmore, J., Gajewski, K., Sawada, M., Minckley, T., Shafer, S., Viau, A.E., Webb, T., III, Anderson, P.M., Brubaker, L.B., Whitlock, C., Davis, O.K. 2006. *An Atlas of Pollen-Vegetation-Climate Relationships for the United States and Canada*. American Association of Stratigraphic Palynologists Foundation, Dallas, Texas.



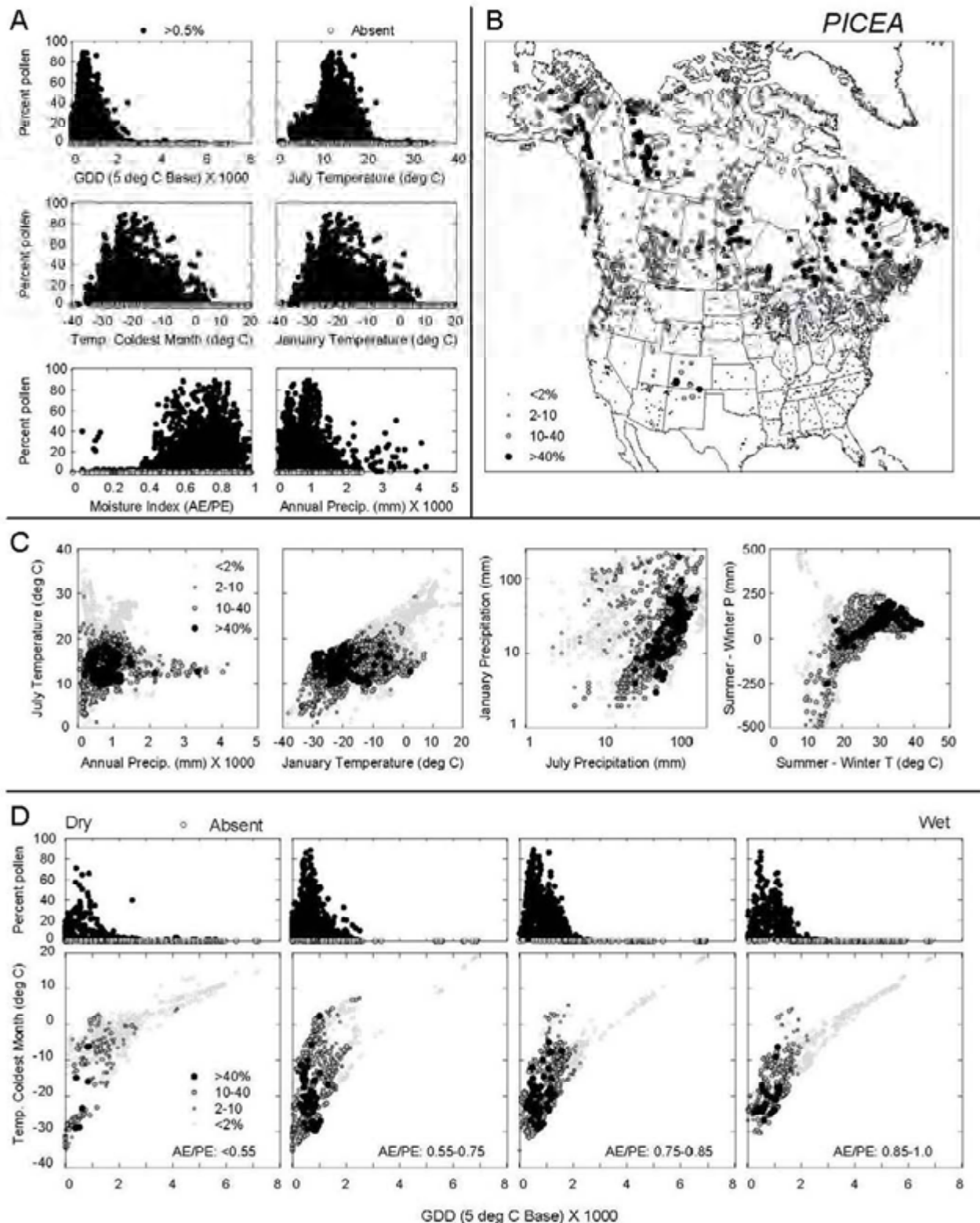


Figure 2. Sample pair of atlas pages, for *Picea*. A) Univariate scatter diagrams in which the percent abundance of *Picea* is plotted against a single climatic variable, for corresponding bioclimatic (growing degree-days [GDD<sub>5</sub>], mean temperature of coldest month [MTCO], the ratio of actual to potential evapotranspiration [AE/PE]) and climatic (mean July temperature, mean January temperature, and total annual precipitation) variables. B) Maps of percent pollen abundances. C) Bivariate scatter diagrams in which points are plotted with respect to two climatic variables and symbol types indicate *Picea* abundances. D) Sliced bivariate scatter diagrams, which add an additional climatic dimension by segregating the surface samples along a moisture gradient (indexed by the ratio of actual to potential evapotranspiration). The “sliced” bivariate plots are accompanied by univariate plots of *Picea* percentages versus GDD<sub>5</sub>, segregated by the same ranges of AE/PE. (from Williams et al. 2006).



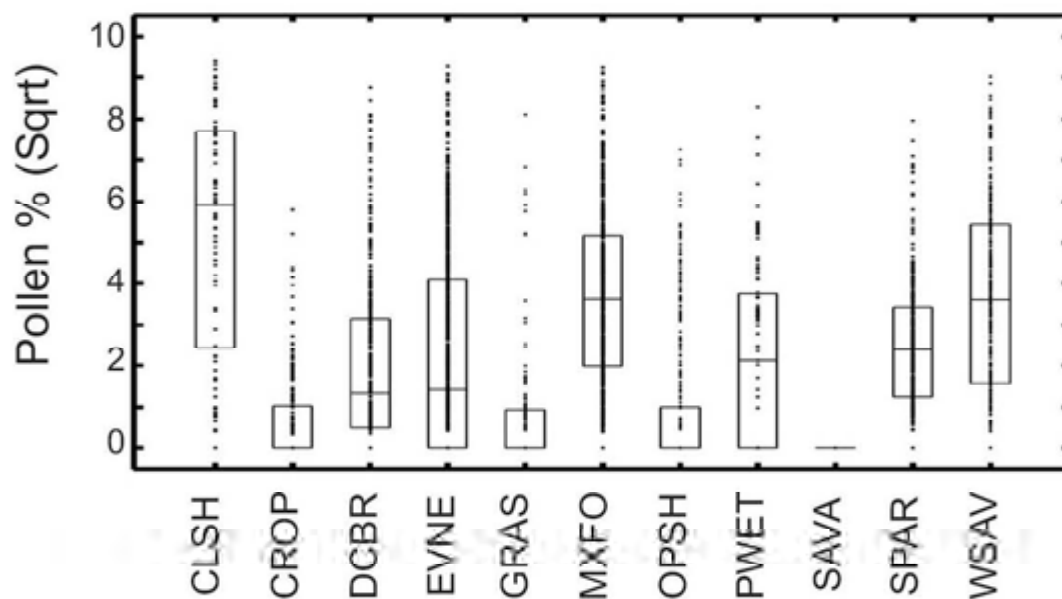
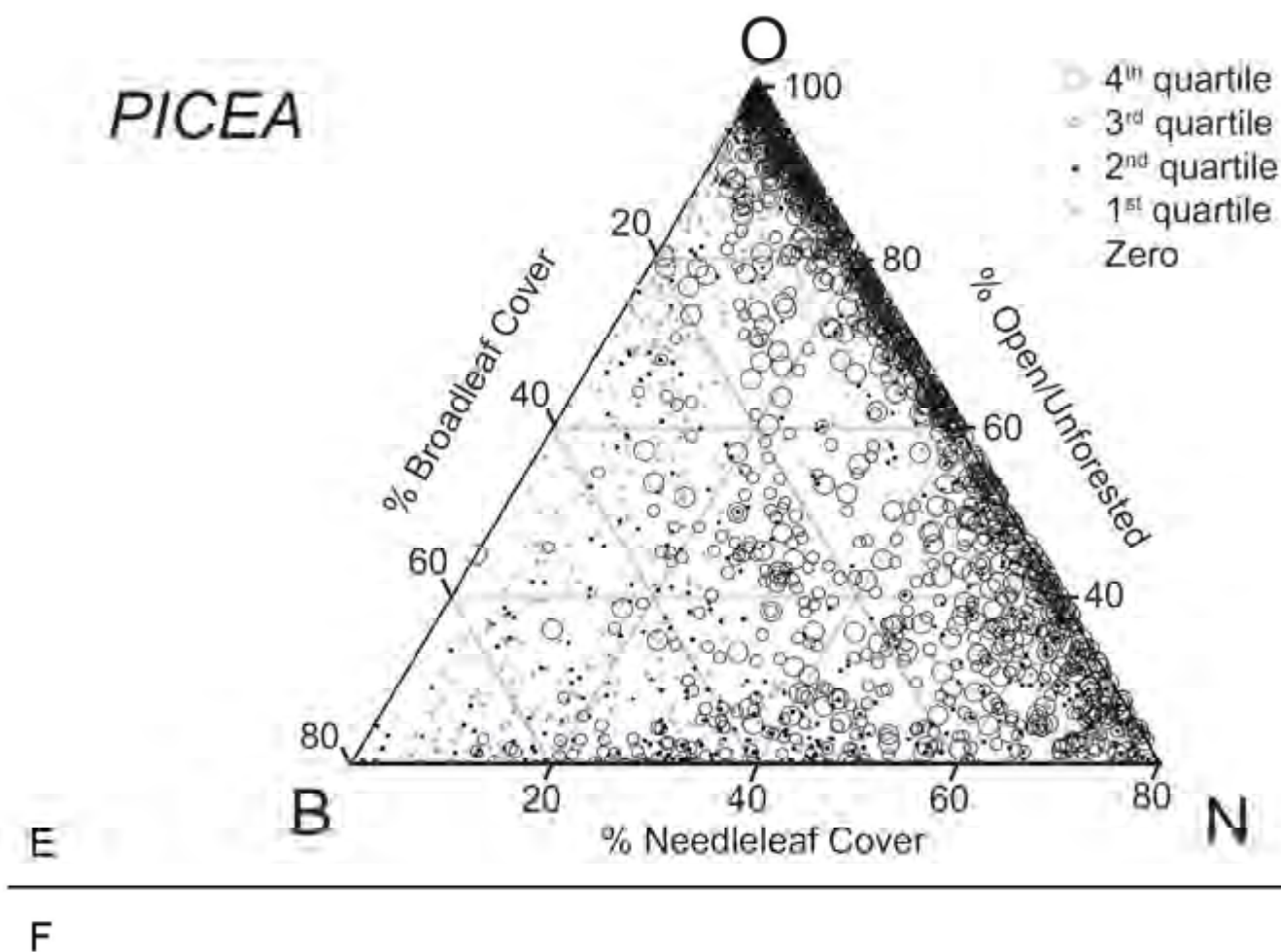


Figure 2 continued. E) Ternary diagram of *Picea* pollen percentages relative to the percent land surface area covered by needleleaved woody, broadleaved woody, and open vegetation. F) Boxplots of *Picea* pollen percentages within biomes, using the IGBP vegetation classification scheme. Pollen percentages in the boxplots are square-root transformed. IGBP vegetation abbreviations: EVNE= Evergreen Needleleaf Forest, DCBR= Deciduous Broadleaf Forest, MXFO= Mixed Forest, CLSH= Closed Shrublands, OPEN= Open Shrublands, WSAV= Woody Savannas, SAVA= Savannas, GRAS= Grasslands, CROP= Croplands, and SPAR= Barren or Sparsely Vegetated. (from Williams et al. 2006).

## Lead and Strontium Isotopes as Tracers of Turquoise

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Over the past several decades, archaeological studies of long distance trade have come to depend increasingly upon physical and chemical techniques to establish the provenance of organic and inorganic materials. The addition of precise chemical techniques has strengthened our ability to establish the provenance of long-distance trade goods and track the movement of people and artifacts. These methods include lead isotopic analysis (applied to glasses, metals, and ores), trace element analysis (used for ceramic, obsidian, and lithic materials), and both strontium and stable (C, O, H) isotopic analysis (applied to bones, teeth, and wood).

Turquoise [ $\text{CuAl}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4\text{H}_2\text{O}$ ] is a precious mineral that was widely traded among prehistoric societies in the American Southwest and Mesoamerica. Tracking the movement of this mineral is of significant interest to archaeologists and has important implications for reconstructing ancient trade routes and assessing contact between distant societies (e.g., Weigand 1992). We seek to contribute to studies of long distance trade by establishing a framework that will allow researchers to constrain the geologic provenance of turquoise recovered from archaeological contexts. Here we present the results of a pilot study that applies lead and strontium isotopic analyses to five turquoise sources in Arizona and New Mexico, and suggest that these two isotopic systems can be used to trace archaeological turquoise.

Turquoise is a secondary copper mineral and is abundant in Arizona, New Mexico, Nevada, Colorado, southern California, and northern Mexico. There have been many attempts to source archaeological turquoise (e.g. Sigleo 1975; Weigand et al. 1977; Mathien 1981; Welch and Triadan 1991; Mathien and Olinger 1992; Kim et al. 2002; Hull 2006). However, despite much important work, more research is needed before archaeological turquoise can be systematically linked to mines across the southwestern U.S. and Mexico.

### *Approach*

To successfully trace turquoise, it is necessary to find a fingerprint that is both unique and relatively homogenous within a single source, but that possesses significant variation between sources. Previous attempts to chemically source turquoise have been hindered by the chemical variability within individual deposits (e.g. Mathien and Olinger 1992), abundant impurities, associated matrix minerals, and the susceptibility of turquoise to alteration when exposed to surface conditions (Hull 2006).

This research is based upon the simple hypothesis that lead and strontium isotopes reflect the original source of the turquoise, do not fractionate during surficial processes, and can be used to distinguish between turquoise sources. The lead and

strontium isotopic systems have a wide range of natural isotopic variability, are among the best-studied isotopic systems in the geosciences (e.g., Faure and Mensing 2004 and references therein), and have proven to be successful tracers of objects and people in many archaeological studies (e.g., Thibodeau et al. 2007). We expect the isotopic compositions of lead and strontium in turquoise to potentially vary due to a number of factors, including: the type and age of the rock that hosts a deposit (volcanic, sedimentary, and metamorphic), the age of the underlying crust, processes related to turquoise formation, impurities, the age of formation of the turquoise mineralization itself, and secondary surficial processes. Because these factors vary for turquoise deposits across the American Southwest, we expect to observe lead and strontium isotopic variations between individual turquoise mines and mining districts. Each element may or may not provide a unique discriminator on its own, but by combining both isotopic systems we hope to provide a strong foundation for distinguishing between turquoise sources.

As previously stated, turquoise within a single source area can be heterogeneous in terms of its appearance, purity, and chemical composition. Most importantly, prehistoric turquoise sources have been effectively exhausted or destroyed by modern copper mining making it impossible to comprehensively sample or fully characterize the original chemical variability within these deposits. To emphasize the variety of material mined and valued in the past, a number of researchers have made the explicit distinction between chemical turquoise, and “cultural turquoise,” a term that encompasses a variety of blue-green stones utilized and valued in prehistory (see Weigand et al. 1977 and Kim et al. 2002 for discussions of this issue). Despite the fact that major and trace elemental concentrations in turquoise can vary widely within mines, we predict that the isotopic composition of lead and strontium will be controlled by the geologic context of each deposit rather than the chemical composition of the turquoise itself. This feature is one of the major strengths of our approach that we believe will allow us to link geologic samples obtained today with the material mined in prehistory.

### *Methods*

To characterize turquoise, we employ bulk isotopic analyses. Because turquoise is usually cryptocrystalline or massive, can contain many impurities, and is often associated with some sort of matrix, it is impossible to obtain ‘pure’ turquoise for bulk analysis. Thus, samples were selected on the basis of visual heterogeneity to assess whether or not hardness, color, or visual impurities would cause the isotopic composition of these samples to vary within mines.

For this study, 17 turquoise samples from five localities were powdered using a clean mortar and pestle, accurately weighed, and dissolved using twice distilled concentrated nitric ( $\text{HNO}_3$ ), hydrochloric, (HCl) and hydrofluoric (HF) acids to achieve maximum sample dissolution. Typically, at least 200 mg of sample is needed to ensure enough lead and strontium is present for analysis. Total process blanks were measured

alongside samples to assess contamination throughout all laboratory procedures.

After dissolution, lead and strontium were separated from single samples using Sr-Spec resin (Eichrom, Darien IL). Lead isotope analysis was conducted on a GV-Instruments multi-collector inductively coupled mass spectrometer (MC-ICPMS) at the University of Arizona. All lead isotope results were spiked with Tl, Hg-corrected, and empirically normalized to Tl using the exponential law correction after methods developed by Rehkamper and Metzger (2000). To correct for interlaboratory bias, all results were normalized to the values reported by Galer and Abouchami (1998) for the NBS-981 standard. Internal error reflects the reproducibility of the measurements on individual samples, whereas external errors are derived from long-term reproducibility of NBS-981 Pb standard and results in part from the mass bias effects within the instrument. In all cases, external error exceeds the internal errors and is reported here. Errors are 0.024%-0.041% for  $^{206}\text{Pb}/^{204}\text{Pb}$ , 0.025%-0.041% for  $^{207}\text{Pb}/^{204}\text{Pb}$ , and 0.034%-0.048% for  $^{208}\text{Pb}/^{204}\text{Pb}$ . Strontium samples were analyzed according to procedures discussed in Chesley et al. (2002). Analyses of NBS-987 performed during the study yielded a reproducibility of  $0.710247 \pm 0.000007$  ( $n=4$ ), with in run precision of  $\pm 0.000012$  or better.

### Results/Discussion

The lead and strontium isotopic values for turquoise samples from five different localities in the southwestern US are shown in figures 1 and 2. When only one isotopic system is considered, overlap occurs between some sources. However, when both lead and strontium isotope data are plotted together, unique fields for each source area can be defined. These results emphasize the value of a multi-isotopic approach to the turquoise problem. The lead and strontium isotopic composition of turquoise from the Sleeping Beauty deposits (Gila County, AZ) are extremely radiogenic and offset from the rest of the turquoise samples measured. The four samples from the Old Hachita mining district (Grant County, NM) were collected from the same outcrop, but were selected for isotopic analysis based on variability in color, hardness, and visual purity. Because the isotopic ratios of turquoise from this locale are similar despite having a wide range of visual characteristics, we suggest that impurities within the turquoise do not produce significant variations in isotopic signature.

In the five samples of turquoise from the Cerrillos Hills mining district (Santa Fe County, NM), we observe unique lead isotopic compositions between individual mines. The strontium isotope composition of these turquoise samples co-varies with the lead isotope data, but the variability between individual mines is less pronounced. We interpret these variations as evidence that the Sr and Pb isotopic methods have the potential to distinguish between individual mines within larger mining districts, while still providing a consistent isotopic signature for the district as a whole. Additionally, we note that the lead isotope composition of the Cerrillos Hills turquoise is similar to lead isotope data reported by Habicht-Mauché and others (2002)

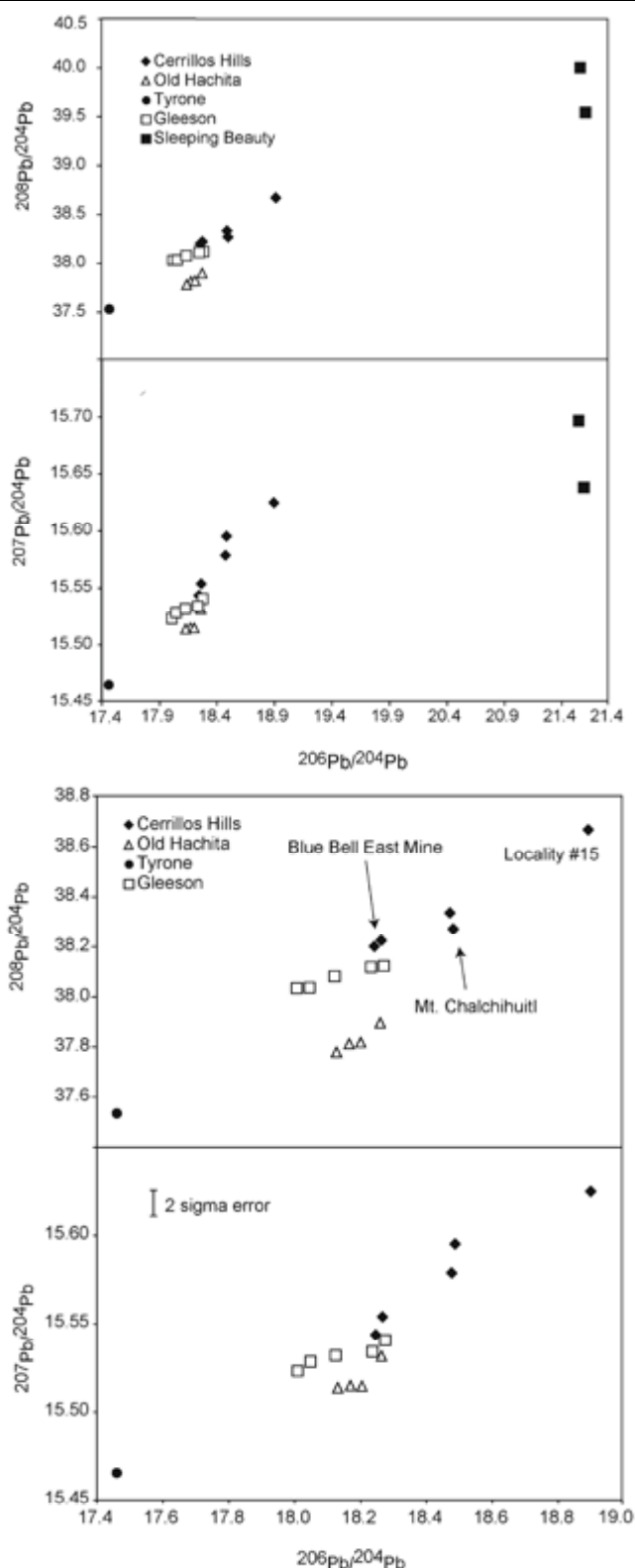


Figure 1. Lead isotopic composition of turquoise from the five sources discussed in the text. Except where shown, errors on all analyses are smaller than symbols. (Above) When all sources are plotted together, turquoise from the Sleeping Beauty deposit is far offset from turquoise measured from other locales. (Below) Plot of turquoise from all sources except Sleeping Beauty. Note that individual mines within the Cerrillos Hills mining district have distinct lead isotopic compositions.

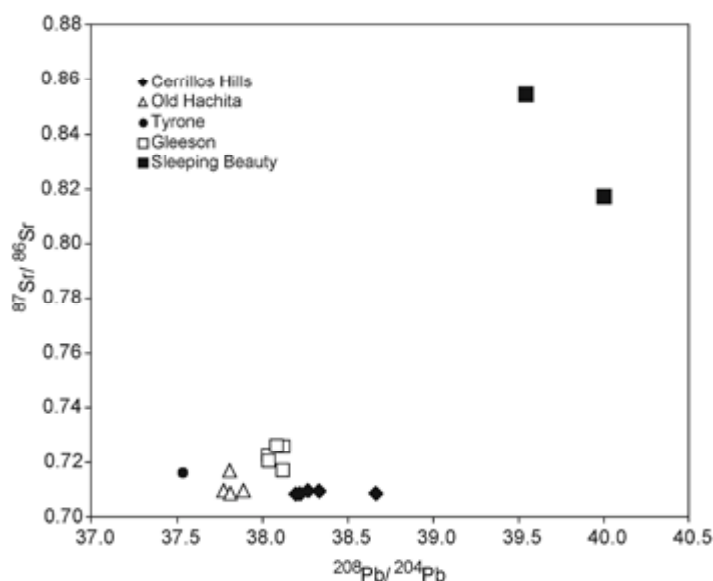


Figure 2.  $^{87}\text{Sr}/^{86}\text{Sr}$  vs.  $^{208}\text{Pb}/^{204}\text{Pb}$  ratio for all samples discussed in text. Errors on all analyses are smaller than symbols. When isotopic ratios of both lead and strontium are used, distinct fields for each source can be defined.

for galenas in the same mining district (Figure 3). Thus, the lead isotopic composition of turquoise in the Cerrillos Hills appears to be consistent with the isotopic signatures of nearby lead mineralization.

### Conclusions

We conclude that lead and strontium isotopes can be used to distinguish between turquoise sources across the American Southwest, and thus could be used to significantly constrain or identify the source of turquoise recovered from archaeological contexts. Our results emphasize the value of a multi-isotopic approach, as the combination of these two isotopic systems provides a far better fingerprint than either one alone. Given the large number of deposits prehistorically exploited in the American Southwest and northern Mexico it is not expected that every source will have a unique signature. However, by combining archaeological lines of evidence with these geochemical tools, we expect that lead and strontium isotopes will be excellent discriminators.

Based on the positive conclusions of the pilot study we plan an extensive isotopic investigation of important prehistoric turquoise deposits (such as those of the Cerrillos Hills in New Mexico), and eventually hope to publish a lead and strontium isotopic database for all the major prehistoric turquoise sources across the Southwest and northern Mexico. We are currently conducting an extensive isotopic investigation of turquoise from the Sleeping Beauty deposit (the results are not reported here) and are performing leaching experiments on samples to determine whether or not multiple isotopic domains contribute to the bulk isotopic signature of individual samples. The methodological development from this project should help us

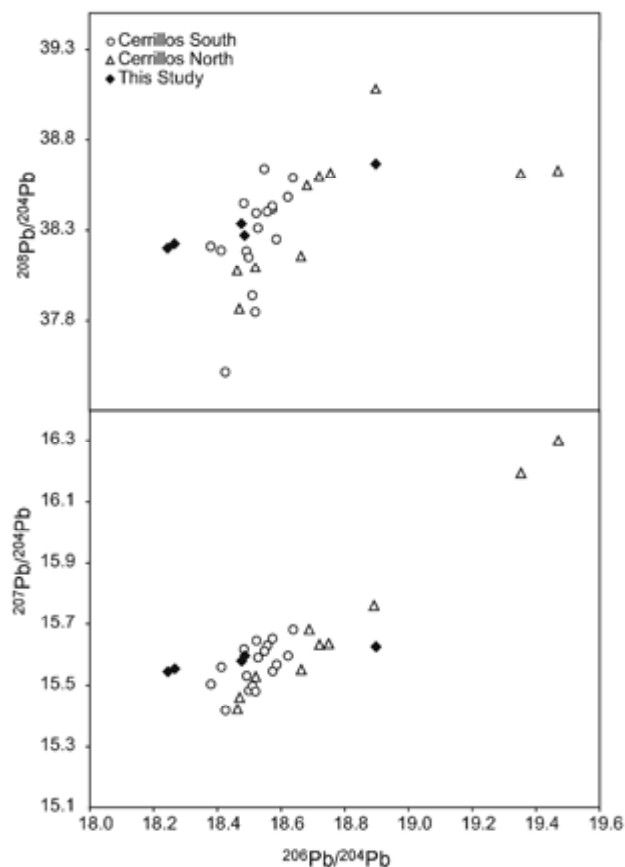


Figure 3. Comparison of the lead isotope composition reported for galenas from the Cerrillos Hills (Habicht-Mauche et al. 2002) with turquoise from the same mining district (this study). The isotopic composition of lead in the turquoise from the Cerrillos Hills is similar to that reported for nearby lead mineralization.

test the conclusions presented here and allow for us to characterize isotopic variation in turquoise deposits in a more rigorous manner. Through these analyses, we are also seeking to better understand turquoise formation, and relate this knowledge to observations and predictions regarding potential isotopic variation within turquoise deposits. We are actively looking to develop collaborations with archaeologists to address specific problems of turquoise provenance.

### Acknowledgements

Many of the samples reported in this study were obtained from the turquoise collection of Phil C. Weigand, which is curated at the Museum of Northern Arizona in Flagstaff, Arizona. We would like to thank Dr. Weigand for his helpful discussions regarding this project, and for granting us access to his extensive set of geologic samples. Many thanks to Mostafa Fayek, F. Joan Mathien, and Sharon Hull for generously providing some of the samples reported here, for informative and helpful conversations, and for the opportunity for A.M.T. to visit the Cerrillos Hills mining district. This research was supported, in part, by a Graduate Fellowship to A.M.T. by



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## References

- Chesley, J.T., Ruiz, J., Richter, K., Ferrari L., and Gomez-Tuono. 2002. Source contamination versus assimilation: An example from the Trans-Mexican Volcanic Arc. *Earth Planet. Science Lett.* 195:211-22.
- Galer, S.J.C., and Abouchami, W. 1998. Practical application of lead triple spiking for correction of instrumental mass discrimination. *Mineralogical Magazine* 62A:491-492.
- Faure, G., and Mensing, T. 2005. *Isotopes: Principles and Applications*. Wiley and Sons, Hoboken, New Jersey.
- Habicht-Mauche, J.A., Glenn, S.T., Schmidt, M.P., Franks, R., Milford, H., and Flegal, A.R. 2002. Stable lead isotope analysis of Rio Grande glaze paints and ores using ICP-MS: A comparison of acid dissolution and laser ablation techniques. *Journal of Archaeological Science* 29:1043-1053.
- Hull, S. 2006. *Using Hydrogen and Copper Stable Isotopes to Source Turquoise*. Unpublished M.A. thesis, Eastern New Mexico University.
- Kim, J., Simon, A.W., Ripoche, V., Mayer, J.W., and Wilkins, B. 2003. Proton-induced x-ray emission analysis of turquoise artifacts from Salado Platform Mound sites in the Tonto basin of central Arizona. *Measurement Science and Technology* 14:1579-1589.
- Mathien, F.J. 1981. Neutron activation of turquoise artifacts from Chaco Canyon, New Mexico. *Current Anthropology* 22:293-294.
- Mathien, F.J., and Olinger, B. 1992. An experiment with X-ray fluorescence to determine trace element variability in turquoise composition. In *Archaeology, Art, and Anthropology: Papers in Honor of JJ Brody*, edited by Meliha S. Duran and David T. Kirkpatrick, pp 123-134. Papers of the Archaeological Society of New Mexico No. 18, Albuquerque.
- Rehkämper, M., and Mezger, K. 2000. Investigation of matrix effects for Pb isotope ratio measurements by multiple collector ICP-MS: verification and application of optimized analytical protocols. *Journal of Analytical Atomic Spectrometry* 15:451-1460.
- Sigleo, A.C. 1975. Turquoise mine and artifact correlation for Snaketown Site, Arizona. *Science* 189:459-460.
- Thibodeau, A.M., Killick, D.J., Ruiz, J., Chesley, J.T., Deagan, K., Cruxent, J., and Ward, L. 2007. The strange case of the earliest silver extraction by European colonists in the New World. *Proceedings of the National Academy of Sciences* 104:3663-3666.
- Weigand, P.C., and Harbottle, G. 1992. Turquoise in Pre-Columbian America. *Scientific American* 266:78-85.

Weigand, P.C., Harbottle, G., and Sayre, E.V. 1977. Turquoise sources and source analysis: Mesoamerica and the Southwestern USA. In *Exchange Systems in Prehistory*, edited by Jonathon E. Ericson and Timothy K. Earle, pp 15-35. Academic Press, New York.

Welch, J.R., and Triadan, D. 1991. The Canyon Creek Turquoise Mine, Arizona. *Kiva* 56:145-164.

## New Evidence for High-Tin Bronze in Ancient Bengal

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High-tin bronze, or *Kansha*, is one of the most successful alloys developed in ancient Bengal of the south Asian sub-continent. The new discovery of a bronze object from Tilpi in West Bengal has revealed the development of a high-tin bronze casting process. The recent excavations at this site have unearthed a high tin bronze ingot and crucible fragments of furnaces, indicating a metal manufacturing center. The site also revealed antiquities of the early historical period. The metals were analyzed by scanning electron microscopy with EDX spectroscopy and X-ray diffraction. The analyses of the bronze ingot in the present work provides evidence for bronze casts in the workshops of ancient Bengal.

## Ancient Bronzes

Copper-tin alloys, commonly called tin bronzes, are known in the ancient civilizations of Mesopotamia, Egypt, India, China, Rome, and Greece. Most of these bronzes can be called low-tin bronzes, having maximum tin content of 10 percent, and also can be termed alpha-bronze, which has only a single phase solid solution of tin in copper. Bronzes are naturally harder and stronger than copper. Their hardness increases with higher tin content but subsequently loses formability. The alpha-phase of Cu-Sn system is usually poor in its hot working characteristics (West 1982) and was cast and cold forged in the ancient world. Over 20 percent tin in copper alloy is conventionally termed high-tin bronzes, also known as  $\beta$ -bronzes, as the matrix consists of  $\beta$ -phase or their subsidiaries  $\beta''$ , delta, and so on. A sample of this cast alloy has been obtained during the excavation of a south Bengal site at Tilpi, India. Along with the cast sample, other manufacturing aids were also excavated.

## Excavation at Tilpi

The first session of excavation by the Directorate of Archaeology, Government of West Bengal, was conducted in

March 2006 under the supervision of A. Ray. The site, Tilpi (22°15'N, 88°38'E), is located in the coastal District of South 24-Parganas, West Bengal, India (Figure 1). Excavation was simultaneously conducted in the nearby village Dhosa, near Jaynagar. Artifacts and structural evidence found during excavations at Dhosa suggest that a *stupa* existed at the site during the 2<sup>nd</sup> and 1<sup>st</sup> century B.C. Excavations at Tilpi have unearthed a wealth of evidence indicating that the site was once densely populated by industrious and self-sufficient people (the unearthed furnace is shown in Figure 2).

Eight hearths for smelting metals have been found at this site along with crucibles and a suspected copper lump (Figure 3). The size, shape, and material of the crucibles fascinate us and allow for little doubt of the ancient inhabitants' knowledge of energy efficient melting practices. The metal lump, later identified as an ingot, was coated with a greenish blue hydrated copper carbonate corrosion layer. Removing the clay, the ingot measured approximately 35 mm x 30 mm x 8 mm and weighed approximately 35 grams. A small specimen from the metal sample was removed for investigation into its material characterization.

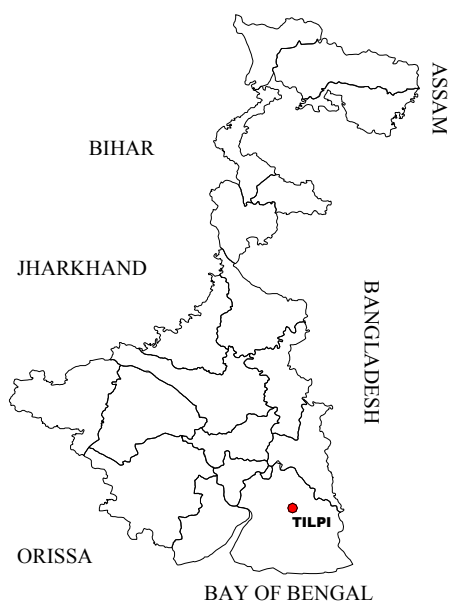


Figure 1. Location of Tilpi (22°15'N, 88°38'E) in West Bengal, India.



Figure 2. Excavation at Tilpi, showing a hearth for metal processing.

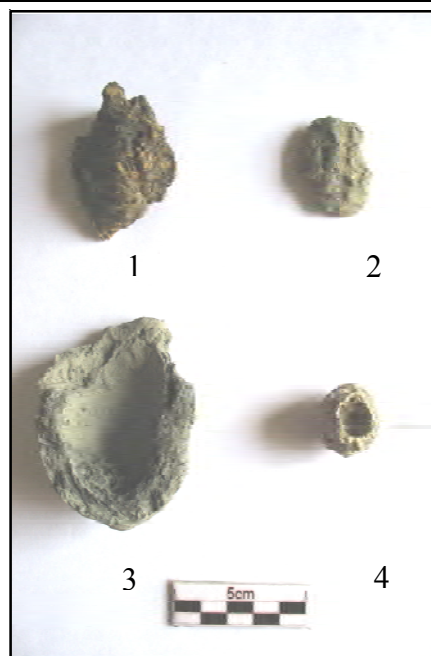


Figure 3. The excavated objects show (1) a slag lump, (2) a bronze ingot, and two molded crucible fragments (3, 4).

#### SEM-EDX Characterization

The metal specimen was analyzed with a scanning electron microscope (a Leica S440) at the Paleontology Division II of Geological Survey of India. A thorough compositional study was conducted with detailed scanning, and microstructures were taken at different locations.

The average composition of the cast specimen is shown in Table 1, which suggests the bronze is a high-tin bronze, or  $\beta$ -bronze, having an average composition of 75/25 (Cu/Sn) alloy. The presence of sulfur and iron is noteworthy, as it proves the source of copper as sulphide ore, chalcopyrite, or  $\text{CuFeS}_2$ . An indication of unique fluxing by silica ( $\text{SiO}_2$ ) to isolate copper sulphide from iron sulphide (Datta 2004), during matte smelting is hinted by the presence of silicon. The small presence of nickel also points towards the ore as local Singhbhum ore from Bengal. The near absence of oxygen (-) could be evidence that ancient Bengal smelters had already achieved the technology of deoxidation, or degassing of copper melt by the charging of tin, before the beginning of Christian era.

#### Analyses of Microstructure

The microstructure (Figure 4) of the high-tin bronze specimen shows the usual dendritic structure of any cast material. The dark phase is a copper-rich dendrite, and the gray phases surrounding the dendritic regions are tin-rich areas. The primary dendrites are very coarse and grew from long solidification time and a large diffusion period. Therefore, the smelters must have left the liquid bronze alone in a hot crucible or similar environment to achieve slow cooling provided by low rate of heat dissipation.

Table 1. Average Composition.

Cu K	Sn L	Ni K	O K	Fe K	S K	Si K
73.09	24.37	0.28	-	0.45	1.76	0.06

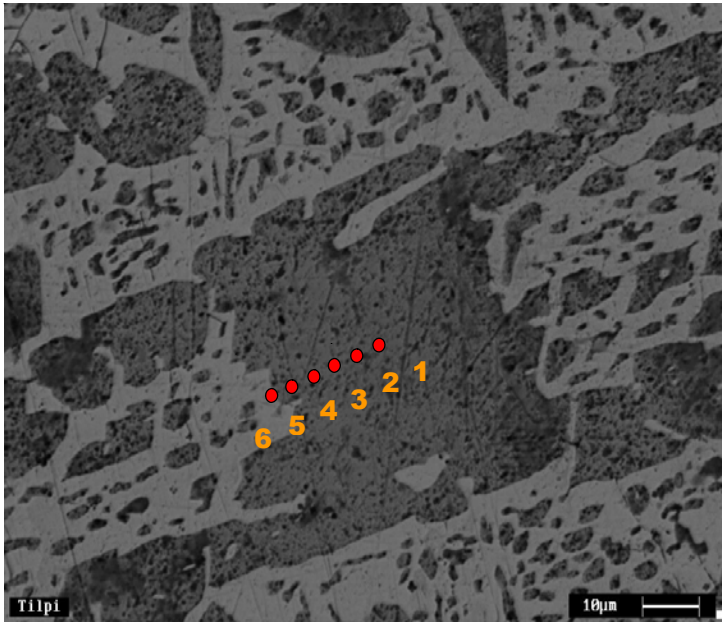


Figure 4. Microstructure selected for specific compositional analysis.

Cu-Sn system has a distinct peritectic reaction at C, (22 percent Sn), 798 °C (Figure 5), where  $\alpha$  + liquid yields  $\beta$ . Like other peritectic reactions, the primary dendrite, solid  $\alpha$ -phase, is surrounded by tin-rich, last-to-freeze liquid, which is more concentrated in tin (over 25 percent). Due to the poor diffusivity of metal atoms (tin) into the solid phase, the peritectic reaction never comes to completion in practice (Smith 1993). The resultant microstructure should produce the low-tin  $\alpha$ -phase and high-tin  $\beta$ -phase, if quenched (Figure 5). Due to further incomplete  $\beta$  yields  $\alpha$  +  $\gamma$  and  $\gamma$  yields  $\alpha$  +  $\delta$  eutectoid transformations, the resultant microstructure shows the remnants of many Cu-Sn phases in actual alloys. In this general condition, only the visible dendrites of Cu-rich  $\alpha$ -phase and the untransformed mixture of tin-rich phases (lighter) have been obtained.

#### EDX Spectroscopy

A large grain of  $\alpha$ -phase (see Figure 4) was selected, and EDX spectroscopy was performed from the center of the dendrite to its boundary. Scanning began from the center and ends at the edge. The results revealed the presence of Cu, Sn, and Fe, which is shown in Table 2. The EDX results amply display the continuous increase in Sn percent from the core (center) of the dendrite towards its skin (surface). All these data signify the phenomenon of heavy coring of the primary dendrite,  $\alpha$ -phase, in the microstructure due to the solidus and liquidus gap obtained in Cu-Sn phase diagram. The last-to-

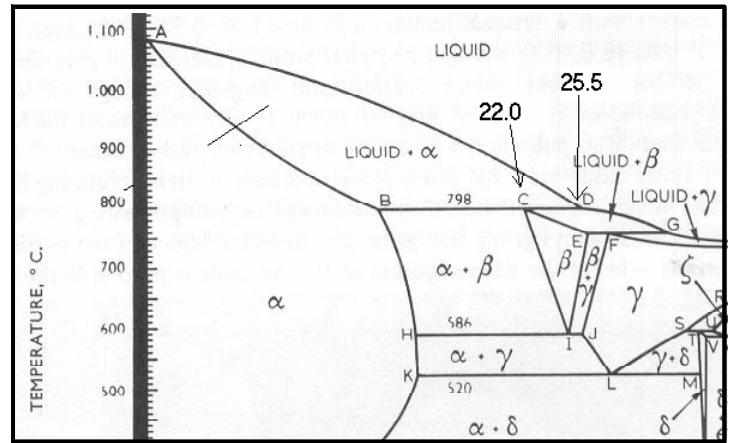


Figure 5. A part of Cu-Sn phase diagram, showing the relevant portion.

Table 2. Compositions of a Primary Dendrite.

Comp. at point	Cu	Sn	Fe
1	85.24	13.66	1.10
2	84.59	14.11	1.30
3	84.94	14.03	1.03
4	83.66	15.10	1.24
5	82.17	16.97	0.86
6	81.96	16.78	1.25

freeze liquid is also heavily enriched in tin content (Table 3). This vindicates the non-equilibrium freezing of the bronze alloy during solidification in the given foundry condition.

#### Micro-hardness

The micro-hardness results (Table 4) also corroborate the non-equilibrium freezing of the alloy concern. A uniformity in the HV values has been obtained over primary dendrites; however, a scatter of HV values signify the presence of hard high-tin rich phase  $\delta$  or  $\beta''$  or  $\beta$  phases with copper-rich  $\alpha$ -phase. The proportion of harder phases dominates the XRD pattern while  $\alpha$ -phase remains as a minor constituent.

#### X-ray Diffraction Analyses

A sample has been analyzed for XRD at Jadavpur University (Figure 6). The diffraction pattern was compared with standard JCPDS File. The pattern shows the presence of harder tin-rich  $\delta$  or  $\beta''$  or  $\beta$  phases with copper-rich  $\alpha$ -phase. The proportion of harder phases dominates the XRD pattern while  $\alpha$ -phase remains as a minor constituent.

#### Conclusions

Characterization of the  $\beta$ -bronze sample conclusively demonstrates the production and use of high-tin copper alloys

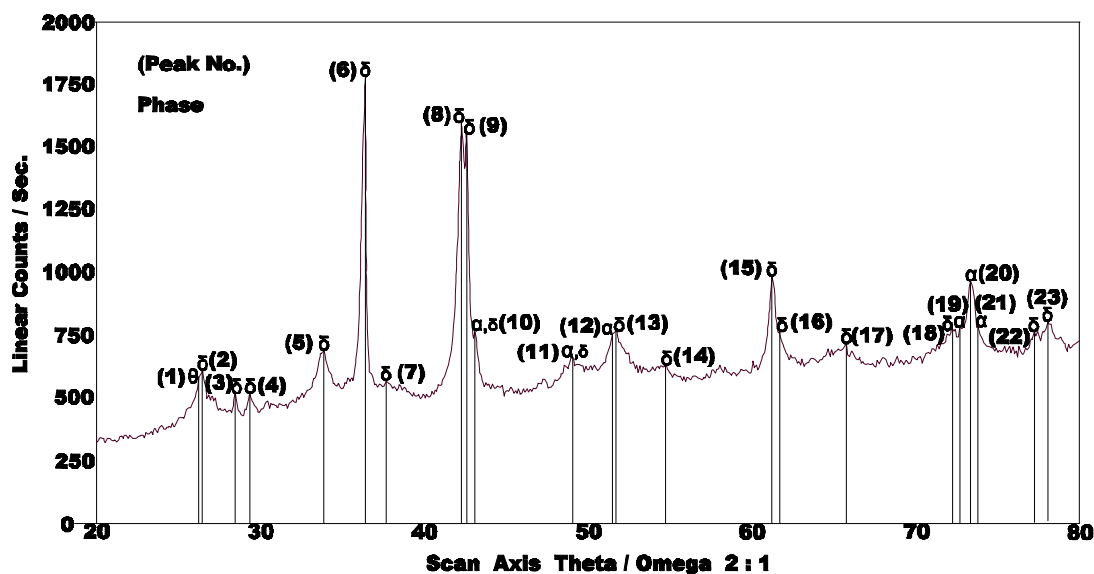


Figure 6. XRD pattern of the bronze sample find at Tilpi.

Table 3. Compositions of Last-to-freeze Liquid.

Cu	Sn	Fe	Ni
64.92	34.71	-	0.36
65.05	34.50	-	0.45
64.83	34.67	-	0.50
64.29	34.42	0.78	0.51
64.54	34.92	0.13	0.41

Table 4. Vickers Micro Hardness (Leica, VMHT) Load 15 gf. Time 20 sec.

No	HV(Kg m2)	Phase
1	454.20	Light gray phase
2	188.50	Light gray phase
3	284.00	Light gray phase
4	362.00	Dark gray phase
5	351.70	Dark gray phase
6	331.00	Dark gray phase

by ancient people of Bengal before the beginning of the Christian era. The presence of high tin levels in bronze is not accidental but incidental.

The ancient people must have had the knowledge of sponginess and high melting low-tin bronzes, otherwise they could not allow such a generous addition of costly tin in copper to shorten the liquidus - solidus gap and to lower the melting temperature of the bronzes. The idea of killing oxygen in the copper alloy in this way is brilliant where both primary copper ores and secondary tin ores could be easily sourced. Ancient people at this site had a highly efficient, innovative approach to material problems and presumably ran a well organized business and trade.

### Acknowledgements

The present paper is developed with a number of analyses carried in different laboratories of Jadavpur University and Geological Survey of India. We are thankful for the support provided by Mr. Sabyasachi Shome of Geological Survey of India with SEM-EDAX. Mr. Sambit Chakraborty of the Centre for Archaeological Studies and Training, Eastern India has provided computer supports. We are also thankful to Dr. Gautam Sengupta, Director of Archaeology and Museum, Government of West Bengal and Secretary, Centre for Archaeological Studies & Training, Eastern India for his constant support and encouragement.

### References

- Datta, P. 2005. Copper and copper alloys in archaeological perspectives. In *Science in Archaeology and Archaeo-materials*, edited by A. K. Biswas, pp. 207-270. D.K. Printworld, New Delhi, India.
- JCPDS, Joint Committee on Powder Diffraction Standards, International Centre for Diffraction Data. 2001. Swartmore.
- Smith, W. F. 1993. In *Foundations of Materials Science and Engineering*, pp. 394-400. McGraw Hill, New York.
- West, E. G. 1982. *Copper and its Alloy*. Ellis Horwood Series, John Wiley & Sons, New York.

**CORRECTION:** In the last issue of the *SAS Bulletin*, a reference in "Understanding Chronology in Historic Period Navajo Textiles: Red Dye Analysis" (30[1]:20-23), by K. Duffy and A. L. Hedlund, was cited in error when translated from the authors' bibliographic format. The correct reference is "Wheat, J.B. 2003. *Blanket Weaving in the Southwest*, edited by A.L. Hedlund, University of Arizona Press, Tucson." The in-text citations should be (Wheat 2003). Archaeologist Joe Ben Wheat was the sole author of this book based on his original research.



## Archaeometallurgy

Thilo Rehren, Guest Associate Editor

This column contains several recent news items relevant to archaeometallurgy.

### Conferences

The sixth international conference on the *Beginnings of the Use of Metals and Alloys*, BUMA VI, took place in September 2006 in China. It was hosted by the Institute for Historical Metallurgy and Materials at the University of Science and Technology Beijing, one of the longest-established centers for teaching and research in archaeometallurgy worldwide. More than 50 papers were presented, most of them as oral presentations, covering both technical aspects such as extractive metallurgy, manufacturing and decorating techniques, and archaeological and anthropological approaches, including some synthetic studies of the spread of metallurgy and intercultural interactions across Asia and the Steppe. Some 85 percent of the papers were concerned with Asian metallurgy, defined as everything east of the Urals and including Japan, India, and Sri Lanka, but excluding Arabia and the Near East. Only seven papers were on European metallurgy, two on Africa, and none on the Americas, although a number of American scholars were presenting their research on Asian metallurgy. All ancient metals, alloys, and relevant materials were covered by at least one paper. A strong emphasis emerged for studies on casting, not surprisingly in view of the extremely strong tradition of high-skill casting technology in China. These covered studies of finished objects as well as mould fragments, some preserved in breath-taking clarity; however, there seems still to be a lack of well-documented casting furnaces and crucibles. Almost a third of the papers focused on iron metallurgy, but smithing or other manufacturing techniques for iron and steel objects were strangely absent from the program. In contrast, manufacturing of non-ferrous metals and alloys featured prominently.

The audience was very international, and included a good number of students and young colleagues; an important development to safeguard BUMA's future existence (see below). We all had a chance to see and hear the two founding fathers of this important series, Professors Ko and Maddin, who gave the introductory speeches and were present throughout the proceedings; we can only congratulate them to their life achievements (this conference was held in honour of Professor Ko), and their most eminent and lasting role as teachers and scholars in archaeometallurgy.

BUMA began as a circum-Pacific conference some twenty years ago, but has always been held in an Asian country. The range of papers offered at BUMA VI strongly suggests that it is now seen by the academic community as the main venue for Asian metallurgy, not neglecting intercultural and wide-reaching connections. With this remit, BUMA has still a mind-blowing range and volume of work ahead of it, and it is very promising that several colleagues offered to hold the next BUMA conference. After detailed discussion the Steering Committee

of BUMA accepted an invitation to hold BUMA VII in three year's time in India, probably Bangalore, and BUMA VIII in Japan. However, the first necessary step now is to publish the proceedings as a peer-reviewed volume, building on the good examples set by the earlier conferences.

This brief report would not be complete without congratulating the local organizers for an excellent conference, with a smooth and extremely friendly organization, near-faultless technical provision and all the wonders of Chinese food and culture as a further stimulus for interaction and communication. I mentioned the fathers of BUMA earlier on; at BUMA VI, much of the work was done by three generations of Institute directors, Professors Han Rubin, Shuyun Sun, Mei Jianjun, and the tireless Phyllis Lin, together with a dedicated team of staff and students from the IHMM at USTB.

An even larger conference on ancient metals is scheduled for 16 to 21 June 2007 in northern Italy. The second *Archaeometallurgy in Europe* conference, organized by the Italian Institute of Metallurgy, will take place in Aquileia at the northern tip of the Adriatic, with most accommodation on the island resort of Grado a few kilometers away. The provisional program has recently been published and runs to some 140 oral presentations in two to three parallel sessions, plus a further 73 posters. Early bird registration, at Euro 190 for academics and speakers and a very reasonable student rate of Euro 30, is open until 30 April; after that, the rates increase by Euro 30. Despite its programmatic title there are several sessions scheduled for non-European metallurgy. The details are at [www.aimnet.it/archaeometallurgy2.htm](http://www.aimnet.it/archaeometallurgy2.htm).

### Ph.D. Theses

A lot of cutting-edge work in archaeometallurgy is being done as part of doctoral research; a few recently completed theses which have come to my attention include the following.

*The Archaeology of Iron Production: Romano-British Evidence from the Exmoor Region* by Lee Bray from the University of Exeter in England. Lee has worked with Dr. Gill Juleff on the Exmoor Iron project, and this thesis covers several sites spanning from Roman to early medieval activity. Following a detailed geological investigation of the available ores, the author has developed a systematic typology of archaeological features relevant for iron production and processing sites in order to standardise recording, and aid quantification. The quantification of iron production based on slag volumes includes several assumptions on fuel consumption, and produces consistent evidence for a range of smelting activities in the region, from small-scale localised smelting to export-oriented production, probably in the context of Romanisation and increased demand. These data are then interpreted in the regions historical context, adding a compelling hypothesis to its long-term fortunes over time. This thesis struck me as an example how an excellent archaeometallurgical study can be done without any laboratory analyses, by careful archaeological fieldwork and intelligent observation and interpretation.

*Ironworking in Northwest Wales: An Evolutionary Analysis* by Michael Charlton from the Institute of Archaeology in London, in close co-operation with Peter Crew from the Snowdonia National Park Study Centre in Wales. This thesis investigates patterns of variation in archaeological, historical, and metallurgical data on early ironworking systems in terms of evolutionary processes. Models derived from neo-Darwinian theory are constructed to identify lineages of technological knowledge from the bulk chemistries of ironworking residues, especially slag. Case studies are drawn from northwest Wales, including Crawwellt West (300 BC to AD 50), Bryn y Castell (150 BC to AD 250), and Llwyn Du (AD 1357 to AD 1450). Bulk chemistries of slag, ore, and furnace materials are determined by polarising energy dispersive x-ray fluorescence spectrometry [(P)ED-XRF], and supplemented with reflected-light microscopy of smelting slag. Both archaeological and experimentally derived materials were analyzed. The experimental data provide technological insights and a controlled means of evaluating analytical models. Historical data are used to model socioeconomic conditions. Results stress the importance of analyzing variation in early ironworking technology. Considerable variation is observed in slag chemistry between the Iron Age and medieval sites and between activity phases of the same site. The later phases of Llwyn Du contain coexisting chemical groups—suggesting the coordinated use of multiple iron-making recipes. Adaptive processes account for most of the observed patterns of variation; building optimal recipes and strategies for fluctuating environments. Specific technological trajectories are historically contingent and geologically constrained. (Modified abstract)

*The Technology of Ancient and Medieval Directly Reduced Phosphoric Iron* by Evelyn Godfrey, from Bradford University in England. After carbon, phosphorus is the most commonly detected element in archaeological iron. The typical phosphoric iron range is 0.1 wt% to 1 wt% P. The predominant source of phosphorus in iron is the ore smelted. Ore-metal-slag phosphorus ratios for bloomery iron are derived, by means of laboratory experiments; full-scale experimental bloomery smelting; and analysis of remains from three Medieval and two Late Roman-Iron Age iron production sites in England and the Netherlands. Archaeological ore, slag, metal residues (gromps), and iron artefacts were analysed by metallography, SEM-EDS, EPMA, and XRD. The effects of forging and carburising on phosphoric iron were studied by experiment and artefact analysis. The ore to slag and ore to metal %P ratio for solid-state reduction was determined depending on reducing conditions during smelting. Archaeological phosphoric iron and steel microstructures resulting from non-equilibrium reduction, heat treatment, and mechanical processing are presented to define the technology of early phosphoric iron. The phosphoric iron artefacts examined appear to be fully functional objects, some cold-worked and carburised. Modern concepts of ‘quality’ and workability are shown to be inapplicable to the archaeological material. (Modified abstract.)

*Elizabethan Industries in Jacobean Virginia? An Examination of the Industrial Origins and Metallurgical*

*Functions of Scrap Copper at Jamestown c. 1607-1610*, by Carter Hudgins, Royal Holloway, University of London focussed on the origin and role of metal waste in the English settlement of Jamestown. The main theme, the identification, morphological and chemical characterisation and technical interpretation of scrap copper and copper-based alloys from Jamestown’s earliest years, provides a wealth of original research. The integration of this data into the socio-economic context of the early years of the Virginia Company and its multiple links to other companies and individuals of the time is fully appropriate for a Ph.D. in History. Particularly good is the integration of chemical analyses of artefacts with the information from historical sources, and the result demonstrates the beneficial nature of such a combination of approaches and methods. It appears that the settlers were not all reckless ignorants obsessed with unruly behaviour, as apparently some sources depict them, but included skilled and dedicated craftsmen as well as people with less practical expertise but close personal and financial links to the metal industry in England. The thesis underpins this through the identification of a predominantly English origin of the metal scrap found at Jamestown, and makes a strong case that this metal was brought to America to aid in search for useful ores, in particular zinc ores to feed the English brass industry in which some major financial backers of the settlement were directly involved.

### *Publications*

The publication landscape for archaeometallurgy has traditionally been relatively good, with several journals dedicated to the subject in addition to its coverage in generic archaeological science and materials science journals, and the sheer endless archaeological literature. Here, I want to give a brief update on some core journals.

Among the archaeometallurgy journals, the well-established *Bulletin of the Metals Museum* in Japan sadly had to cease publication after 37 volumes; Volume 36 appeared in 2003 with papers on the *Origin, identity and richness of gold in ancient and medieval times* (RK Dube), the *Dhar iron pillar* (R Balasubramaniam), *A metallurgical study of early metal objects from eastern Xinjiang* (Mei, Liu and Chang), *A search for tinned coins of the Song Dynasty, China* (Zhou and Li), *Ancient shell molding technology and casting of Batloi* (B Prakash), and *Traditional Korean sword making as estimated from the metallurgical microstructures of a privately owned sword* (JS Park). Volume 37, also in 2003, had a final paper by Z Weirong on *Coin-cast technology and their evolution in ancient China*, and then a full list of the papers published over the years in the Bulletin, chronicles of the museum, a list of distinguished guests and visitors etc. It is a truly sad development to see this journal go, which has been contributing to archaeometallurgy over so many years, often with a uniquely Asian perspective.

*Historical Metallurgy*, the journal of the eponymous society based in England but with an international membership ([www.hist-met.org](http://www.hist-met.org)), luckily is going strong; it has recently

published two parts for Volume 40 for 2006, with a total of just under 160 pages. The first part is dedicated to *The Art of the Early Medieval Goldsmith*, following a seminar held in Leeds in 2005, with papers on *Visigothic filigree in the Guarrazar (Toledo) and Torredonjimeno (Jaen) treasures*, by A Perea; *Back to front: observations on the development and production of decorated backing foils for garnet cloisonné*, by N Adams; *Technological aspects of the Viking age gold treasure from Hiddensee*, by B Armbruster with H Eilbracht; *All that glitters: the case for gold-working at the early medieval monastery at Portmanhomack*, by C Spall; *The cross of Cong and some aspects of goldsmithing in Pre-Normal Ireland*, by G Murray; and *On the noble and illustrious art of the goldsmith: an 11<sup>th</sup>-century text*, by J Wolters. The issue is complete with six A4 colour plates at the end, and constitutes an important collection of papers on the subject. The second part is the usual mix of papers as submitted to the editors, and includes *The metallurgy of early Chinese wrought-iron and steel objects from the British Museum*, by M Wayman and Michaelson; *Metallographic examination of iron artefacts from Gansu Province, China*, by Scott and Ma; *A typology of lead-bale slags based on their physico-chemical properties*, by R Smith; *The elusive Walloon finery forges of Liege*, by B Awty; *Why pay more? An archaeometallurgical investigation of 19<sup>th</sup>-century Swedish wrought iron and Sheffield blister steel*, by Mackenzie and Whiteman; and concludes with Book reviews and abstracts.

*IAMS*, the journal of the Institute for Archaeo-Metallurgical Studies, is still a couple years behind its schedule; Volume 24 for 2004 appeared recently with papers on the *Examination of copper slags from the EBA island of Keros (Cyclades, Greece)* by M Georgakopoulou; *Experiential and experimental archaeology with examples in iron processing*, by D Jeffery; *Late Neolithic and Chalcolithic copper smelting at the Yotvata oasis (south-west Arabah)*, by Rothenberg, Segal and Khalaili; and on *The Wertime Pyrotechnological Expedition of 1968*, by Arab and Rehren. From Volume 25 onwards *IAMS* will be entirely web-based and published as PDF files only, free to download from its homepage (<http://www.ucl.ac.uk/iams>).

*Metalla*, finally, published by the Deutsches Bergbau-Museum in Bochum in Germany, appears in one or two parts per year. It has recently published a couple of Masters' theses and conference proceedings; in 2004 appeared as Volume 11 *Ein Ensemble frühlatenezeitlicher Metallverarbeitung aus der Siedlung von Eberdingen-Hochdorf* by D. Modarressi-Tehrani, and as Volume 13 in 2006 *Zink oder Messing? Ein Beitrag zu den metallurgischen Tätigkeiten im Legionslager Neuss*, by H.D. Nielen. Both investigate archaeological assemblages in considerable detail; Modarressi-Tehrani analyzed slags, crucibles and metal fragments from a Latene settlement near Stuttgart in southern Germany, while Nielen explored in detail the nature of the metallurgical activity in a Roman fortress as preserved in their crucibles, with particular emphasis on the question whether brass or zinc were produced or processed in them. Like Ph.D. dissertations, a lot of original

research is done in many Masters' and diploma programs, and it is excellent to have at least some of these publicly available. Volume 12 (2005) is dedicated to the archaeometallurgy and archaeology of Georgia, with 11 papers (155 pages in total) from both Georgian and German scholars, from a colloquium held in late 2002 in Wiesbaden, Germany.

## Archaeological Ceramics

Charles C. Kolb, Associate Editor

The column in this issue includes eight topics: 1) Reviews of Books on Archaeological Ceramics; 2) Online Book reviews; 3) New British Archaeological Reports, International Series (2006-2007); 4) Previous Meetings; 5) Forthcoming Meetings; 6) Ceramic Exhibitions; 7) Internet: Historical French Earthenware; and 8) Nuclear Analytical Techniques in Latin America.

### Reviews of Books on Archaeological Ceramics

Valli S. Powell-Martí and Patricia A. Gilman (eds.), *Mimbres Society*, Tucson: University of Arizona Press, 2006 viii + 213 pp., 35 photos, 26 illustrations, references, index; ISBN 0816524815, 9780816524815 (hardcover), \$50.00. The authors are affiliated with the Department of Anthropology at the University of Oklahoma and are recognized specialists on the prehistoric cultures of the American Southwest, particularly the Classic period (ca. 950-1150 CE) Mimbres people, a division of the Mogollon culture. This volume focuses on the architecture and ceramics of the Mimbres, and provides new and compelling sociocultural interpretations. The pottery created by the Mimbres people of southwestern New Mexico is considered by a number of Southwestern scholars to be unique among all the ancient art traditions of North America. Distinguished by their elaborate hand-painted black-on-white designs, Mimbres ceramic vessels have inspired artists and collectors, many of whom believe that they are unrivaled during several millennia of pottery making. A focus on the artistry alone has masked other cultural achievements and important questions about this sophisticated culture. The 11 authors of the nine contributions to this volume ask and respond to a set of queries: Was the society as truly egalitarian as it has often been suggested? Was the pottery produced by specialists? How did the architecture (among the first to break living spaces into apartment-style room blocks) reflect the relationships among individuals, families, and communities? Did aggregate housing units translate into social equality, or did subtle hierarchies exist? Tracing the way technology evolved in ceramic decoration, architecture, and mortuary practices, this collection of original contributions brings new insights into previously unexplored dimensions of Mimbres culture and, also, provides examples of how modern archaeology is linking field data to social theory. The initial contribution, "Mimbres Society" (pp. 3-12), written

by the editors, provides context for the volume. The book is organized into three major sections, the first of which concerns Mimbres architecture and contains four chapters: “Extended Families to Corporate Groups: Pithouse to Pueblo Transformation of Mimbres Society” (pp. 15-31) by Harry J. Shafer; “Evidence for Mimbres Social Differentiation at the Old Town Site” (pp. 32-44) by Darrell Creel; “Variability in Classic Mimbres Room Suites: Implications for Household Organization and Social Differences” (pp. 45-65) by Michelle Hegmon, Jennifer A. Brady, and Margaret C. Nelson; and “Social Differences at the Classic Period Mattocks Site in the Mimbres Valley” (pp. 66-81) by Patricia A. Gilman. The second set of contributions is on Mimbres pottery and includes three chapters: “Picturing Differences: Gender, Ritual, and Power in Mimbres Imagery” (pp. 85-108) by Marit K. Munson; “Who Made the Mimbres Bowls? Implications of Recognizing Individual Artists for Craft Specialization and Social Networks” (pp. 109-150) by Steven A. LeBlanc; and “Ceramic Iconography and Social Asymmetry in the Classic Mimbres Heartland, AD 970-1140” (pp. 151-173) by Valli S. Powell-Martí and William D. James. The final part contains a single concluding essay, “Material Differences and Social Differentiation in Mimbres Mogollon Prehistory” (pp. 177-188) by Michael W. Diehl. The contributions are supported by 256 “References Cited” (pp. 189-206) and a detailed double-column index (pp. 209-213) of conflated topics and proper nouns.

The three chapters on ceramics are especially interesting. Munson’s chapter documents the complex picture of factors influencing power, status, and prestige – notably gender. The images suggest that men generally enjoyed greater power and higher status than women. The evidence also indicates that there were distinctions between villages, especially the core sites in the Mimbres valley versus those in the Gila Valley and elsewhere. Village ties, kin groups, family, and gender all constituted intersecting layers of distinction. LeBlanc asks the question “Who made the Mimbres bowls?” and assumes that women were the bowl makers (an assumption that is irrelevant to his main argument). Recognizing individual artists for craft specialization is the focus of his analysis, which follows the Beazley Technique, borrowed from Classical Greek ceramic analyses. He notes INAA analyses (reported in Powell-Martí and James’s subsequent chapter) in his study of about 500 bowls (less than ten percent of all known Mimbres bowls). Among the major motifs represented on the vessels are rabbits, turtles, human figures, and scrolls. He considers the limitations of his research design and discusses the spatial distributions of the motif data sets and the standardization of bowl dimensions. LeBlanc concludes that one or two potters on the largest Mimbres sites would have been sufficient to produce most of the Classic bowls and proposes that only 20 to 40 potters were working contemporaneously over the entire Mimbres region. The concept that relatively few pottery painters produced the bulk of the Mimbres Classic period painted bowls suggests some specialization which is only minimally discussed. The Powell-Martí and James chapter combines aspects of archaeometry and iconography. The chemical compositional analysis of 152 Mimbres black-on-white sherds from four sites

(970-1140 CE) was done by INAA, and the 367 iconographic designs from these specimens were categorized and seriated. Thirty-one elements were identified in the INAA measurements conducted at Texas A&M Center for Chemical Composition and Analysis. The actual data and plots are not detailed in the chapter. The remainder of the essay considers import and export, iconography, and the special role of the Galaz site.

*Mimbres Society* is a significant contribution to the study of architecture and ceramics and sociocultural interpretations and is useful; to scholars working in the Greater American Southwest, including northern Mexico. The chapters on ceramics are innovative and provocative, and suggest that combining chemical characterization and iconographic analysis is a useful research design.

Marilyn Jenkins-Madina, *Raqqa Revisited: Ceramics of Ayyubid Syria*, Metropolitan Museum of Art Series, New York/New Haven: Metropolitan Museum of Art and Yale University Press, 2006. xi + 247 pp., 421 figures (308 illustrations mostly in color, including 119 color plates), color map, references, index; ISBN 0300111436, ISBN-13: 9780300111439 (hardcover), \$60.00. Marilyn Jenkins-Madina is *curator emerita* of Islamic Art at The Metropolitan Museum of Art and co-author, with Richard Ettinghausen and Oleg Grabar, of *Islamic Art and Architecture 650-1250*, Pelican History of Art Series, New Haven: Yale University Press, 2002. She has spent much of her career studying artifacts from Raqqa, and the results of her research culminate in this extraordinary, well-documented treatise. In this new work, Jenkins-Madina describes the dramatic journey these ceramics took from their discovery in Raqqa to the emporiums of Paris and New York, the drawing rooms of great collectors, and The Metropolitan Museum of Art. Using “art historical detective work,” archival documents, and scientific data, she establishes provenance and chronology, placing these ceramics in a clear historical context for the first time.

Raqqa (also spelled Rakka or Al-Raqqah) is a city in north central Syria located on the north bank of the Euphrates River, approximately 160 km east of Aleppo, that has been occupied from Hellenistic times through the Byzantine (the city was then called Kallinikos), Early and Late Islamic, and Ottoman and modern periods. The city had its first Islamic flowering in the late 8<sup>th</sup> century, when it was the residence of the legendary Abbasid caliph Harun al-Rashid. In the late 12<sup>th</sup> and early 13<sup>th</sup> centuries under the Zangids and Ayyubids, the city experienced a cultural resurgence. Jenkins-Madina’s book focuses on the so-called “Second Blossom” (Zangid and Ayyubid periods) when agriculture and industrial production flourished. During this era, a blue-glazed ceramic called Raqqa-ware was produced. Interest in the city was kindled in Europe during the late 19<sup>th</sup> century primarily by the publication of the Arabic literary classic *Alf Layla wa-Layla* (*The Thousand and One Nights*), in which Harun al-Rashid was a main character. During this same period, ceramics purportedly connected to the legendary caliph were excavated in Raqqa and speculation about the site and the objects unearthed there has flourished



for over a century. The volume begins with a “Director’s Foreword” by the Metropolitan’s Philippe de Montebello. Following an informative “Introduction” (pp. 2-9, 6 figures) in which the author provides context and chronology, she presents the reader with six compelling chapters on the ceramics: “The Lore and Lure of Raqqa” (pp. 11-19, 4 figures); “Raqqa Demythologized” (pp. 21-34, 10 figures); “The Rejects of Raqqa” (pp. 37-113, 157 figures); “Raqqa Ceramics in The Metropolitan Museum of Art” (pp. 115-163, 59 figures); “Patterns, Profiles, and Provenance” (pp. 166-177, 60 figures); and “The Period of Production” (pp. 179-187, 29 figures). An “Epilogue” (pp. 188-189, 2 figures), which provides suggestions for future studies of ceramics from this period and region, completes the narrative. There are two appendices: Appendix 1: “The Ottoman Response to Illicit Digging in Raqqa” (pp. 191-220, 1 figure) by Aysin Yoltar-Yildirim; and Appendix 2: “Compositional Analysis of Early-Thirteenth-Century Ceramics from Raqqa and Related Sites” by Dylan T. Smith (pp. 221-235, 93 figures). The “Bibliography of Works Cited” (pp. 238-243) contains 145 entries and there is a useful index (pp. 243-246).

The chapter on “rejects” (pp. 37-113) consists primarily of 157 figures that illustrate 140 kiln wasters in three decorative techniques (Underglaze and Luster-Painted, Painted Black under Clear Turquoise Glaze, and Bichrome or Polychrome Underglaze-Painted) and six forms: bowls (biconical, segmented with flat rim, and hemispherical), jugs, jars, and handled pouring vessels. “Patterns, Profiles, and Provenance” documents 25 decorative patterns and 19 vessel profiles. The “scientific verification” of Raqqa origins for Black-Painted Decoration under a Turquoise Glaze; Luster-Painted and Underglaze- and Luster-Painted Decoration; and Black-and-Cobalt Painted or Black-Painted Decoration under a Clear Colorless Glaze (pp. 176-177) is considered briefly and depends on information presented in Appendix 2.

The data in Appendix 2 sought to illuminate three issues: 1) determine whether objects grouped on a historical and stylistic basis has related ceramic fabric compositions; 2) assign objects to particular points of origin by comparing them with a number of reference samples from relevant sites; and 3) assign each object to a single site, ruling out all other possible places of origin. Dylan Smith recognizes the contributions of Mark Wypyski (Department of Scientific Research, The Metropolitan Museum of Art) and M. James Blackman (National Museum of Natural History, Smithsonian Institution) to the analyses. A total of 93 specimens were selected from seven collections and represented 68 decorative techniques (Luster,  $n = 30$ ; Black-under-Turquoise,  $n = 22$ ; Bichrome,  $n = 8$ ; Manganese and Luster,  $n = 4$ ; Polychrome,  $n = 3$ ; and Monochrome,  $n = 1$ ). Comparative materials included: Syrian and Other Stonepaste,  $n = 3$ ; Turquoise Stonepaste (vessels),  $n = 3$ ; Outlier,  $n = 1$ ; Turkish Stonepaste (tiles),  $n = 16$ ; and Raqqa earthenware,  $n = 2$ ). Smith discusses briefly the results of three previous compositional studies. Compositions for the 93 specimens were assessed by NAA and EDS, the results combined, and then examined by cluster analysis (Charts 1-3, pp. 227-228). A total

of 68 objects were identified as belonging to the Raqqa Stonepaste group (20 on EDS-NAA, 20 on EDS alone, and two on NAA only). Smith also discussed several subgroups and results on Raqqa Earthenware, Turkish Stonepaste, Syrian Other Stonepaste, and other groups. EDS results for iron oxide vs. aluminum oxide are also presented (Chart 4, p. 229) and show associations between aluminum content and decorative technique. Notably, the combined use of EDS-NAA results proved necessary to resolve questions of provenance. Smith’s contribution on the compositional analysis of the ceramics from Raqqa and other sites is especially useful.

This important analysis and interpretation of Raqqa ceramics is recommended for Islamic and Middle Eastern specialists and scholars whose work focus on archaeology, and the decorative arts. This seminal research shows the value of combining art historical research and archaeometry and establishes provenance and chronology, placing Raqqa ceramics for the first time in a clear historical context.

Gabriele Puschnigg, *Ceramics of the Merv Oasis: Recycling the City*. Sponsored by University College London, Institute of Archaeology Publication. Walnut Creek, CA: Left Coast Press, distributed by the University of Arizona Press, 2006. xxii + 231 pp., 54 figures, 72 tables, 15 color plates, 400+ ceramic drawings, bibliography, index; ISBN 978-1-59874-225-1 (hardcover), £60.00/\$99.00. Gabriele Puschnigg is a Research Fellow at the Institute of Archaeology, University College London, and Assistant Director of the Ancient Merv Project. The ancient city of Merv (Persian name *mānā* transliterated as Marw or Mary) is located near the modern city of the same name; it was a major Central Asian oasis-city and located on steppe and on the fabled Silk Roads/Silk Route and served as a gateway for travelers and traders along the east-west route. Merv’s origins date to the 3<sup>rd</sup> millennium BCE and was included in the Bactria-Margiana Archaeological Complex (BMAC, also known as the Oxus civilization), which is the current archaeological designation for the Bronze Age culture of Central Asia (ca. 2200-1700 BCE and located in modern Turkmenistan, northern Afghanistan, southern Uzbekistan, and western Tajikistan, and centered on the upper Amu Darya (Oxus River)). Merv was a significant settlement during Achaemenid period and was one of the satrapies listed in the Behistun inscriptions (ca. 515 BCE) of Darius Hystaspis. Margiana was the Greek name for the Persian satrapy of Margu, the capital of which was Merv. After the death of Alexander the Great (323 BCE), Merv became the primary city of the province of Margiana of the Seleucid, Parthian, and Sasanid polities (the latter is 224-651 CE). Merv was re-named “Antiochia Margiana” by the Seleucid monarch Antiochus Soter, who rebuilt and expanded the city at the site currently known as Gyaour Kala. After the Sasanid monarch Ardashir I (ca. 224-240 CE) took Merv, there was a four-century period of Sasanian rule documented through numismatics. The city’s inhabitants adopted a multiplicity of religions in addition to the official Sasanian religion of Zoroastrianism. The major ones were Buddhism, Manichaeism, and Nestorian Christianity. Sasanian rule ended with the death of Yazdegerd III (632-651) and when

the Sassanian military governor surrendered to an approaching Arab army. UNESCO has designated ancient Merv as a world Heritage site.

Puschnigg points out that our knowledge of many cultures or periods has benefited from systematic ceramic analysis; however, as yet the Sasanian Empire of ancient Persia (224-651 CE) has not been subjected to the same examination. Forthcoming publications following this initial monograph include: D. Gilbert and G. Puschnigg (with contributions by Feuerbach, Vince, and Williams), *The Ceramics from Merv, Volume 1: The Achaemenid to Late Sasanian Ceramics from Merv c 6th Century BC to 7th Century AD and The Ceramics from Merv, Volume 2: The Islamic Ceramics from Merv c 7th-14th century AD (both, Institute of Archaeology, University College London)*.

Her 2006 publication is based, in part, upon her unpublished doctoral dissertation, *A Diachronic and Stylistic Assessment of the Ceramic Evidence from Sasanian Merv* (University College London, 2000). In this revision, she considers the ceramic frequencies and chronologies, documents some of the wares, and illustrates profiles of hundreds of securely excavated pieces and compares them with the finds from earlier Soviet and Russian studies which are generally unavailable to western researchers. Puschnigg employs this material to provide insights into Sasanian sociocultural and economic patterns, as well as providing researchers with a catalog of typical vessel shapes and wares. Structurally, this volume is divided into three parts with eight chapters, supplemented by three appendices, a bibliography (pp. 219-226) with 176 entries, and a basic four-page index. "Appendix 1: Fabric Type Series" (pp. 171-178, 12 color plates) documents 14 fabrics; "Appendix 2: Pottery Forms" (pp. 179-197) is a catalog containing 131 vessel profiles; and "Appendix 3: YuTAKE Pottery Drawings" (pp. 199-218) has 34 figures (30 from Gyaour Kala and 4 from the Merv necropolis) with a total of 730 drawings.

"Part I: Context and Perspective" contains two introductory chapters, "Ceramics in Sasanian Archaeology" (pp. 3-16, 2 figures, 1 table) and "The Setting" (pp. 17-40, 7 figures, 5 plates). Early excavations and surveys (1884-ca. 1949) are reported, including the research conducted by YuTAKE (Southern Turkmen Archaeological Comprehensive Expedition) since 1950. The relative chronologies were developed on the basis of ceramic seriation, while absolute dates were based on numismatic evidence and Brahmi Buddhist manuscripts found in ceramic vessels at Merv. The archaeological surveys and selected excavations at MEK 1 (Erk Kala Area 1) and MGK 5 (Gyaour Kala Area 5), conducted by the International Merv Project (1992-1995), are detailed, and pottery processing and recording methods are described. Plain wares dominate the assemblages and three coarse ware fabrics are defined: vitrified clay or "slag," calcite and grog, and coarse organic material. "Part II: Analysis" has three chapters on dating analyses: "Chronological Analysis: The Conventional Approach" (pp. 43-54, 1 figure, 4 tables); "Chronological Analysis: Using 'Pie-Slice'" (pp. 55-109, 13 figures, 62 tables); and "Chronological

Analysis: Absolute Dates" (pp. 111-120, 8 figures, 5 tables). Puschnigg emphasizes two statistical approaches – traditional assemblage comparisons and "Pie-slice." The initial data set includes 318 assemblages (211 from MEK 1 and 107 from MGK 5). She also discusses the criteria to ensure appropriate selection procedures, reducing the numbers to 127 (39 MEK 1 and 88 MGK 5). Five fabric groups were defined: fine ware (74.5%), unidentified (202%), slag tempered (3.5%), grog tempered (1.4%), and calcite tempered (0.4%). Chapter 5 is devoted to "Pie-slice," a quasi log-linear analysis, previously used in British Roman and Medieval ceramic analyses and defined by Orton and Tyres in 1990. Four pie-slice "configurations" were discerned for MEK 1 and MGK 5 with contexts (n = 86 and 127, respectively), forms (n = 411 and 483), and wares (n = 14) as key variables discussed at length. A brief "traditional" petrographic analysis of 17 specimens, undertaken by Louise Joyner in 1999, discerned five fabric groups (pp.105-107). The chapter on absolute dates depends upon the analysis of 202 Roman, Byzantine, Sogdian, and Sasanian coins; MGK 5 was occupied until the end of the 4th century; MEK 1 was occupied from the 5th-6th century.

"Part III: Stylistic Evaluation" includes three chapters: "Pottery from Early and Middle Sasanian Times" (pp. 123-146, 12 figures, 7 plates); "Pottery from late Sasanian Times" (pp. 147-164, 11 figures, 3 plates); and "So what have we gained?" (pp. 165-169). The stylistic assessments consider three issues: vessel types and common styles, innovation or the continuation of traditional forms, and regional or interregional stylistic features. Three locally made pottery types are defined for the Early Sasanian period (handled bowl, trefoil mouth jug, and bowl), four for Middle Sasanian (double handled jar [amphora], jar with perforated neck, juglet, and jug), and five for Late Sasanian (bowl, jar, jar with perforated neck, double handled jar [amphora], and jug). The final chapter summarizes briefly the conventional analysis and quantitative seriation, and the use of the "seriate" computer program.

This very specialized monograph provides a detailed study of Merv's Sasanian pottery and establishes a much needed standard for additional work. The catalog of vessel forms, fabrics, and wares is important for comparative analyses with assemblages for other sites in Central and Southwestern Asia. The comparisons of traditional assemblage seriation and pie-slice analysis, however, provide the reader with much food for thought and how these statistical manipulations may lead to social and economic interpretations of Sasanian culture.

#### Online Book Reviews

E. Andrikou, V. L. Aravantinos, L. Godart, A. Sacconi, and J. Vroom, *Thèbes: Fouilles de la Cadmée, II.2. Les tablettes en linéaire B de la Odos Pelopidou: le contexte archéologique. La céramique de la Odos Pelopidou et la chronologie du linéaire B*. Pisa-Roma: Istituti Editoriali e Poligrafici Internazionali, 2001. Reviewed by: Georgia Flouda, *Bryn Mawr Classical Review* 2006.12.31, <http://ccat.sas.upenn.edu/bmcr/2006/2006-12-31.html> (2006).

Kostandinos S. Christakis, *Cretan Bronze Age Pithoi: Traditions and Trends in the Production and Consumption of Storage Containers in Bronze Age Crete*. Prehistory Monographs 18. Philadelphia: INSTAP Academic Press, 2005. Reviewed by: Charles C. Kolb, *Bryn Mawr Classical Review* 2007.03.05, <http://ccat.sas.upenn.edu/bmcr/2007/2007-03-05.html> (2007).

Beth Cohen, *The Colors of Clay: Special Techniques in Athenian Vases*. Los Angeles: The J. Paul Getty Museum, 2006. Reviewed by J. Michael Padgett, *Bryn Mawr Classical Review* 2007.03.09, <http://ccat.sas.upenn.edu/bmcr/2007/2007-03-09.html> (2007).

Nota Kourou, *Corpus Vasorum Antiquorum: Greece 8. Athens, National Museum 5. Attic and Atticising Amphoras of the Protogeometric and Geometric Periods*. Athens: Academy of Athens, 2002. Reviewed by E. Simantoni-Bournia, *American Journal of Archaeology* 110(2): online review, [http://www.ajaonline.org/pdfs/book\\_reviews/110.2/AJA1102\\_Bournia.pdf](http://www.ajaonline.org/pdfs/book_reviews/110.2/AJA1102_Bournia.pdf) (2006).

Michael Lindblom, *Marks and Makers: Appearance, Distribution and Function of Middle and Late Helladic Manufacturers' Marks on Aeginetan Pottery*. SIMA 128. Åströms Förlag, Jonsered, Sweden, 2001. Reviewed by Nicolle Hirschfeld: *American Journal of Archaeology* 111(1): online review, [http://www.ajaonline.org/pdfs/book\\_reviews/111.1/AJA1111\\_Hirschfeld.pdf](http://www.ajaonline.org/pdfs/book_reviews/111.1/AJA1111_Hirschfeld.pdf) (2007).

Thomas Mannack, *Haspels Addenda: Additional References to C. H. E. Haspels Attic Black-figured Lekythoi*. Oxford: Oxford University Press, 2006. Reviewed by: Jenifer Neils, *Bryn Mawr Classical Review* BMCR 2006.12.15, <http://ccat.sas.upenn.edu/bmcr/2006/2006-12-15.html> (2006).

Susan I. Rotroff and Andrew Oliver, Jr. with the collaboration of Ilse Hanfmann and George M.A. Hanfmann, *Hellenistic Pottery from Sardis: The Finds through 1994*. Cambridge, MA: Archaeological Exploration of Sardis; Distributed by Harvard University Press, 2003. Reviewed by: Aikaterina Sanali, *American Journal of Archaeology* 110(3): online review, [http://www.ajaonline.org/pdfs/book\\_reviews/110.3/AJA1103\\_Danali.pdf](http://www.ajaonline.org/pdfs/book_reviews/110.3/AJA1103_Danali.pdf) (2006).

Beni Servizio Beni, *Culturali Ufficio/Beni Archeologici of the Autonomous Province of Trento 1998 Bell Beakers Today: Pottery, People, Culture, Symbols in Prehistoric Europe*. Proceedings of the International Colloquium, Riva del Garda (Trento, Italy), 11-16 May 1998, 2 vols. Trento: Servizio Beni Culturali Ufficio, 1998. Reviewed by: J. Turek, *assemblage* 4, <http://www.assemblage.group.shef.ac.uk/4/4beakers.html> (1998).

Panayiotas I. Soterakopoulou, *Akrotiri, Thera: The Neolithic and Early Bronze Age According to the Pottery*. Archaeological Society of Athens, Athens, 1999. [In Greek with a detailed summary in English]. Reviewed by: Eva Alram-

Stern, *American Journal of Archaeology Online* 110.4: online review, [http://www.ajaonline.org/pdfs/book\\_reviews/110.4/AJA1104\\_AlamStern.pdf](http://www.ajaonline.org/pdfs/book_reviews/110.4/AJA1104_AlamStern.pdf) (2006).

*New British Archaeological Reports, International Series (2006-2007)*

Pamela Elizabeth Craven, *The Final Feast: An Examination of the Significant Iron Age Amphora Burials in North-West Europe in Relation to the Mediterranean Symposium and Feasting Ritual*, BAR S-1605, 2007, ISBN 9781407300221, £36.00. vi + 223 pp., 12 tables; 76 figures, maps, plans, drawings and photographs; glossary. The author, intrigued by this mundane, ubiquitous vessel began to collect data from amphora related burials with the intention of drawing parallels between Roman lifestyles and changing funerary practices in Gaul. As the data collection grew, it became apparent that not all of the burial contexts that contained amphorae qualified as elite burials. Some contained sherds rather than complete amphorae, together with potsherds and fragmentary goods. Convinced that sherd burials hinted at a localized tradition, details were added to the growing database of evidence. This study aims to understand this relationship through interrogation of the reasons for the selection of amphorae and their treatment in the light of mortuary practice. While amphorae are still the key to this study, it is recognized that the significance of the vessels must be relative to cultural and social contexts; therefore, the focus of this study widens from being a study of amphora in burials to a study of funerary behavior and attitudes in which amphorae are incidental. The work is divided into three parts. The first section explores the development of feasting rituals in Iron Age Europe using the evidence of mythic literature, classical texts and iconography. Chapters 2 and 3 identify, describe, differentiate, and analyze the feasting customs of Greek and Roman societies in order to lay a foundation for a comparative interpretation of Celtic or Gallic feasting ritual in Chapter 4. Chapter 4, as well as reviewing the classical observation of authors such as Tacitus and Strabo who describe the Gauls through Roman eyes, also introduces the corroboration of later Irish mythic in which 'Celtic' feasting plays a part. In Chapter 5 the textual sources are supported by the artifactual evidence of feasting vessels, furnishings, and accommodation which were particular to feasting. Chapter 6 comments on the rise of powerful individuals and the social changes which may have culminated in a series of Gallic burials containing wine-related vessels. In Part II, three chapters are concerned with the disposal of both human and non-human material. Chapter 7 lists 265 Late Iron Age burials of Gallic Europe which contain amphorae, either in complete or sherd form. Though the initial recording of interments may have been included in a cemetery record, in this instance each burial is treated as a unique ceremony and is accorded an individual account. The amphora burials of the Champagne region are considered in full detail in Chapter 8. A body of evidence presenting similar ideology to that of amphorae burials is that of 'funerary' pits, which contain artifactual deposits associated with wine. These are considered in Chapter 9. Part III, the concluding Chapter 10, provides an

interpretation of the assembled evidence, and attempts to justify conclusions.

Steven E. Falconer and Patricia L. Fall with contributions by Ilya Berelov and Mary C. Metzger; *Bronze Age Rural Ecology and Village Life at Tell El-Hayyat, Jordan*, BAR S-1586, 2007; ISBN 1841717991, £37.00. xxiv + 274 pp., 37 tables; 178 figures, maps, plans, drawings and photographs; data appendices on CD. The archaeological site of Tell el-Hayyat is located in the Jordan Rift Valley approximately two kilometers east of the Jordan River on the first terrace above the present floodplain. This report details the authors' investigations of agrarian economy and ecology as they illuminate the roles of rural communities in the larger context of the first urbanized civilizations. The study explores the ways in which small farming villages like Tell el-Hayyat contributed and responded to the rise and fall of Bronze Age town life in the southern Levant. A rural perspective is particularly appropriate for this region amid its long legacy of sedentary agriculture, dynamic urban-rural relations, and their ecological consequences. The Table of Contents includes: Village Communities in the Bronze Age Levant: Ecology and History; Interpretative Framework for Exploring Bronze Age Ruralism; Domestic and Public Architecture at Tell el-Hayyat; Ceramic and Radiocarbon Chronology for Tell el-Hayyat; Economy and Subsistence at Tell el-Hayyat; Temple Economy and Ritual at Tell el-Hayyat; Household Economy at Tell el-Hayyat; and Bronze Age Agrarian Ecology along the Jordan Rift.

David R. M. Gaimster, *Studies in Contemporary and Historical Archaeology 1: The Historical Archaeology of Pottery Supply and Demand in the Lower Rhineland, AD 1400-1800: An Archaeological Study of Ceramic Production, Distribution and Use in the City of Duisburg and its Hinterland*, BAR S-1518, 2006; ISBN 1841719528. £37.00. 270 pp., 131 figures, maps, plans, drawings, graphs and table; eight data appendices. This important study of post-medieval ceramic production and consumption in the Lower Rhineland is prefaced by a survey of previous work and approaches in the field. With the initiation of large-scale urban excavations in the Lower Rhineland during the 1980s, particularly in the town of Duisburg, an extensive sequence of pottery has been recovered dating from ca. 1400 to 1800, enabling archaeologists for the first time to re-examine traditional chronologies, attributions and socio-economic interpretations. Gaimster's survey comprises 95 individual assemblages of pottery from sites excavated in Duisburg and from towns and rural sites in the region. This report is based on the author's 1992 doctoral dissertation (University College, London), *Supply and Demand in the Lower Rhineland c.1400-1800: An Archaeological Study of Ceramic Production, Distribution and Use in the City of Duisburg and its Hinterland*. Studies in Contemporary and Historical Archaeology is a new series of edited and single-authored volumes intended to make available current work on the archaeology of the recent and contemporary past. The series brings together contributions from academic historical archaeologists, professional archaeologists and practitioners

from cognate disciplines who are engaged with archaeological material and practices.

Dragos Gheorghiu (ed.), *Ceramic Studies: Papers on the Social and Cultural Significance of Ceramics in Europe and Eurasia from Prehistoric to Historic Times*, BAR S-1553, 2006; ISBN 184171982X, £25.00. iii + 84 pp., maps, tables, plans, figures, drawings and photographs. The ten papers (nine in English and one in French) derive from the symposium "Ceramics in the New Millennium," presented at the 2002 European Association of Archaeologists Conference in Thessaloniki, Greece. The contents include: 1) Introduction: One more contribution on ancient ceramics (Dragos Gheorghiu); 2) The threshold model for ceramic resources: A refinement (Dean E. Arnold); 3) Some approaches to ceramic study (Ludmila Koryakova); 4) Technological chain and visibility: Ceramic styles and social changes in Late Prehistory in the north-west Iberian Peninsula (Maria Pilar Prieto-Martinez); 5) On Chalcolithic ceramic technology: A study case from the Lower Danube traditions (Dragos Gheorghiu); 6) Basal motifs on Bronze Age pottery across the Eurasian Steppe (Karlene Jones-Bley); 7) La céramique de l'Age du Bronze Moyen et Recent en Italie nord-occidentale (Laura Domanico); 8) Iron Age ceramics in western France: A multidisciplinary approach (Marie-Yvane Daire and Guirec Querré); 9) Ceramic researches in northern Etruria: Archaeological and archaeometric aspects (Simonetta Menchelli, Claudio Capelli and Marinella Pasquucci); and 10) Material values past and present: The intellectual history of the study of Greek ceramics (Michael Vickers). The editor is also the creator of Studia Vasorum, an e-journal of theory and experiment in ceramics that seeks to promote ceramic studies and to document archaeological research and theory. The journal's aim was to present an interdisciplinary approach to ceramic analysis, technology, typology and decoration analysis, through the integration of theory and experiment. Most of the papers in this BAR volume appeared in Studia Vasorum in 2002 and 2003, but the Web site, <http://www.studiavasorum.ro/>, is no longer accessible. The author is also the editor of *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, 2003. A review of Gheorghiu's 2006 edited volume, *Ceramic Studies*, will appear in a subsequent issue of the *SAS Bulletin*.

Philippe Gosse (Peter Davey, ed.), *The Archaeology of the Clay Tobacco Pipe XIX: Les pipes de la quarantaine: Fouilles du port antique de Pomègues (Marseille)*, BAR S-1590, 2007, ISBN 9781407300061, £50.00. vi + 346 pp., 8 color plates; illustrated throughout with figures, maps, plans and drawings; catalogue. In French with an English abstract. The collection of almost 1,000 clay pipes from the quarantine port of Pomègues provides a unique insight into pipe production and use throughout the Mediterranean and further afield. The author's comprehensive study makes a significant contribution to knowledge both of pipe production and circulation in a number of different ways. Although these have already been



recognized and published from a range of sites throughout the Mediterranean basin, the Pomègues collection, arriving off Marseilles on ships from many ports of origin, is by far the most extensive and varied yet collected. This study establishes a logical nomenclature for the formal and technical variables that can be observed on these pipes. The Pomègues assemblage demonstrates clearly that a wide range of stylistic and constructional forms, many previously thought to be late, coexisted over a wide geographical area. All existing dating typologies for Ottoman-style pipes will now have to be revised. Using existing published groups from specific sites and areas the author has attempted to identify the origins of the pipes within the Empire - whether from north Africa, the Near East, Asia Minor or Greece. Apart from the Ottoman-style pipes, he provides an interesting study of an extensive Dutch element in the Pomègues collection. The pipes derive from a large number of makers and a number of probable centers and include a range of qualities, including possible copies. An attempt to combine stem-bore analysis, bowl form and maker information in a single dating statement for each pipe provides an original contribution to the study of Dutch pipes from this kind of context. The English pipes are fewer in number and more difficult to source with few distinctive regional forms or makers' marks. This study describes and identifies for the first time a major pipe production centre in Venice, producing thrown pipes in a specific technology, contrasting with the well-known molded types from Chioggia. The author has defined, albeit tentatively, a range of 18th-century products from France and provides some indication of how such pipes can be identified in the future. This is significant since very little research has been conducted on the products of an industry which, from the documentary sources, was apparently a major one.

Yves Monette, *Les productions céramiques du Québec méridional, c. 1680-1890: Analyses, caractérisation et provenances*, BAR S-1490 2006, ISBN 1841719218, £30.00. ii + 128 pp., 120 figures, maps, plans, drawings and illustrations, including 4 in color; 55 tables, 2 data appendices. In French with an English abstract. Historical records mention that over 200 potters were active in Southern Québec between 1655 and 1920. These locally-made productions "are found on every archaeological excavation undertaken in Southern Quebec," but their contribution to the understanding of the archaeological sites is limited because these locally-made ceramics are rarely identified. This study presents compositional analysis as a solution to the problem of identification and provenance of local wares. Through the analysis of major, minor, and trace elements (using ICP-AES and ICP-MS) of about 300 ceramics uncovered from 16 production sites, the author was able to distinguish and characterize the different productions, as well as relate them to the Southern Québec geological environments (and reduce the risks of confusion with exogenous productions).

Varda Sussman, *Oil-Lamps in the Holy Land: Saucer Lamps From the beginning to the Hellenistic Period: Collections of the Israel Antiquities Authority*, BAR S-1598, 2007, ISBN 9781407300146, £47.00. vi + 493 pp., 60 figures, 1 color map, 1585 b/w illustrations, concordances; catalogue. Over

the course of the past century, excavations in Palestine have turned up large numbers of oil lamps. This first volume in a planned catalogue raisonné, summarizes the typological development of Palestinian oil lamps from the earliest such items of the Late Chalcolithic period onward, and their historical, cultural, and political contexts. The abundance and great variety of the material make this, a difficult undertaking—particularly for the oil lamps of the earlier periods dealt with in the present volume. Detailed descriptions of many items in the collections of the Israel Antiquities Authority, as well as of recorded oil lamps from other sites and neighboring regions, serve here as a basis for generalizations and conclusions.

Mélanie Forné, *Paris Monographs in American Archaeology 17: La cronología cerámica de La Joyanca, Noroeste del Petén, Guatemala*, BAR S-1572, 2006; ISBN 1841717878, £44.00. vii + 351 pp., 152 figures, maps, plans, drawings and photographs. In French. Not available for examination.

#### *Previous Meetings*

*The Fourth New Jersey Ceramics Symposium*, "New Jersey Terra Cotta: Building an Industry on Clay" was held 21 April 2007 in the New Jersey State Museum Auditorium, Trenton, New Jersey. The Potteries of Trenton Society (POTS) and New Jersey State Museum co-sponsored the day-long symposium. Speakers explored New Jersey's clay resources, terra cotta manufacturing in the state, and its use on buildings in New York City, Philadelphia, and Trenton. The symposium focused on the contribution of New Jersey's important terra cotta makers to urban skylines in the region. Forty-eight companies operated in the U.S. during the period of terra cotta's greatest popularity (1880-1930), and New Jersey had the largest concentration of terra-cotta manufacturers. Outstanding clay deposits, proximity to markets, and a wide variety of transportation options all contributed to this industrial prominence. Architectural terra cotta is extraordinarily adaptable as a building material since it can be molded, sculpted, and glazed to imitate all sorts of other materials or used for its own characteristics. Architects in the early 1900s thought it a superior medium because of its longevity, imperviousness, color, and imitative qualities. Most of the architectural terra cotta made in New Jersey was used as ornamental cladding on skyscrapers, but it was also found useful for grave markers, hitching posts, carriage blocks, chimney pots, and statuary. The session began with an introduction to New Jersey's clay resources by Peter Sugarman, research specialist with the New Jersey Geological Survey. Archaeologist Richard Veit and curator Mark Nonestied discussed New Jersey's terra cotta manufacturers. Susan Tunick, president of the New York Friends of Terra Cotta and author of *Terra-Cotta Skyline*, provided a survey of New Jersey terra cotta in significant buildings of New York City and environs. In the afternoon, Ellen Denker summarized information on Trenton's tile makers and described the driving tour that POTS has developed of significant tile and terra cotta buildings surviving in Trenton. Participants also had the opportunity to take a tour of Trenton-

made tile installations in the New Jersey State House. Additional information may be found on the POTS Internet site, [www.potteriesoftrentonsociety.org](http://www.potteriesoftrentonsociety.org) or the New Jersey State Museum's website at [newjerseystatemuseum.org](http://newjerseystatemuseum.org).

*The 2007 Winterthur Ceramics Conference*, "Earth and Fire: The Art & Mystery of the Potting Business" was held 27-28 April 2007 at Winterthur Museum and Country Estate, Winterthur, DE. The major papers and presenters on the first day included: "*A Unique Material: The Manufacture of Porcelain in China*" by Rose Kerr (Honorary Research Associate at the Needham Research Institute in Cambridge and Honorary Senior Research Fellow at the University of Glasgow); "*Up to the Elbows in Clay: The Commercial Making Processes of Ceramic Tableware*" by Robert Copeland (Historical Consultant to Spode, England); "*In Pursuit of White Gold: The Discovery and Evolution of Porcelain in Europe*" by Donna Corbin (Associate Curator, European Decorative Arts, Philadelphia Museum of Art); and "*A Sense of Relief: Raised Decoration on Ceramics*" by Leslie B. Grigsby (Curator of Ceramics and Glass, Winterthur). The second set of presentations were: "*Cobalt and Gold: Two Important Decorative Traditions in Chinese Ceramics*" by Rose Kerr; "*Penny Plain-Twopence Colored: The Art and Science of Enamel Painted Decoration*" by Pat Halfpenny (Director of Museum Collections at Winterthur); "*Early American 'Pott' Houses: Wheels, Kilns, and More*" by James R. Koterski (Author and Collector, Chadds Ford, PA); "*On the Fireplace, Floor and Walls: Decorative Tiles in Europe and America*" by Ronald W. Fuchs II (Associate Curator of Ceramics for the Leo and Doris Hodroff Collection, Winterthur); and "*Beyond Form and Function: How Manufacturing and Decorative Techniques Inform Style in American Art Pottery*" by David Rago (Partner, Rago Arts and Auction Center, Lambertville, NJ). Additional information is available on the Internet at [http://www.winterthur.org/calendar/ceramics\\_conference.asp#workshops\\_tours](http://www.winterthur.org/calendar/ceramics_conference.asp#workshops_tours).

#### *Forthcoming Meetings*

*Terracotta Figurines in the Greek and Roman Eastern Mediterranean: Production, Diffusion, Iconography and Function* is the focus of a symposium to be held 2-6 June 2007 in Izmir, Turkey. The deadline for a paper submission to the conference has closed, and there are at least 162 paper applicants from more than 24 different countries. Paper applicants and their countries are as follows: Greece (44), Italy (22), Germany (20), Turkey (19), France (17), USA (10), Great Britain (5), Austria (5), Roumania (5), Switzerland (3), Israel (2), Russia (2), Jordan (2), Canada (1), Sweden (1), Spain (1), South Africa (1), Poland (1), Bulgaria (1), Ukraine (1), Albania (1), Egypt (1), Tunisia (1) and Algeria (1). There will be three separate sessions for poster presentations. Additional information is to be found on the symposium's Internet site <http://web.deu.edu.tr/terraccottas/> and <http://web.deu.edu.tr/terraccottas/applicants.html>. The organizers are preparing an abstract booklet for their web site as well as abstracts for the publication in *Instrumentum* 25. Greek and Turkish abstracts

have been translated into French and English. To register to the conference, organizers ask that attendees arrive to Izmir on 1 June, preferably before 6:00 p.m. Registration will be open from 6:00-11:00 p.m. in Burgundy Hall ("Bordo Salon") of the Rectorate Building (DESEM) of the Dokuz Eylul University in Izmir. Also provided is a list mobile telephone numbers of student assistants who speak English, French, German and Turkish and who are working on the conference's "Technical Assistance" team. <http://web.deu.edu.tr/terraccottas/organizers.html>. Conference organizers Dr. Ergun Lafli and Dr. Michel Feugere will also be available through mobile phones throughout the whole entire of the conference for inquiries.

*British Ceramics: The Development of Technical Genius in the British Ceramic Industry-1650-1850* is scheduled for 22-23 June 2007 at Eastfield Village, UK. The fee for the full three-day workshop is \$465 US. Additional information is available from [dcsapottery1@taconic.net](mailto:dcsapottery1@taconic.net). The prospectus and additional information follow. From the earliest attempts to replicate the much-desired Chinese porcelains to the introduction of turning lathes for earthenware production, the British ceramics industry was in the forefront of the industrial revolution. This 3-day symposium explores some of the remarkable inventions that not only made Wedgwood & Spode household names, but had a powerful effect on society, not only amongst the Potteries' workers & their families, but in a broader international context. There will be a large number of early 19th century models and molds from the Spode Factory exhibited for the inspection of the participants. This is part of the collection of rare material purchased from Spode by Eastfield in the past year. The nine lectures and demonstrations include: 1) "Beer Shops and Bread Riots": The changes in technology, including the (limited) introduction of steam power & the increasing mechanization of making processes, did not come about without a huge impact on the way of life of the ordinary working potters – men, women and children. This lecture looks at some of the changes in the working and home life of the Georgian and Early Victorian potters including child labor, the rise of the unions and food riots. Lecturer: Miranda Goodby, Keeper of Ceramics, the Potteries Museum, Stoke on Trent, UK; 2) "From Clay to Glost Oven": This talk covers the processes involved in the many phases of pottery production from the raw state to the final glaze firing until the late 20th century. It includes a section on the process of bat and transfer printing. Presenter: Robert Copeland, author and former historian of the Spode Factory and noted member of the family that ran Spode for over 175 years; 3) "The Development of Lathe Turning in the Potteries from the 18<sup>th</sup> Century to the mid 19th Century": The lecture details the progression of lathe work from the simple turner's lathe to the complicated rose and crown engine lathes. The presentation includes how these lathes actually worked and what was made on them. Lecturer: Don Carpentier, practical potter and Director of Eastfield Village; 4) "Josiah Wedgwood, Master Potter and Marketing Genius": From his experiments to create new bodies and glazes, to his ability to secure royal contracts for his pottery, Josiah Wedgwood was one of England's most important and influential potters of the 18th century. Presenter: Nancy Ramage,

Professor of Art History at Ithaca College, author and lecturer on 18th century pottery, especially Wedgwood; 5) "The Influence of Chinese Export Porcelain on British Ceramics in the 18<sup>th</sup> to the 19<sup>th</sup> Century": The presentation traces the use of Chinese designs after the development of porcelain in Britain (1740s), the role of the East India Company in providing Chinese Export porcelain for the upper class, factories who provided matching and entire tea and dinner services in the Chinese style to an ever increasing public demand, with an emphasis on the prominent role played by Josiah Spode. Lecturer: Connie Rogers, General Editor of the *Transferware Collector's Club Database of Transfer-printing Patterns ca. 1780-1900*, author and lecturer; 6) "The Rise and Fall of Slip": Slip decoration on utilitarian earthenwares rose to extraordinary heights of inventiveness during the 1770-1840 period, then began a long, slow slide into oblivion. The lecturer explores some of the more creative uses in which fluid clay was used to make everyday objects visually exciting. Presenter: Jonathan Rickard, author, collector and independent scholar specializing in 18th and 19th century Mocha and Diptwares; 7) "Ceramics for Hyde Hall, Cooperstown, NY 1813-1834": Hyde Hall, one of the great country houses in America, was designed by its builder George Clarke and by Philip Hooker, Albany's leading neoclassical architect, between 1817 and 1828 on a site overlooking Otsego Lake near Cooperstown. It stayed in his family until purchased by the state in 1963. A number of the original contents remain in the house. Clarke was a meticulous record keeper and many of the bills for his furnishings still survive. These document his choices of English, French and few Chinese ceramics from retail merchants and auction in Albany, Cooperstown and New York City between 1813 and 1834. Lecturer: Gilbert Vincent, independent scholar and former Director of the New York State Historical Society, Cooperstown NY; 8) "The Making of Potter's Tools by a Potter": The demonstration of the creation of a blowing bottle for slip work and a three chamber slip pot. Presenter: Bob Nopper, practical potter, Salem, NY, and manager Bear Pottery Studio; and 9) "The Evolution of Polychrome-Painted Pearlware from the Late 18th to the Early 19th Century:: A lecture and demonstration by Denise Carpentier, practical potter, specializing in polychrome pearlware reproductions and adaptations.

*Pecos Conference 2007.* This year, 2007, marks the 80<sup>th</sup> anniversary of the Pecos Conference, first convened by Alfred V. Kidder at Pecos Pueblo, New Mexico, in 1927. Because the conference was not held during certain years (due to World War II and other circumstances), this year's meeting will not be the 80th annual gathering. This year is, in reality, the 70th annual meeting of the Pecos Conference. In the early 1990s, the numbering of the Pecos Conference became confused when the anniversary year was substituted for the actual count of prior conferences. The solution is to indicate that this year's conference will be the 70th occurrence and refer formally to this year's event simply as the Pecos Conference 2007. Pecos National Historical Park is the site of the 2007 conference, 9-12 August 2007. The park is located off Interstate 25, near the Village of Pecos, New Mexico, approximately 27.6 miles (about 45 min.) east of Santa Fe. The schedule of events and

registration information will soon be available at [http://www.swanet.org/2007\\_pecos\\_conference/about/index.html](http://www.swanet.org/2007_pecos_conference/about/index.html).

*The 9th European Meeting on Ancient Ceramics (EMAC), "Vessels: Inside and Out,"* will be held in the Hungarian National Museum in Budapest, Hungary 24-27 October 2007. Pottery, the organizers note, is one of the basic sources of archaeological inquiry. Ceramic typology and stylistic study of pottery has been, for long time, the main tool for temporal and spatial ordering, classification of peoples and cultures through the vessels they use. EMAC is devoted to ceramic studies beyond the form and concerned with the technological characteristics of vessels. Researchers are invited to submit papers to be presented in subjects concerning ceramic technology, provenance of raw materials, decorative techniques, vessel use and function.

In order to investigate these issues, various methods of scientific analyses are applied ranging from routine laboratory practice to the application of sophisticated analytical techniques. Special emphasis will be placed on problems of function and integrating archaeometric results on pottery into classical archaeological argumentation and historical interpretation. The eight main topics of the Conference are intended to cover, in accordance with former EMAC practice: methodological development in pottery studies; production, distribution, and trade; dating pottery; pottery as containers; ceramics as building materials; industrial/technical ceramics; ceramics in conservation (deterioration, preservation methods and analyses); and slips and glazes. Because of new directions of Hungarian ceramic research, a topic will be announced on geological and petrographic approaches to the study of pottery. Oral presentations are limited to 20 minutes and, due to the restricted amount of time for these presentations, the organizers with the help of an international scientific committee will select among the suggested oral presentations those that may attract more general interest. Confirmation of attendance is needed for both oral and poster presentations: at least one of the authors must be present on the conference for acceptance in program and abstract volume. There is a 20 minute time limit on all presentations, including discussions, and introductory and closing arguments. All correspondence should be submitted through electronic format to the conference Web site; for details, please visit: <http://www.ace.hu/emac07>.

*The American Schools of Oriental Research Annual Meeting* 14-17 November 2007, San Diego, CA will include a session entitled "Artifacts: The Inside Story." The session, chaired by Elizabeth Friedman at [friedman@iit.edu](mailto:friedman@iit.edu), consists of papers concerning the analysis of Near Eastern artifacts by means of physical or chemical techniques has led to a new or re-interpretation of the archaeological record. Paper topics include provenance, materials characterization, raw material acquisition, workshop activity, manufacturing techniques, and ancient technology. The session is planned for 4-5 speakers with individual papers limited to 20-25 minutes. The deadline for abstracts was 1 April 2007. Please consult the ASOR website for additional information: <http://www.asor.org>.

*The 37<sup>th</sup> International Symposium of Archaeometry* is planned for Siena, Italy, from 12-16 May 2008. The aim of the symposium is to promote the development and use of scientific techniques in order to extract archaeological and historical information from the cultural heritage and the paleoenvironment. It involves all natural sciences and all types of objects and materials related with human activity. In general, papers submitted should deal with the development and/or application of scientific techniques for extracting information related to human activities of the past, including the biological nature of man himself and the environment in which he lived. Papers that deal with weathering and deterioration of archaeological objects or monuments are welcome provided they are relevant to one of the main themes of the symposium. Visit the website at [www.unisi.it/eventi/isa2008](http://www.unisi.it/eventi/isa2008).

### *Ceramic Exhibitions*

*Taking Shape: The Ceramics of Southeast Asia*, scheduled from 1 April 2007 through 2010, at the Arthur M. Sackler Gallery (Smithsonian Institution, Washington, DC) and is organized by Louise Cort. Approximately 200 diverse and visually striking vessels from Southeast Asia going on view will remain on display for three years. These clay pots and jars, made permanent by firing in bonfires or kilns, form the most enduring record of human activities, interactions and ideas about form and decoration in mainland Southeast Asia. Given to the Sackler between 1996 and 2005 by brothers Osborne and Victor Hauge and their wives Gratia and Takako, these objects provide the focus for a detailed narrative of the migration of pots from their makers to their users.

*The Potter's Mark: Tea Ceramics and Their Makers*, scheduled from August 11, 2007 through February 10, 2008, at the Freer Gallery of Art (Smithsonian Institution, Washington, DC). Japanese ceramics were among the first in Asia to display impressed or incised marks relating to their makers. Such marks, emerging in the late 16<sup>th</sup> century on vessels made for use in the Japanese tea ceremony, indicate keen interest in the maker's identity and skill. Marks began as "seals of approval" impressed by patrons who commissioned tea wares, such as the imprint of a large square seal—possibly owned by a Kyoto tea master—on a Bizen ware water jar. By the mid-17<sup>th</sup> century, potters such as the Kyoto master Ninsei used elegant oval seals to identify their products. Ideally a famous person wrote the calligraphy for the seal. At the end of the 17<sup>th</sup> century, the Kyoto potter Ogata Kenzan introduced a new style by inscribing his own studio name in large brush strokes, sometimes even as part of the vessel's decoration. Marks used at the Seto kilns emphasized the ware rather than individual makers. Some Seto tea-leaf storage jars bore the name of a special local clay, "Sobokai," incised on the base.

### *Internet: Historical French Earthenware*

*Historical Earthenwares of Southwestern France: Painted Tableware & Other Ceramics of the Midi Toulousain* (<http://people.bu.edu/arcange>) has two main

components: 1) Toulouse and the Midi Toulousain and 2) North American Sites. There are major discussions on ceramics from Midi Toulousain, Giroussens, Lomagne, and Cox, and accounts of the cooking vessels produced and slip dots decoration. For the North American Sites there is a discussion of chronologies, a map showing 14 North American sites, and a very useful "suggested readings." This Internet site is highly recommended and has excellent color images and informative discussion of production locations and their products.

The section on Toulouse and the Midi Toulousain points out that Toulouse is the capital city of the large southwestern French region called Midi-Pyrénées. The Midi Toulousain lies inland on the Garonne river valley, with no direct port access to the Atlantic Ocean or to the Mediterranean. Unlike in many French regions, its traditional architecture uses bricks more than stones. At the beginning of the 16<sup>th</sup> century, Toulouse entered the Renaissance era and what is often referred to as an historic "golden age." The city opened up to the intellectual and cultural influences of humanism. It also developed close ties with the great humanist center of Lyon, and with Italy and Spain. New markets and new trade patterns greatly increased Toulouse's wealth. Pastel, a blue textile coloring agent produced in nearby Lauragais, played an essential role in trade until 17<sup>th</sup>-century religious wars and the downfall of the pastel economy started to drain the city's dynamic impetus. Toulouse became a catholic and conservative stronghold, and remained so up to the end of the 18<sup>th</sup> century. It was also cut off from outside influences, and its economic activity shrank; it became an agricultural market for the surrounding countryside. Local pottery centers flourished during the first half of the 16<sup>th</sup>-century. A few potters seem to have immigrated from nearby areas, and in particular from Spain, to help develop these centers. Pottery workshops already existed in the Saintonge area. Toulousain potters may have copied the Saintonge potters and/or been in competition with them. Both areas used similar techniques, and made similar vessels. The major difference between the two is that Toulousain potters selected brand new locations to set up shop. Their workshops of the modern era have no direct ties to the workshops of the Medieval period. They made traditional ceramics like round bottomed cooking pots and porridge cups, and brand new objects, like plates and other pieces of tablewares. Originally, these painted wares were very decorative, and might have been displayed in the houses of regional elites and ordered for weddings and other special occasions. Later they became less fancy and were probably not as expensive as faïences or foreign wares, though they were adequately decorative for urban household tables. The various pottery centers specialized in different local markets. Cox pottery was abundantly sold in Toulouse itself, while the Giroussens wares were rare in the capital, but abundant in Albi, a smaller city north of Toulouse. Cox might have been the first center to also turn towards Bordeaux merchants. Its cooking pots were sold to the colonial market. Soon however, more centers involved themselves in colonial trade.

Most ceramics from the Toulousain area on North American colonial sites have been found in New France and Acadia.



Only a few examples come from the Hudson Bay, Newfoundland, or Louisiana. None have been identified in the French West Indies to date. We mapped a few 17th- and 18th-century sites where the ceramics have been located throughout a detailed literature review. The Atlantic port of Bordeaux was one of their departure points throughout the period. Toulousain ceramics have been recovered on archaeological sites in the city. The French ship *Le Machault* that sank in Chaleur Bay, Canada, had also sailed from Bordeaux on April 10th, 1760, with Toulousain wares onboard, i.e. Giroussens and Lomagne tablewares, cooking pots and tableware decorated with slip dots. Bordeaux was important early in the 16th-century Atlantic market and there was a relationship between the Toulousain potters and the Saintonge workshops, which were more closely tied to the port of La Rochelle. In North America, tableware from Giroussens is the most common Toulousain type found on historical sites, followed by the cooking pots from Cox. Painted tableware from the Lomagne area is less frequent. Slip dot decorated wares seem to be very rare. The chronologies extracted from these colonial sites are important, given the lack of other accurate dating. Cox cooking pots were found early in America: in a 16th-century context, at the site of Red Bay. They were also part of the kitchen equipment of the fort of Pentagoet, in Maine, during its final phase of occupation, from 1670 to 1674. Cooking pots were also identified in several 17th- and 18th-century contexts. Some were found on the 1760 wreck of the *Machault* and at the Estèbe house, some dating from before 1752, and others from 1752 to 1800. Painted wares have mostly been recovered from 18th-century sites. Their earliest occurrence in North America is at Champlain's Second Habitation, place Royale, in a context dated from 1701. Giroussens painted wares also came from the 1752-1800 privy of the Estèbe house. Painted tablewares and cooking pots were used in the households of wealthy merchants and other members of the colonial elite at place Royale. Two Giroussens plates and three cooking pots were found in the privy of the Estèbe house. They were associated with numerous local earthenwares, and various English wares: Staffordshire slipware, creamware, pearlware, and agate ware. The cooking pots were the only cooking earthenwares of the assemblage, while probate inventories mention other ceramic forms, i.e. pans and food-warmers. The Giroussens plates on the other hand were found with other coarse earthenware plates, i.e. some slipwares (Staffordshire, Saintonge) and some Albisola. Both Lomagne and Giroussens plates were discarded at maison Perthuis, another house at place Royale. Toulousain tableware was excavated in military forts like Fort Chambly and Fort Michilimackinac, and the Québec monastery of Récollets. In such settings, it is often assumed that the wares belonged to officers and persons of higher status within the community. Giroussens tableware was also found in non-elite households, for example in the 18th-century Acadian Belleisle house.

#### *Nuclear Analytical Techniques in Latin America*

*Nuclear Analytical Techniques in Archaeological Investigations*. Technical Reports Series 416. International Atomic Energy Agency, Vienna, Austria (2003). <http://www->

[pub.iaea.org/MTCD/publications/PDF/TRS416\\_web.pdf](http://pub.iaea.org/MTCD/publications/PDF/TRS416_web.pdf). The ten papers in this volume concern Latin American ceramics (Argentina, Brazil, China, Cuba, Mexico, and Peru). A particularly successful combination of analytical expertise and a field of common interest in the Latin American region were created through the Coordinated Research Project (CRP) on Nuclear Analytical Techniques in Archaeological Investigations, organized by the IAEA following the recommendations of an Advisory Group meeting. The first Research Co-ordination Meeting (RCM) of the CRP was held in June 1997 at the Smithsonian Institution in Washington, DC, where the participants were introduced to the concept of the project and the preliminary work plans were outlined. Emphasis was given to a close collaboration between analytical scientists and archaeologists — from the definition of the problem, selection of sampling sites and samples to interpretation of analytical results using multifunctional statistical analysis. Also highlighted was the validation of analytical techniques using several certified reference materials. In April 1999, a second RCM was held in Cuzco, Peru, to present and discuss preliminary results of the individual projects and to refine the methods used. The final RCM, which was held in Santiago, Chile, from 6-10 November 2000, revealed extensive information obtained by the participating research groups during the CRP, which is described in detail in this report. As the research objectives of each group were very particular, i.e. related to each country's specific situation, the range of results is exceptionally broad. The results demonstrated the great potential of the combination of nuclear analysis and archaeological research. The contributors to this volume and the titles of their chapters are: IAEA, "Techniques used and results obtained," pp. 3-31; Bishop, R. L., "Instrumental Neutron Activation Analysis of archaeological ceramics: progress and challenges," pp. 35-44; Plá, R. R. and Ratto, N., "Provenance archaeological studies of ceramic raw materials and artifacts using Instrumental Neutron Activation Analysis: The cases of Chaschuol and Bolsón de Fiambalá (Catamarca, Argentina)," pp. 45-69; Sabino, C. V. S., Prous, A. P., Wüst, I., and Gauapondaia, V., "Tribes and chiefdoms: An analytical study of some Brazilian ceramics," pp. 71-88; Munita, C. S., Paiva, R. P., Alves, M. A., de Oliveria, P. M. S., and Momose, E. F., "Chemical characterization of Brazilian prehistoric ceramics by INAA," pp. 89-97; Falabella, F., and Andonie, "Regional ceramic production and distribution systems during the Late Intermediate ceramic period in central Chile based on NAA," pp. 99-118; Padilla Alvarez, R., and Celaya González, M., "Classification of the regional aboriginal ceramic production and distribution in the central region of Cuba based on INAA," pp. 119-134; Padilla Albarez, R., and Arrazcaeta, R., "Classification of majolica pottery from Colonial Havana on the basis of INAA," pp. 135-146; Monroy-Guzman, F., and Fournier, P., "Elemental composition of Mexican colonial majolica using INAA," pp. 147-161; and Montoya, E., Glowacki, M., Zapata, J. and Mendoza, P., "Chemical characterization of archaeological ceramics using  $k_0$  based INAA: A study in the production and distribution of Middle Horizon pottery from Cuzco, Peru," pp. 163-183. These essays are informative and provide a useful baseline for future research. Ron Bishop, the driving force behind this effort, is to be congratulated.

## Book Reviews

Stacey N. Lengyel, Associate Editor

**Archaeology, Cultural Heritage, and the Antiquities Trade.** Edited by Neil Brodie, Morag M. Kersel, Christina Luke, and Kathryn Walker Tubb, University Press of Florida: Gainesville, 2006. xiv + 349 pp., 28 figures, three tables, five maps, three appendices, list of contributors, index. Price: \$65.00 (hardback). ISBN: 0-8130-2972-4.

*Reviewed by Felicia Beardsley, University of La Verne, Department of Sociology and Anthropology, 1950 3<sup>rd</sup> Street, La Verne, CA, 91750, USA*

You cannot ask for a more timely book. Nearly every month there is at least one report by the local or international news media on a loss or recovery in the archaeological record; another archaeological site looted somewhere in the world, some newly rediscovered ancient treasure consigned to the auction block, the repatriation of a culture's patrimony decades after its collection, curation and exhibit in a foreign land, or the damage or destruction of a people's heritage through acts of war, political fanaticism, or religious zealotry. The recent auction of natural, cultural, paleontological, and otherworldly articles, artifacts, and scientific specimens at a fund-raiser by the I. M. Chait Gallery in New York drives home the prevailing attitude that the world's archaeological and natural heritage are commodities subject to the conventions and practices of international trading networks ("And to the Winners go the Dinosaur Skull and the Mummified Hand" by Roja Heydarpour, March 26, 2007, *New York Times*). These are objects without context, to be owned, relished, exchanged, displayed for reasons personal or social, or to be brandished as symbols of power, control, or some other divergent personal agenda.

*Archaeology, Cultural Heritage, and the Antiquities Trade* is a collection of essays covering the current issues surrounding the antiquities trade and its regulation, the roles played by collectors and museums, destruction of archaeological sites and monuments, and the sale and collection of unprovenanced antiquities. Several of the essays are expanded versions of papers delivered in two of the sessions on Marketing Heritage at the Fifth World Archaeological Congress in Washington, D.C., in June 2003: (R3) Collecting Material Heritage: Past and Present Orthodoxies and (R4) Practicing Archaeology? Pillage of Sites, Trafficking of Artifacts. Although there are no resolutions or recommendations offered by individual authors on ways to stem or otherwise curtail the seemingly formidable market forces, the cumulative result of the book is a solid historical and social context of the antiquities trade. In-depth case studies from Honduras, Turkey, Iraq, Afghanistan, and India illustrate the global demand for access to the archaeological heritage, along with the intricacies and politicization surrounding regulation of cultural patrimony. Additionally, highly complex issues are addressed, such as the

rights of indigenes to use their heritage as they see fit, subsistence digging, and the imposition of preservation conditions and restrictions by outside developed communities on descendent communities.

The opening and closing essays, "Introduction" (N. Brodie) and Chapter 17, "Conclusion: the Social and Cultural Contexts of Collecting" (N. Brodie and C. Luke), summarize the themes presented throughout the book and establish a context for examining the antiquities trade as a whole. Moreover, Chapter 17 also develops the theme of social and cultural contexts behind the antiquities trade, or why people collect. The central point is that collecting behavior drives the antiquities market and sets in motion the mechanisms of commerce, the lack of transparency and politicization of that market, and the forces behind promulgation of the regulations affecting the market. To understand the antiquities trade and its place in social and cultural networks, one must first understand the reasons behind collecting: the social values, etiquette, and ethos of collecting.

Chapters 1, 2 and 3 provide the reader with a sound foundation in the legal protections for the world's cultural heritage. Chapter 1, "Protecting Cultural Heritage in Conflict" (L. Prott) discusses the 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict. With reference to the looting of the Iraqi National Museum in Baghdad, Prott outlines the strengths and weaknesses of the Hague Convention, and asks whether it is simply a futile exercise. How is enforcement possible when the need for the Convention Protocols is most visible during armed conflicts, a time when national governments are faced with more immediate concerns? Chapter 2, "The U.S. Legal Response to the Protection of the World Cultural Heritage" (M. Papa Sokal) outlines the history of negotiations behind the U.S. Cultural Property Implementation Act (CPIA). Laws like the CPIA are end-products of heated debates, political arguments and backroom compromises with powerful constituencies. The CPIA was just such an Act, formed on the political realities of the antiquities trade. The weaknesses of the Act, the exceptions buried in its very fabric, reflect each voice in its making. But, like any law, it is provisional, subject at some future date, to renegotiation. Chapter 3, "Recent Developments in the Legal Protection of Cultural Heritage" (P. Gerstenblith) completes this triad of essays. It describes the legal mechanisms, including patrimony laws, available to discourage or combat the illicit trade in antiquities, while preserving that heritage at its source.

The antiquities market, from a definition of its role to the development of legal and illegal trading networks, is covered in four essays. Chapters 4 and 9, "Convicted Dealers: What We Can Learn" (P. Watson) and "From the Ground to the Buyer: A Market Analysis of the Trade in Illegal Antiquities" (M. Kersel), focus on the market per se; what it is, what it does, and how it promotes the taking of cultural heritage. The former essay describes the antiquities market as a general reflection of prevailing conditions of supply and demand, but with the caveat that many of the most precious artifacts are traded outside the traditional market network and hence beyond market

statistics. Watson also discusses the role of the market in legitimizing questionable pedigrees of objects, establishing sales histories, and facilitating the dispersal or accumulation of major collections. Kersel examines the structure of global markets, dividing them into source-, transit- and destination markets.

The only essay to specifically treat subsistence digging is Chapter 5, "St. Lawrence Island's Legal Market in Archaeological Goods" (J. Hollowell). It raises the question, who's past is it? and presents the reader with a modern dilemma: the rights of indigenous communities to market their heritage for economic security and survival versus pressures by outside communities to dictate the conditions of preservation, rights and legalities of use of that community's heritage. Juxtaposed to this essay is Chapter 6, "A Model Investigative Protocol for Looting and Anti-Looting Educational Program" (R. Hicks) which presents a two-pronged approach for combating looting and preserving the world's archaeological heritage.

Museum policies and their influence in shaping the antiquities trade are covered in Chapters 13 and 15, "Museum Acquisitions: Responsibilities for the Illicit Traffic in Antiquities" (C. Renfrew) and "Supporting and Promoting the Idea of a Shared Cultural Patrimony" (P. Lazrus). Both essays touch on the shifting ground of ethical acquisitions, as well as the value and desirability museums place on their collections.

To drive home the national and international consequences of the antiquities trade, a series of case studies are presented in the remaining essays: "The Plunder of the Ulua Valley, Honduras, and a Market Analysis for Its Antiquities" (C. Luke and J. Henderson), "Looting Lydia: The Destruction of an Archaeological Landscape in Western Turkey" (C. Roosevelt and C. Luke), "The Plunder of Iraq's Archaeological Heritage, 1991-2005, and the London Antiquities Trade" (N. Brodie), "Afghanistan's Cultural Heritage: An Exceptional Case?" (J. Van Krieken-Pieters), "Illicit Trafficking and Trade in Indian Antiquities: Renewed Efforts to Save and Preserve India's Heritage" (S. Pachauri), "Structural Complexity and Social Conflict in Managing the Past at Copan Honduras" (L. Mortensen), and "Artifacts and Emotion" (K. Tubb).

The antiquities trade is a lucrative, complicated business that has pushed the world's cultural heritage into a global crisis. *Archaeology, Cultural Heritage, and the Antiquities Trade* provides a thorough, systematic, and enlightening guide for understanding that market in all its dimensions.

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## Upcoming Conferences

*Rachel S. Popelka-Filcoff, Associate Editor*

### 2007

20-27 May. Sixth World Archaeological Congress (WAC-6) Jamaica, [wacinfo@flinders.edu.au](mailto:wacinfo@flinders.edu.au) General information: <http://ehlt.flinders.edu.au/wac/site/confer.php>.

2-7 June. Clay Minerals Society, Santa Fe, NM, USA General information: <http://www.sandia.gov/clay>.

4-8 June. Carleton University, Ottawa, Ontario, Canada. The Canadian Quaternary Association Conference (CANQUA) Conference. The conference will provide an invigorating forum for those interdisciplinary field of Quaternary geoscience, including geologists, geomorphologists, physical geographers, biologists, botanists, oceanographers, archaeologists, environmentalists, and others. General information: [www.canquaottawa2007.ca](http://www.canquaottawa2007.ca).

6-8 June. 2do. Congreso Argentino y 1ro. Latinoamericano De Arqueometría. Buenos Aires, Argentina. La investigación interdisciplinaria. Métodos, técnicas y análisis al servicio de la arqueología y de la caracterización, preservación y conservación de los bienes culturales. Organiza: Comisión Nacional de Energía Atómica. Email: [arqueomet2@cnea.gov.ar](mailto:arqueomet2@cnea.gov.ar).

11-17 June. 1st Latin American Symposium on Physical and Chemical Methods in Archaeology, Art and Cultural Heritage Conservation. Sao Paulo, Brazil. General information: <http://www.sbf1.sbfisica.org.br/eventos/extras/lasmac>. Contact: [lasmac@sbfisica.org.br](mailto:lasmac@sbfisica.org.br).

9-15 July. 18th World Congress of Soil Science, Philadelphia, PA, USA. Symposium on "Soil Micromorphology, Archaeometry, and Archaeology". Contact: Robin Thwaites ([R.Thwaites@qut.edu.au](mailto:R.Thwaites@qut.edu.au)) or Brian Slater ([slater.39@osu.edu](mailto:slater.39@osu.edu)). General information: <http://www.colostate.edu/programs/IUSS/18wcss/index.html>.

28 July-3 August. XVIII INQUA Congress, Cairns, Australia. Several sessions, including: "Comparing Quantitative Reconstructions from Biological Proxies: Progress and Problems". Contacts: Peter Langdon and Nicki Whitehouse, and "High-resolution analysis of catastrophic environmental changes and human response" Contacts: Suzanne Leroy, John Clague, and Matt McGlone. General information: <http://www.inqua2007.net.au/>, email: [inqua2007@icms.com.au](mailto:inqua2007@icms.com.au). Abstracts due January 31, 2007.

30 July - 3 August Colorado Springs, CO, U.S.A. Denver X-ray Conference. More information: <http://www.dxcicdd.com>.

19-23 August. 234th National Meeting and Exposition, American Chemical Society, Boston, MA USA. General information: <http://www.acs.org>.

9-14 September. International Meeting on Organic Geochemistry Torquay, Devon, United Kingdom. Abstract deadline: January 12 2007. General information: <http://www.imog2007.org>.

8-10 October VII Iberian Congress on Archaeometry (VII Congreso Ibérico de Arqueometría). Madrid, Spain. Contact: [viicia@ih.csic.es](mailto:viicia@ih.csic.es). General information: <http://www.ih.csic.es>, <http://sapac.hispagate.com>.

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