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LABORATORY REPORTS: THE MNA LAB AND THE ARCHAEOLOGICAL RESEARCH GROUP AT UCLA

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At the University of California, Los Angeles, a collective effort towards systematic scientific investigations and conservation of material culture is spearheaded by the Archaeological Research Group (<https://archaeomaterialsgroup.wordpress.com/>) and the Molecular and Nano Archaeology (MNA) Laboratory (<http://www.ioa.ucla.edu/content/molecular-nano-archaeology-lab>). The breadth of their work focuses on three scientific pursuits:

- **Archaeometry:** Integrating the scientific analysis of material culture through the application of principles in the natural and life sciences, geosciences and materials science, to understand ancient technology and craft specialization, socioeconomic systems and interregional and transregional trade in antiquity.
- **Conservation Science:** Studying the relation between microstructure and properties and the kinetics and mechanisms of alterations induced by anthropogenic, environmental and diagenetic processes to a) determine suitable conservation treatments and b) design new conservation materials.
- **Forensics:** Providing expert opinion and analyzing physical evidence in the field and in and laboratory

using integrated technologies to support law enforcement investigations of looted and questionable artifacts.

The MNA Laboratory is a unique research facility at UCLA co-directed by Profs. Ioanna Kakoulli, Christian Fischer and Sergey Prikhodko. It was established through a collaborative initiative between the Dept. of Material Science and Engineering (MSE) and the Cotsen Institute of Archaeology in 2008 to support cross-disciplinary research and innovation in the study of material culture. The laboratory has received major support from the Archaeology/Archaeometry Program and the Division of Materials Research of the National Science Foundation (NSF), as well as, the UCLA Shared Resources Consortium (SRC). Equipped with high-end instrumentation for non-invasive and non-destructive analyses from the macro to the nano and molecular-length scale, the laboratory has been enabling breakthrough research in the fields of archaeology, conservation and materials engineering that has yielded new discoveries, peer-reviewed publications and multimillion dollar research grants. Currently the laboratory serves more than 120 researchers from conservation, archaeology/anthropology, engineering, the physical and life sciences, earth and planetary sciences and medicine. The laboratory also serves UCLA and the broader Los Angeles community through multiple educational activities and supports events with focus on diversity, inclusion and equity. Through national and international agreements and memoranda the laboratory has developed research collaborations with other academic institutions, large-scale facilities, museums, NGOs and government agencies.

The Archaeological Research Group is comprised of a truly multicultural and multidisciplinary team of students (both graduate and undergraduate), postdoctoral fellows and faculty whose research focuses primarily on: 1) fundamental and applied science to answer big questions of anthropological significance through the analysis of material culture; 2) developing new and advanced technologies; 3) identifying fingerprint markers as trace evidence in forensic investigations; 4) design and development of new conservation materials; 5) studying taphonomic changes and weathering processes; 6) design

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of materials for modern applications inspired by ancient materials and technologies. As varied as the research topics are in nature, so are the analytical tools that are utilized for investigations. The Archaeomaterials Research Group applies a range of non-invasive field deployable technologies including spectral imaging, 3D imaging, Reflectance Transformation Imaging (RTI), fiber-optic reflectance spectroscopy (FORS) and x-ray fluorescence (XRF) spectroscopy combined with non-destructive optical, electron and microanalytical techniques such as digital and polarized light, microscopy, electron microscopy and synchrotron-based X-ray and IR spectromicroscopies.

Research conducted by the Archaeomaterials Group and the MNA Laboratory draws from the expertise of the faculty and the unlimited potential for innovation within UCLA and through multiple national and international collaborations and exchange. Following are highlights of a few selected research projects pursued by the Archaeomaterials Group.

Hydroxyapatite (HAP) development for consolidation of wall paintings (Xiao Ma, PhD, MSE)

This research develops hydroxyapatite (HAP)-based, inorganic mineral systems with improved properties for the consolidation of powdery wall paintings (fig. 1). The scientific approach exploits biologically inspired design principles to induce the formation of protective calcium phosphate (HAP) phases by triggering reactions between the calcium in the carbonate-rich layers in wall paintings and ammonium phosphate precursors. The consolidating effect, influence of the solution and conditions (concentration, contact time) on the extent of hydroxyapatite formation was evaluated through a series of structurally and compositionally sensitive analytics. Thermodynamic modeling was also performed to evaluate the stable phase equilibria and interpret the HAP formation

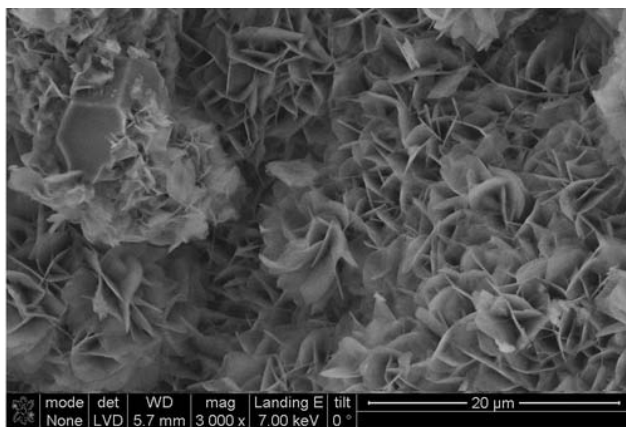


Figure 1. Detail of in situ formation of hydroxyapatite on marble dust particles using diammonium phosphate precursor.

in aqueous solution. This research has been supported by the Solid State and Materials Chemistry Program, DMR, NSF (Award # 1139227) and published in ACS books (<http://pubs.acs.org/doi/abs/10.1021/bk-2013-1147.ch022>).

Chinese blue and white porcelain (Ellen Hsieh, PhD, Archaeology)

This research focuses on exported blue-and-white porcelain found in Southeast and East Asia. Its first goal has been to evaluate the capability of non-invasive technologies such as handheld X-ray fluorescence (pXRF) and fiber optics reflectance spectroscopy (FORS), at differentiating sherds of porcelain produced in the Jingdezhen and Zhangzhou kiln sites (fig. 2). This approach has the potential to be very useful for on-site archaeological research and/or to sort out blue and white assemblages in museum collections. Following positive results obtained for a pilot study on a set of about thirty blue and white sherds from the Philippines and Indonesia, the team is currently applying the methodology to the analysis of many more samples from the Philippines, Taiwan, Cambodia and Indonesia, as well as from common kilns in China.

Beyond the identification of raw materials, sources and technical ‘savoir-faire’ as well as of compositional variations across time and space, this research aims at fostering our understanding of production processes, trade organization and consumption patterns in different archaeological and historical contexts in East and Southeast Asia.



Figure 2. Analysis with pXRF of a blue-and-white porcelain fragment.

Egyptian blue and Chinese blue (Yuan Lin, PhD, MSE)

This research explores the spatial and temporal production technology and variability of Egyptian blue ($\text{CaCuSi}_4\text{O}_{10}$) and Chinese blue ($\text{BaCuSi}_4\text{O}_{10}$) in new light.

Archaeological samples from different parts of the world and different time periods are being analyzed for the identification of the raw materials and step-by-step manufacturing processes to infer the mode of production and to help reconstruct the social context, technological choices, and possible ancient trade routes. The strong near infrared (NIR) luminescence yield is also being investigated for modern materials applications. This research has been supported by the Chateaubriand Fellowship Program in collaboration with the Laboratoire d'Archéologie Moléculaire et Structurale (<http://www.umr-lams.fr/>)

Terahertz (THz) imaging (Roxanne Radpour, PhD, MSE)

THz imaging is a powerful analytical tool for revealing hidden features and non-discernible iconography in multilayered structures. In collaboration with the UCLA Biophotonics Laboratory, a novel architecture THz system featuring direct detection imaging is being tested on cultural heritage materials to characterize their THz interactions (fig. 3). The overall goal of this work is twofold: to push the boundaries of THz imaging instrumentation development for cultural heritage purposes, and to apply this THz system architecture *in situ* for imaging of wall paintings to overcome complex stratigraphy and reveal hidden iconography for improved comprehensive studies (<http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=1903816>).



Figure 3. Sequence of images from unobscured to obscured, and then imaged with THz system

The APPEAR Project (in collaboration with the J. Paul Getty Museum, Antiquities Conservation Dept.)

The APPEAR project is a research effort and database developed to collect technical and historic information on Romano-Egyptian funerary portraits (fig. 4). The Archaeomaterials Group works with Getty Villa antiquities conservator Marie Svoboda, APPEAR Project coordinator, to study these unique artifacts using a variety of imaging and spectroscopic techniques. The analyses have contributed important technical data supporting the project's goal to overcome the dearth of scientific and historical understanding of these funerary portraits.



Figure 4. Mummy Portrait of bearded man (73.AP.94), Roman-Egyptian, c. 1st century CE. J. Paul Getty Museum. Visible image courtesy of the Getty's Open Content Program. Select views obtained by multi-spectral imaging.

Forensics in art and archaeology

The Archaeomaterials Group collaborates closely with the Homeland Security Investigations (HSI) unit (Dept. of Homeland Security) and other international law enforcement agencies to combat the looting of art, ethnographic materials and antiquities and to assist through expert scientific opinion their repatriation to the lawful owner.

Additional information on past and current projects within the Archaeomaterials Research Group can be found at: <https://archaeomaterialsgroup.wordpress.com/research-projects/>

ANNOUNCEMENTS

Call for applications: Student research awards

Though it's not film award season just yet here in L.A. there are several awards available in archaeological sciences or related fields that would be of interest to SAS student members to help support research.

The first is the **SAS Student Research International Travel Award**. This award offers up to \$1000 to help with costs of international travel for laboratory or field research. This award is open to students who have been SAS members for more than one consecutive year. Applications will be accepted from undergraduates in their final year of study who are planning to attend graduate school as well as Masters degree and PhD students. Research must be undertaken in a different country than that of their home institution. Funds may not be used to attend at conferences, field schools, classes and/or training courses. The application deadline is **February 1st, 2016**. You can find more information

and an application on the SAS website: <http://www.socarchsci.org/Student%20Research%20Award.pdf>. You can find a list of past Travel Award recipients also on the SAS website: <http://www.socarchsci.org/awards1.html>.

Two awards are available from the Geoarchaeology Interest Group of the Society for American Archaeology.

The **Douglas C. Kellogg Award** is granted to students who are actively working on their doctoral dissertations. The award (\$500) will provide support for aspects of dissertation research, with an emphasis on field or laboratory analyses that are necessary for completion of the project. To qualify for the award, students should be registered at the Doctoral level with majors in the fields of anthropology, archaeology or earth sciences/geology. Their proposed project should include applications of geoscientific methods to archaeological questions, and they should make clear in their applications that they are preparing for an eventual career in geoarchaeology. The memorial award is provided by the Douglas C. Kellogg Fund for Geoarchaeological Research. The deadline for application is **December 4, 2015**; before midnight, Pacific time (PST).

The application materials required include: (1) a research proposal, maximum 3 pages (excluding references) that clearly describes the research project and its potential contributions to the archaeology of North or South America; (2) a CV, and (3) two letters of support, one of which must be from the chair of the dissertation committee that certifies the student's Doctoral candidacy and expected graduation date.

Please submit materials electronically (pdf format preferred) to: Dr. Susan Mentzer, susan.mentzer@ifu.uni-tuebingen.de File names should include the first and last name of the applicant, and the award name should be indicated in the title of the proposal

The second award offered by the GeoArchaeology Interest Group is the **MA/MS Award**. The award (\$500) is granted to students who are actively working on their MA or MS projects. The award will provide support for research, with an emphasis on field or laboratory analyses that are necessary for completion of the MA/MS thesis or report. To qualify for the award, students should be registered at the MA or MS level with majors in the fields of anthropology, archaeology or earth sciences/geology. Their proposed project should include applications of geoscientific methods to archaeological questions. The

deadline for application is **December 4th, 2015**; before midnight, Pacific time (PST).

The application materials required include: (1) a research proposal, maximum 3 pages (excluding references) that clearly describes the research project and its potential contributions to the archaeology of North or South America; (2) a CV, and (3) two letters of support, one of which must be from the chair of the thesis committee that certifies the student's role in the project and expected graduation date.

Please submit materials electronically (PDF format preferred) to: Dr. Susan Mentzer, susan.mentzer@ifu.uni-tuebingen.de File names should include the first and last name of the applicant, and the award name should be indicated in the title of the proposal

SAS Bulletin Seeking New Assoc. Editor for Meeting Calendar

The *SAS Bulletin* is looking for a new associate editor for the Meeting Calendar. The responsibilities include compiling information on conferences focusing on the archaeological sciences of interest to SAS members for publication in the *Bulletin* (which goes out to members 4 times a year). Anyone interested in the position should send a letter of interest and a CV to the editor, Vanessa Muros, vmuros@ucla.edu.

ARCHAEOLOGICAL CERAMICS

Charles C. Kolb, Associate Editor

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

Book Reviews on Ceramics

Portable Digital Microscope Atlas of Ceramic Pastes: Components, Texture, and Technology, Isabelle C. Druc (ed.) with the technical assistance of Bruce Velde and Lisenia Chaves. Blue Mounds, WI: Deep University Press, 2015. 129 pp., 99 illustrations (84 in color), 1 table, appendix, glossary, references, biographies. ISBN-13 9781939755070, 1939755077; OCLC Number 900616439, ca. \$20.00 to \$25.00 (paperback). *Pastas cerámicas en lupa digital: componentes, textura y tecnología*, Isabelle C. Druc y Lisenia Chavez. Blue Mounds, WI: Deep University Press, 2014. ISBN-13 9781939755049, 1939755042; OCLC Number 887735222. 108 pp., illustrations, glossary, and

bibliography. ca. \$20.00 to \$23.00 (paperback). [Contact Isabelle about purchases: icdruc@wisc.edu]

Druc is likely well-known to Latin American archaeologists for her ethnographic and archaeological research on ceramic production. Bruce Velde and Druc coauthored *Archaeological Ceramic Materials: Origin and Utilization*, Natural Science in Archaeology Series, New York: Springer Publishers, 1999. This volume was conceived as an introduction to the origin and the analysis of the most abundant material found in archaeology: ceramics. The authors explain the origin of the components of ceramic materials, the selection of these materials by potters as a function of use and physical properties, the effect of firing on ceramic materials, and the means used to analyze the ceramics in a post-use context. Reviewed by Kolb in *SAS Bulletin* 23(1):17-21 (Spring 2000). Among her other books are: *Ceramic Production and Distribution in the Chavín Sphere of Influence (North-central Andes)*, British Archaeological Reports International Series 731, Oxford: J. and E. Hedges, distributed by Hadrian Books, 1998, an analysis of six first-millennium BC pottery producing sites in the north-central Andes concentrating on production, exchange, and interregional relationships. She is also the editor of *Archaeology and Clays* (British Archaeological Reports International Series 942, Oxford: J. and E. Hedges, distributed by Hadrian Books, 2001, a compendium of papers focusing on different approaches to the analysis and interpretation of clays and ceramics from archaeological contexts that were presented at the 37th Annual Meeting of the Clay Minerals Society Meeting in Chicago in 2000. Reviewed by Kolb in *La Tinaja: A Newsletter of Archaeological Ceramics* 13(2):12-14 (2001) and *Old Potter's Almanack: Joint Newsletter of the Prehistoric Ceramics Research Group and The Ceramic Petrology Group* (British Museum, London) 9(3):3-4 (November 2001). Among her Spanish-language books is *Producción cerámica y etnoarqueología en Conchucos, Ancash, Perú*, Lima: Instituto Cultural Runa, 2005.

Portable digital microscopes with and without imaging capabilities (cameras) are becoming more commonly utilized in both the laboratory and in the field. Some models are handheld, others desktop but costs have declined so that these devices are affordable. This manual, published in Spanish in May 2014 and in English in January 2015, is the first of its sort describing the use of the new portable digital microscope for analysis of archaeological ceramics in the field or in the laboratory. It is presented as a geological atlas with a description of the most common minerals and lithic fragments found in ancient ceramic pastes to assist archaeologists in

identifying what they see under the microscope. Identification of manufacture and technological features are also addressed. An analysis protocol is proposed, along with suggestions for granulometric and digital image analyses to help with the constitution of groups of similar composition and paste texture. The manual is abundantly illustrated with 165 color pictures (in 94 numbered illustrations) of archaeological and ethnographic ceramic pastes, sherds and whole vessels, and raw materials. A majority of the illustrations are from her work in Peru, but others are from North America, and the Far East. This is a timely and practical guide for anyone engaged in the analysis of archaeological ceramics and is also a major tool to help study and classify sherds and select appropriate specimens for archaeometric analysis.

The volume begins with Acknowledgments" (p. 6), and a useful Chapter 1 "Introduction" (pp. 9-11, 1 color illustration) in which she cites Shepard and Matson's recommendation regarding the use of basic binocular microscopy in sherd analyses. The focus of this manual is the use of hand-held digital microscopes. Druc uses a Dino-Lite AM423ZTAS for her reflected light analyses of ceramic cross-sections but mentions basic parameter for portable digital microscopes in general. [Your reviewer has a comparable Dino-Lite Edge Digital Microscope AM4115ZT with backlight and DinoCapture 2.0.] The four additional chapters are: 2, "Methodology and terminology" (pp. 13-21, 3 color and 3 monochrome illustrations), including discussions of elementary methods, granulometric scales, comparison charts, identification problems, and basic geological terminology. 3 "Identification of common mineral and lithic components in the ceramic paste" (pp. 23-58, 39 color illustrations with 88 images). Seven topics are addressed: felsic minerals (quartz and feldspars); mafic minerals (iron and magnesium bearing: micas, amphiboles, and pyroxenes); oxides and hydroxides (particularly iron); intrusive rock fragments (notably diorites); volcanic rock fragments (lava, pumice, and glass); the alteration of igneous rocks (types of processes and resulting modifications of mineralogy, chemistry, and texture); and sedimentary and metamorphic rock fragments (particularly sandstone and slate). 4-"Raw materials and ceramic technology" (pp. 59-90, 2 monochrome line drawings, 44 color illustrations with 74 images). Five major topics are reviewed: raw materials (clays, not pigments, and creating fired clay test tiles); tempers (sand, grog, shell, crushed rock, and chaff); manufacturing techniques (hand-made coil and paddle-and-anvil only); paste textures; slips and glaze; and firing (oxidation and "neutral").

Chapter 5, “Image analysis” (pp. 91-99, 7 color illustrations). provides eight suggested protocols for preparation and study procedures, image analysis protocols, and quantitative image analysis, plus a case study utilizing *JMicrovision* software (available free online) to create paste illustrations and histograms based on point-counting. Notably, mention is made of current requirements for image publication: tiff formats rather than jpeg and 300 dpi. These are likely to change and will depend on emerging editorial requirements for print and online publication. The latter part of the volume includes an Appendix: “Archaeological sites and production places mentioned in the text, and relevant bibliography” (pp. 101-127) with 27 site entries; a “Glossary” (pp. 105-108) with 45 terms; a list of 70 “References” (pp. 109-114), and three “Biographies” (p. 115).

This is a splendid pioneering effort to integrate digital imaging with hand-held equipment and Isabelle Druc is to be commended for this effort. The protocols are likely to change as more researchers utilize this apparatus and new analytical software is developed; Chandra Reedy and her colleagues at the University of Delaware are also working in this area, including 3-D illustration. The images in Druc’s manual have appropriate scales for reference, but some of the reproductions are a bit “fuzzy.” In the future, supplementary descriptions and images of additional raw materials (clays, aplastics, and pigments); other hand-made and modeled and molded ceramic manufacturing techniques; glazes; and additional firing procedures beyond open-firing will prove useful to researchers.

Ceramics in America 2014, Robert Hunter (ed.), Milwaukee, WI: The Chipstone Foundation, distributed by the University Press of New England, Hanover and London, 2014. xiii + 266 pp., 165 illustrations, 5 appendices. ISBN 978-0-9827722-4-9, \$65.00 (hardcover) – available for purchase at less cost from other vendors. Hunter, a fellow of the Society of Antiquaries of London and an archaeologist and ceramic historian, lives in Williamsburg, Virginia. Now in its fourteenth year of publication, *Ceramics in America* is considered the journal of record for historical ceramics scholarship in the American context and is intended for collectors, historical archaeologists, curators, decorative arts students, social historians, and contemporary potters. Hunter provides an “Editorial Statement” (p. vii) and “Introduction” (pp. ix-xiii). He reminds us that “All ceramic objects have a story to tell – but not all stories are equal” (p. ix). The 2014 annual features a rather unusual exercise: reducing great collections of things to a small number. Hence there are essays by ceramic specialists who are widely recognized in their respective fields of

expertise. Each was asked to discuss in detail ten objects, artists, or events that are meaningful to them, and, consequently, perhaps meaningful to us. As expected, this annual contains well-written and edited articles with exquisite color illustrations again rendered by Gavin Ashworth. There are 11 chapters and a 13-page triple-column index focused on proper noun entries (pp. 254-266). Synopses of the contributions follow.

“X Commandments” by Ivor Noël Hume (pp. 2-18, 20 figures, 16 endnotes). Noted ceramic historian Noël Hume has selected ten ceramics: a post-4000 CE Egyptian El Badari black-topped earthenware beaker with incised Coptic graffito ca. 500 BCE; a Best beaker of 1st century CE England; a Wellbrook, England first century CE Roman amphora; a dish made by Martin’s Hundred potter Thomas Ward in 1631 Virginia; objects recovered from the 1666 fire that destroyed London; a French cruet ca. 1760 from a French shipwreck off Bermuda; An East India Company tankard marked “Calcutta” from India dated to 1758; a Yorkshire Pearlware “Puzzle Jug” ca. 1795; a Pearlware Loving Cup from 1855; and a remarkably accurately detailed Denby Pottery salt-glazed flask-shaped replica of a pistol dated 1845. “Ten Key Ceramic Finds from London’s Archaeological Collections” by Jacqui Pearce (p. 19-40, 15 figures, 58 endnotes). British ceramics specialist Pearce selected ten pieces from the Museum of London collections: one Medieval, two 16th century, five 17th century, and two 18th century. Among these are a pig-pot; a Bartmann jug; a Delftware bottle dated 1627; a 1622 Slipware dish; a Chinese-inspired Italian plate; a Southwark charger; and a Lowestoft mug. “A History of Chinese Export Porcelain in Ten Objects” by Ronald W. Fuchs II (pp. 41-60, 13 figures, 58 endnotes). Fuchs, an expert on Chinese pottery, provides a history of Chinese Export Porcelain from 1300 to 1900. Most of the pieces are from Jingdezhen: vase; ewer; wine cup; soldier vase; charger; fishbowl; Hong bowl; and a salad bowl (owned by George Washington and later by Robert E. Lee) as well as a platter (owned by Mary and Robert E. Lee). A Zhangzhou teapot is also characterized. “Top Ten Vessels in Modern and Contemporary Art” by Garth Clark (pp. 61-84, 16 figures, 9 endnotes). Critic, historian, and dealer Clark selected pieces made by Gauguin, Duchamp, Malevich, Oppenheim, Picasso, Fontana, Price, Ohr, Voukos, and Weiwei.

“Curatorial Ten: The World in Clay from the Newark Museum” by Ulysses Dietz (pp. 85-104, 14 figures, 8 endnotes). Winterthur-trained decorative arts curator Dietz picked from the Newark collection: an Attic Red-figured skyphos; an Erinlè Nigerian vessel; a Zūñi storage jar; an Archaistic Ding censer; a Sèvres urn; a “Grecian

Vase” from the Louisiana Purchase Exposition (1904); a Marblehead Pottery vase; a Rookwood Pottery “Black Iris” vase; a Folded bowl; and gold chalice. “I-Porcelain” by John Austin (pp.105-128, 29 figures, 22 endnotes). The curator of ceramic and glass at Colonial Williamsburg (Virginia), Austin focuses on English-produced period pieces from 1750 to 1863 focusing on Chelsea figurines, vases, a tureen, and a soup plate; Derby figurines; Worcester coffee and tea service and milk jugs; Vauxhall pottery; and a dressing box produced by Bonnin and Morris in Philadelphia (1770-1772). “Triumphs and Tribulations – A Cautionary Tale” by Jonathan Horne (pp. 129-146, 19 figures, 19 endnotes). The late author (d. 2010) was a British antique dealer; Hunter has edited the contribution. The author provides a précis of 40 years in the antique business in England, reviewing the importance of selected specimens: two Medieval jugs; a chamber pot; Woolwich Bellarmine; “pew” figurative groups; Chinese figures; a Delft House dish; a blue-and-white tile panel; parrot figurines; and a figurative group featuring a shepherd and his flock. “Hot Bodies, Cool Colors: American China Painting In Two Centuries by Ellen Paul Denker (p. 147-168, 16 figures, 46 endnotes). An expert on the ceramics of America’s industrial age, Denker chose ten painted objects dating from 1880 to the present including dessert plates, vases, a bowl, sculptures, and a unique Turkish coffee set; she documents the painters and their artistic motifs and styles.

“Specializing in the Diverse: A Journey in Ten Ceramic Objects” by Robert Hunter (pp. 169-187, 20 figures, 29 endnotes). This “autobiographical” narrative by the editor of the *Ceramics in America* annuals begins with learning pottery fabrication at age eight through his curatorial work at Williamsburg. He selected shell-edged dishes, salt-glazed stoneware storage jars; a Pearlware jug; a 1773 American China Manufactory basket; a 1773 Crolius ink stand; a 2007 pickle stand; a Slipware cradle dated 1698; and a James Morgan salt-glazes stoneware mug. A brief history of Carolina Creamware (1775 ff.) is also introduced. “My Ten Favorite Ceramic Objects from the National Museum of American History” by Bonnie Lilienfeld (pp. 188-207, 16 figures, 25 endnotes). The author selected objects from the Smithsonian Institution’s National Museum of American History collection of 35,000 ceramics which she curates. These include: a “No Stamp Act” teapot (Cockpit Hill, Derby England, 1966-1770); a Thomas Commeraw salt-glazed stoneware (New York City. 1793-1812); a Bonnin and Morris pickle stand (Philadelphia, 1770-1772); a Wedgwood “Anti-Slavery” Medallion (Staffordshire, c. 1862); a White House coffee cup used by Abraham Lincoln (French-made, decorated in New York City, 1861); a Union Porcelain figure group (Greenpoint, NY, 1880s); a H. Wilson & Co. jar (Texas,

1869-1884); one umbrella stand (Mississippi, 1900); and a pastoral vase with lid (Missouri, 1910). “Dealer’s Choice” by Diana Stradling and J. Garrison Stradling (pp. 208-230, 16 figures, 21 endnotes). This wife-and-husband team recounts their history as fledgling dealers since 1962. They were influenced by books – “books led our way” – authored by Barber, Clement, and Wiltshire; manufacturers such as Bonnin and Morris, Fenton, Callowhill, and Crane; objects – the “Century Vase,” dishes by Absalom Day, a bust of Dolley Madison (1818), and a Neesz (or Nase) Slipware plate; as well as the papers of David Henderson are discussed. Lastly, Book Review Editor Amy Earls, organized “Top Ten Books” (pp. 232-248) featuring separate short bibliographic essays from a diverse group of ceramic scholars: David Gaimster, Mark Shapiro, Ann Smart Martin, Diana Stradling and J. Garrison Stradling, David Rago, and Geoffrey Godden.

The Origins and Use of the Potter’s Wheel in Ancient Egypt, Sarah K. Doherty, Archaeopress Egyptology 7, Oxford: Archaeopress, 2015. x + 140 pages; illustrated throughout in black & white with two color plates. ISBN 9781784910600, £29.00/\$58.00 (paperback); ISBN 9781784910617, £24.60 (e-publication). The author has also uploaded the volume which is available gratis: https://www.academia.edu/6643987/Origins_and_Use_of_The_Potters_Wheel_in_Ancient_Egypt

This monograph derives from the author’s three-year thesis project at Cardiff University for which she was awarded her doctorate. The front matter includes a “List of Figures” (pp. ii-iv) n = 101 (one in color), “List of Tables” (p. v) n = 7 (one in color), “Acknowledgements” (p. vii), a map of the region (p. viii), and Chronological Chart (p. ix). The back matter includes 482 “References” (pp. 112-126) and four appendices. “Potter’s Wheel Videos” by the author are available at <https://www.youtube.com/user/Ramessesmissy/feed> or Archaeopress Open Access site, <http://www.archaeopress.com/ArchaeopressShop/Public/defaultAll.asp?OpenAccess=Y&intro=true>

The volume is divided into eight chapters commencing with the “Introduction (pp. 1-3). Doherty states “The invention of the wheel is often highlighted as one of humankind’s most significant inventions. Wheels do not exist in nature, and so can be viewed entirely as a human-inspired invention. Machinery too, was relatively rare in the ancient world. The potter’s wheel is arguably the most significant machine introduced into Egypt, second only perhaps to the drill, the loom and the bellows for smelting metal. In Predynastic Egypt (c3500 B.C.), the traditional methods of hand-building pottery vessels were

already successful in producing pottery vessels of high quality on a large scale for the domestic market, so it would appear that the potter's wheel would be a rather superfluous invention. However, the impact of this innovation would not just have affected the Egyptian potters themselves learning a new skill, but also signaled the beginnings of a more complex and technologically advanced society." Despite many years work on the technology of pottery production it is perhaps surprising, Doherty comments, that the origins of the potter's wheel in Egypt have yet to be determined. Her research project seeks to rectify this situation by determining when the potter's wheel was introduced into Egypt, establishing in what contexts wheel thrown pottery occurs, and considering the reasons why the Egyptians introduced the wheel when a well-established hand making pottery industry already existed.

In Chapter 2 "Seeking the Potter's Wheel" (pp. 4-22, 13 figures, 2 tables), she notes that potter's wheels were used during the 4th Dynasty but during the 5th Dynasty and since they were employed to make funerary offering vessels. She discusses the previous literature, documents six types of wheels, reviews previous experiments and recent scientific research, and archaeological evidence for the potter's wheel. The latter includes the use of pierced wheel bearings; she provides a tabulation of 19 Near Eastern examples (Table 2.1 with data on chronology [Chalcolithic, 4000 BC, to the Late Bronze Age, 1150 BC], site location, wheel type, material details, illustrations, and references). Egyptian wheel heads at Abusir are documented, tenon and pivot wheel bearings are discussed, and problems of terminology and definitions are noted. Chapter 3 "Ancient Sources for the potter's wheel" (pp. 23-37, 19 figures, 1 table) reviews secondary evidence, notably 20 or so tomb scenes for the 5th and 6th Dynasties, and ca. 10 wooden models and limestone statuettes. Written evidence dates to the 5th and 6th Dynasties and she documents diachronic changes in the use of the term "potter."

Chapter 4, "Inventing the potter's wheel" (pp. 38-54, 14 figures), focuses on the fact that the invention and refinement of the technology was a cumulative process in the early city state workshops. She reviews theories, *chaîne opératoire*, standardization, and technological developments for the Near East (Iraq, Syria, Iran, and the Levant) and Egypt c4000-2600 BC. Doherty points out that Near Eastern city states had centralized control of temples, court officials, and pottery-making precincts. In Egypt (c3500-3100 BC) technologies included basalt and hard stone vessel production employing the twist reverse drill. In the Near East, the earliest examples of the use of the potter's wheel occur near shrines and temples in the

city states of Megiddo, Hazor, Lachish, Tel Yarmoth and Tel Dalit where the device was used to finish coil-made V-shape bowls. Chapter 5 "How did the Potter's Wheel come to Egypt?" (pp. 55-69, 14 figures, 1 table) provides a review of conditions necessary for the transference of the potter's wheel to Egypt. Doherty discusses workshop-led production, cites ethnographic comparisons, comments on the sexual division of labor, and potters' social status. The firing process evolved from bonfires to "large pot" updraft kilns and the use of fire dogs during the Old Kingdom. Production industrialized during the Early Dynastic period. The discussion on workshops follows Prudence Rice's (1987) discussion and minimally Cathy Costin's characterization of workshop types. Notably, the first examples of wheel-made pottery came from funerary contexts of Egyptian royalty, while the use of miniature vessels from Meidum relates to foundation deposits.

Chapter 6 "Detecting the Use of the Potter's Wheel in Egyptian Pottery" (pp. 70-91, 27 figures, 3 tables). Manufacturing marks and techniques of coiling and throwing are reviewed and three experiments are detailed. The first involves the author's pottery replication experiments and xeroradiography of these vessels after firing. The examination of museum collections provided data on fabrication marks; Table 6.1 lists characteristic marks, chronologies, provenance, vessel types, fabrication method (coiling or throwing), and other information. The museums included: Ashmolean (80 specimens), Petrie (20), Cairo (15), and Cyfarthfa (5). Details on miniature vessel formation include color images (Table 6.3 and Figure 6.10). The second experiment concerns "what constitutes a suitable wheel" and throwing pots on replica wheels made of concrete and from granite with the use of boiled linseed oil as a lubricant; throwing times were 11 vs. 5 minutes. The third experiment involved the use wheel bearing in finishing coiled pottery such as the V-shaped bowl. Chapter 7 "The Spread of the Potter's Wheel from Royal to Domestic Contexts" (pp. 92-105, 14 figures) focuses on the purpose of creating miniatures and model vessels. Miniatures are associated especially with funeral rite offerings. The offering triad included: funerary model objects, Meidum bowls, and miniature vessels. She concludes that the miniatures are linked to basalt and stone vessels in that the mass production of the pottery miniatures began during the reign of Sneferu and coincided with the rise of the fabrication of private tombs and the need for offering vessels – pottery became a substitute for basalt and hard stone offering vessels. She also details the production methods for each of the triad offering vessels.

8-“Conclusion (pp. 106-111). Doherty sought to understand the reasons why the potter’s wheel came to be invented and when and how it was used and for what purpose. She summarizes evidence about standardization, relationships of stone to pottery vessels, and that miniatures were used exclusively for food offerings in mastabas and private offering chapels, and as offerings in architectural foundation deposits. The volume concludes with the list of references and four appendices: Appendix I: Selected List of Kilns, Potter’s Wheels, and Workshops (pp. 128-131) has 43 entries; Appendix II: Vienna System of Clay Fabrics: Nile Silts (pp. 132-133), six are documented; Appendix III: Vienna System of Clay Fabrics (pp. 134-137), nine are detailed; and Appendix IV: Concrete and Granite Wheel Bearing Plans (pp. 138-140).

This is a very interesting, detailed, and well-reasoned assessment that has importance well beyond its Egyptian context. Doherty’s meticulous research using methodologies of museum object analyses, experimental archaeology, and the use of X-rays can be applied to other material culture and in other contexts.

Architectural Vessels of the Moche: Ceramic Diagrams of Sacred Space in Ancient Peru, Juliet B. Wiersema. Latin American and Caribbean Arts and Culture Series. Austin: University of Texas Press, 2015. xi + 289 pp., illustrations, notes, bibliography, index. ISBN: 978-0-292-76125-4, \$60.00 (hardcover). Readers can download this book in PDF version for free at <http://bit.ly/1EDpo1A>. This book is based on her Ph.D. dissertation, *The Architectural Vessels of the Moche of Peru (C.E. 200-850): Architecture for the Afterlife* (Department of Art History and Archaeology, University of Maryland, 2010, <http://hdl.handle.net/1903/10412> 2.284Mb PDF) and is also available online at <http://www.museolarco.org/wp-content/uploads/2013/07/Wiersema-dissertationArchitecturalVessels.pdf>. She was the recipient of the 2010 University of Maryland Distinguished Dissertation Award for this work.

Wiersema is currently Assistant Professor of Pre-Hispanic and Spanish Colonial Art the University of Texas at San Antonio. The book contains “Acknowledgments” (pp. vii-x) and “Abbreviations” (p. x); “Notes” (pp. 155-163) a total of 191 endnotes in addition to traditional innotes; a “Bibliography” (pp. 165-180) with 352 citations; and an “Index” (pp. 181-189) conflating topics, proper nouns, and illustration text information. Structurally, there is an introduction, six numbered chapters, and a conclusion. The “Introduction” (pp. 1-16, 10 illustrations [7 in color, one is a map], and 19 endnotes) provides contextual information. The

Moche or Mochica civilization (CE 1-800) was situated along the northern coast and valleys of Precolumbian Peru, notably in the Chicama and Trujillo Valleys, and spread to eventually cover an area from the Huarney Valley in the south to the Piura Valley in the north. They were contemporaries of the Nazca civilization (200 BCE-CE 600) further south and both cultures are known for their ceramics, murals, and metalwork. The author discusses in general terms the geography, archaeological, architectural, and art historical studies concerning Moche pottery. Notably, the cultural ideology is complemented by visual art and associated symbolism in metal working, the production of textiles, and fashioning of volcanic stone, as well as unbaked clay artifacts and fired ceramics including incised, painted, and fineline painted depictions. “Large-scale architectural constructions replicating sacred geometric motifs have not yet been identified for Moche” (p. 13). She mentions other cultures that produced architectural models in ceramics: Middle Kingdom Egypt, Hand Dynasty China, Chalcolithic Palestine, Late Minoan III, Early Iron Age Crete, Iron Age Europe, and ancient West Mexico. Lastly, she provides an overview of chapter contents.

Chapter 1 “Moche Architectural Vessels: An Overview” (pp.17-25, 9 illustrations [5 in color], and 14 endnotes) provides chronological and ceremonial contexts for the objects. She points out that the Moche handmade “hundreds of thousands” of examples of these vessels, but that they were not replicated to an intended or faithful scale. The first studies on the topic were begun by Peruvian archaeologists in 1936, while specialized research dates to the 1970s. She developed her research design in 2010 and was able to study 171 complete specimens. In 2 “Visualizing and Visually Communicating Architectural Space” (pp. 26-49, 29 illustrations [22 in color], and 18 endnotes), Wiersema characterizes these plastically abstract but information laden models, the importance of fineline illustration, the “reading” of the architectural vessels, and Moche artistic conventions such as simultaneously representing two- and three-dimensional imagery and multiple optical perspectives on a single vessel (both sculpted and fineline human figures, for example), conflating architectural space, manipulating scale on stepped pyramids and tiered platforms, and depicting symbolic motifs. Chapter 3 “The Moche Architectural Vessel Corpus and Its Correspondence with the Archaeological Record” (pp. 50-104, 76 illustrations [59 in color but with multiple perspectives, there are actually 105 color images], and 53 endnotes). Ten architectural styles (all elite or ceremonial) were devised based on geographical (local and regional forms), and temporal contexts and

frequencies within chronological phases: “Moche-esque and” Moche I-II, III, IV, and V.

Chapter 4, “Ceramic Diagrams of Sacred Space: Vessels of the Enclosed Gabled Type” (pp. 105-118, 16 illustrations [4 in color], and 17 endnotes), focuses on this vessel type which accounted for about one-third of the 171 specimens, most of which date to the later Moche phases. Huaca de la Luna and one-peaked mountain forms are reviewed and the author discusses the art and archaeological data, and ideological significance. In 5. “Moche Architectural Whistling Vessels: Their Technical Construction and Acoustic Properties” (pp. 119-137, 31 illustrations [15 in color, 4 line drawings, and 12 radiographs], and 43 endnotes), the mechanics of whistling mechanisms in these archaeological specimens are documented. External and interior styles, acoustic characterizations, and interpretations are discussed. There is, unfortunately, a lack of information available on: 1) cultural interaction and exchange, 2) ethnicity, and 3) archaeological context. X-rays have been used on Peruvian mummies since 1897 but not on ceramic structures until the 1930s when 80 specimens were analyzed, and construction techniques were reported by Adrian Digby (1947). However, acoustical studies were not reported until work by Steven Garrett and Daniel Statnekov (Peruvian Whistling Bottles, *Journal of the Acoustical Society of America* 62(2):449-453, 1977) who studied 69 specimens and defined two types: direct whistle and resonating. The latter type typically has primary and secondary chambers connected by a tube, a resonating chamber, a handle, and architectural superstructure. Her radiographic and acoustical studies of 22 ceramic whistling vessels was undertaken with conservators and ethnomusicologists at the Smithsonian Institution’s National Museum of the American Indian and the Museo Nacional de Antropología, Arqueología, e Historia del Peru. In this new research the musicologists played the vessels She determined that external styles are not reflected in the internal structural characteristics. She summarizes that inanimate buildings have an aural presence. In Chapter 6 “Architectural Representations in Other Cultures” (pp. 138-149, 7 illustrations [6 in color], 17 endnotes) the author discusses two model architectural structures recovered from Egyptian tombs or soul houses, three from the Han Dynasty depicting granaries, manor houses, and towers, and six from West Mexico that depict houses, a village, and ancestor figures. In her “Conclusion” (pp. 151-153), she reports that there is a direct relationship between Moche art and archaeology and function and symbolism which may be related to one or more cultural features: ideological, political, and/or social.

The closest related study of archaeological pottery depicting structures of which I am aware – and surprisingly not cited by Wiersema – was written by Qinghua Guo: *The Mingqi Pottery Buildings of Han Dynasty China 206 BC-AD 220: Architectural Representations and Represented Architecture*, Sussex: Sussex Academic Press, 2010 – no whistling or musical vessels, however. Reviewed by Kolb in *SAS Bulletin* 33(3):13-15, 2010. The Moche archaeological vessel research is quite valuable from an art history perspective but less so from a technological or archaeometric viewpoint except for the discussion of the radiographs. There is no tabulation of the 171 specimens selected or measurement variations, nor are specifics reported on the acoustical determinations related for the 22 vessels. All of the Moche vessels are hand-built and, therefore, each is “unique.” No archaeometric studies of the ceramic specimens and their pastes and aplastics were undertaken. For example, did the potters utilize the same clay source or similar sources and comparable tempers in the fabrication process? As she notes, the sample sizes are relatively small so that only general assessments can be reported.

Previous Professional Meetings

Integrated Archaeological and Archaeometric Analyses for the Study of Pottery Production and Building Materials at Qatna and Ebla between the 3rd and 1st mill. BC / Analisi archeologiche e archeometriche integrate per lo studio delle produzioni a Ebla e Qatna fra III-I millennio a.C was held at the University of Padua, Department of Geosciences on 25 June 2015. The following presentations involved ceramics: L. Peyronel (Università IULM, Milano) “Ebla Chora Project: introduzione al progetto di analisi archeometriche sui materiali ceramici e architettonici del Bronzo Antico e del Bronzo Medio di Ebla”; A. Vacca, M. D’Andrea (Sapienza, Università di Roma) “La ceramica del Bronzo Antico III-IV e del Bronzo Medio I di Tell Mardikh/Ebla: tipologia, tecnologia e funzione”; L. Medeghini, S. Mignardi, C. De Vito, (Sapienza, Università di Roma) “Studio archeometrico della ceramica del Bronzo Antico e Medio di Tell Mardikh/Ebla”; M. L. Santarelli, M. Iorio (Sapienza, Università di Roma) “Tecniche costruttive e analisi dei materiali architettonici del Bronzo Antico e del Bronzo Medio II di Tell Mardikh/Ebla”; L. Maritan (Università di Padova) “Analisi archeometriche della produzione ceramica tra il Bronzo Antico e l’età del Ferro a Qatna”; and M. Da Ros (Università di Udine) “La ceramica di Bronzo Antico e Bronzo Medio I di Qatna. Studio tipologico e funzionale.”

Declaring Independence: American Ceramics in the Making is the title of a conference of workshops and lectures held at the Museums of Colonial Williamsburg, Williamsburg, Virginia, USA, 18-20 September 2015. Soon after the establishment of Jamestown and other permanent settlements in North America, colonists began exploring the limits of local clay. Despite the restrictions imposed by England on manufacturing, potters and entrepreneurs set up shop early on and began producing utilitarian wares for local and eventually regional consumption. Settlers in New England, New York, Virginia, and beyond brought training and techniques with them establishing potteries that grew in size and scale as the centuries progressed. With particular emphasis on the eighteenth and nineteenth centuries, this conference explored the vast array of ceramics made in America and will investigate the themes of influence, imitation, and innovation. Optional workshops included two sessions of “Domestic Dishes” by CW curators Suzanne Findlen Hood and Angelika Kuettner as well as two sessions of a “Ceramic Conservation Clinic” by CW conservator Tina Gessler. The conference papers on Saturday were: “Pots of Our Ordinary Earth: One Hundred Years of Virginia Earthenware from the Powhatan to the ‘Poor Potter’ of Yorktown” by Beverly A. (Bly) Straube; “William Rogers the ‘Poor Potter’”: Evidence of Yorktown Pottery in Williamsburg” by Kelly Ladd-Kostro; “The Potters Speak: Norwalk, Connecticut, Slip-Script Pottery and Relative Wares” by Richard Miller; “Fifty Years of Collecting Southern Ceramics: MESDA [Museum of Early Southern Decorative Arts] and the Mariner Collection” by Robert Leath; “The Cherokee Clay and Tales of Alchemy, Magic, and Mystery” by Robert R. Hunter Jr.; and “Made in America: Baskets, Pickles and Barley Corn” by Michelle Erickson. Sunday’s presentations were: “A good Assortment of Tortoise . . . Earthen Ware’: The Benjamin Leigh and John Allman Partnership in Boston” by Angelika Kuettner; “Re-examining the 18th - Century Potters of Charlestown, Massachusetts: An Archaeological Perspective” by Joe Bagley; “... Much improved in fashion, neatness and utility’: The Development of the Philadelphia Ceramic Industry, 1700-1810” by Deborah Miller; “The Cortselius/Crolius Family in North America: From German Master Craftsmen to American Entrepreneurs in Four Generations” by Meta Janowitz; “Influences on the Pottery of the ‘Old Southwest’ - An Alabama Perspective” by Joey Brackner; and “The Southern South: Pottery Traditions Explored and Demonstrated” by Billy Ray Hussey. Additional information is available online at <http://www.event.com/events/declaring-independence-american-ceramics-in-the-making/event-summary-a4c24660e1eb4df1aff97cd8ee6c8a7.aspx>.

The Roman Amphora Contents International Interactive Conference (RACIIC) was held in Cadiz, Spain, 5-7 October 2015. Details about registration and poster submissions are posted on the official website: <http://amphoracontentsconference.es>. The conference provided an opportunity for the scientific and archaeological community, not just for those who carry out their studies on issues related to amphorae.

American Anthropological Association (AAA) 114th Annual Meeting, Denver, CO, USA, 18-22 November 2015. “Ceramic Ecology XXIX: Current Ceramic Research and Its Implications for Understanding the Past as Familiar/Strange” organized by Kostalena Michelaki (Arizona State University, School of Human Evolution and Social Change) and Sandra Lopez Varela (Facultad de Filosofía y Letras, Universidad Nacional Autónoma de México) with “Discussant” Mary Faye Ownby (Desert Archaeology, Inc.). The six symposium presentations were: “A Clash of Tempers: Ways of Knowing Mica and the Micaceous Ceramic Traditions of the American Southwest” by Sunday Eiselt (Southern Methodist University, Department of Anthropology); “Helping, Not Doing: the Familiar/Strange in the Gendered Division of Labor in Potting Households in the Purépecha Region of Michoacán, México” by Amy J Hirshman (West Virginia University); “New Discovery of Coal-Clay Composite Ceramic Traditions in Sichuan Province, China” by Chandra L Reedy (University of Delaware), Pamela Vandiver (University of Arizona), Ting He (Sichuan Provincial Institute of Cultural Relics and Archeology), Ying Xu (University of Delaware) and Yanyu Wang (Sichuan Provincial Institute of Cultural Relics and Archeology); “Estimating San Martin Orange Ceramic Output in Tlajinga 33, Teotihuacan, Mexico, from the Perspective of Ceramic Ethnoarchaeological Models” by James J. Sheehy (Penn State University and Juniata College); “An Experimental Approach to the Cognitive and Technical Aspects of Wheel Fashioning” by Kostalena Michelaki (Arizona State University, School of Human Evolution and Social Change) and Armance Catherine Dupont-Delaleuf (Arizona State University, School of Human Evolution and Social Change); and “Ecology, Technology, and Culture History of Organic-Painted Pottery in the Northern Southwest” by Eric Blinman (Museum of New Mexico, Office of Archaeological Studies) and Dean Wilson (Museum of New Mexico, Office of Archaeological Studies) read by Charles C. Kolb. The other ceramic presentations included: Samuel Duwe (University of Oklahoma Press) “Histories of Coalescence and Regional Interaction among the Rio Grande Pueblos”; Mark Robert Agostini Jr (Peabody Museum of Archaeology & Ethnology, Harvard University) “Relative Ceramic Chronology and Pueblo

Depopulation in the Jemez Region, New Mexico”; Elizabeth H. Paris (Wichita State University), Ronald Bishop (Smithsonian Institution) and Roberto Lopez Bravo (Universidad de Ciencias y Artes de Chiapas) “The Exchange of Fine Orange Pottery in Early Postclassic Period Chiapas: New Evidence from the Jovel Valley”; and Jim Weil (Science Museum of Minnesota) “Lineages and Legacies of Ecological Anthropology at Columbia in the 1970s.”

American Schools of Oriental Research (ASOR) Annual Meeting, Atlanta, GA, USA, 18-22 November 2015 (92 sessions with ca 400 papers). The ceramic papers included: Neil Smith (King Abdullah University of Science and Technology) Jens Schneider (King Abdullah University of Science and Technology), Thomas Levy (University of California San Diego), and Christopher Rollston (George Washington University) “The Edomite Stamped Handle Seal Impressions and Inscription Found at Khirbat Al-Iraq: Implications for Understanding the Social Complexity, Trade, and Specialization of Late Iron II Edom”; Sebastiano Soldi (National Archaeological Museum, Italy) “Colored Glazed Ceramics from Tell Afis and Zincirli: Examples of Architectural Devices in the Northern Levant during the Iron Age”; Melissa Kennedy (The University of Sydney, Australia) “Developing Urbanism in the EB III of the Upper Orontes, Syria: Ceramics, Chronology and Foreign Relations”; Zuzana Chovanec (State University of New York at Albany), Shlomo Bunimovitz (Tel Aviv University), and Zvi Lederman (Tel Aviv University) “Was There Indeed a Late Bronze Opium Trade? New Evidence from Organic Residue Analysis (ORA) of Base Ring I Juglets from Tel Beth-Shemesh, Israel”; David Ben-Shlomo (Institute of Archaeology, Israel) “Pottery Production in Iron Age Jerusalem”; Margreet Steiner (Independent Scholar), “The Case of Enigmatic Cypro-Phoenician Juglets”; Alice Hunt (University of Georgia) and Robert Speakman (University of Georgia) “Portable XRF Analysis of Archaeological Ceramics: the Good, the Bad, the Reality”; Jason Kennedy, (Binghamton University) “Ceramic Use and Commensal Relations at Ubaid Kenan Tepe: A Use-Alteration Perspective”; Andrew McCarthy (CAARI, Cyprus) “Playing with Fire: Experimental Neolithic Cooking in Cyprus.” Deirdre Fulton (Baylor University) “In the Shadow of the Great Tel: Consumption at Tel Megiddo East”; Janling Fu (Harvard University) “Red-slipped and Burnished Pottery as a Proxy for Feasting Activity”; Dylan Karges (Cobb Institute of Archaeology, Mississippi State University) “Creativity in the Archaeological Record: A Potter’s Experiment Frozen in Time”; Jennifer Gates-Foster (University of North Carolina) “Supplying the Eastern Desert: the Early Ptolemaic Pottery from Samut, Egypt”;

Ilan Sharon (Hebrew University, Israel) and Ayelet Gilboa (University of Haifa, Israel) “One (Broken) Potsherd as an Image of the Entire Universe”; Gregory Williams (University of Bonn) “A Cooking Installation at Mafjar and Patterns of Early Islamic Cooking in Palestine and Egypt”; and Melissa Sharp (University of Tübingen) and Kyra Kaercher (University of Pennsylvania Museum) “An Analysis of the Halaf Ceramic Assemblage from Banahilk, Iraq.”

The all-day session “New Research on Pre-Islamic Central Asia I and II” on Saturday, 21 November, included two ceramic-related papers. “Grave Matters: Human Burials and Grave Goods from Aq Kupruk IV, Northern Afghanistan” by Charles C. Kolb (National Endowment for the Humanities, retired). Paper Abstract: The Balkh River Valley of north-central Afghanistan is a significant north-south corridor through the Hindu Kush Mountains, a western extension of the Himalayas, and a caravan route from the Turkestan Plain to the Bamiyan Valley and on to the Kabul River Valley, Indus Valley and the Subcontinent. Louis Dupree and I excavated four sites near the bazaar town of Aq Kupruk (36°05’0”N 66°50’0”E), with major excavations at two sites spanning the Upper Paleolithic through Contemporary Nomad period: Aq Kupruk I (Ghar-i-Mar/“Snake” Cave) and Aq Kupruk II (Ghar-i-Asb/“Horse” Cave). Aq Kupruk III was an open-air Upper Palaeolithic campsite. On what was to be the final day of the 1965 field season, a test pit excavated in Aq Kupruk IV, a shallow cave, revealed a subsurface 1.5 m x 1.8 m stone-lined burial chamber containing ten disarticulated secondary human burials dating to the Early to Late Iron Age (1st century BCE to 5th-6th centuries CE). In addition, 232 sherds, most comprising three vessels (two Red Streak Burnished bowl-dishes, and a Black/Cream Ware round base, double strap-handle amphora/jug), were recovered. These were late displayed in the National Museum of Afghanistan. Other grave offerings including a bronze Han dynasty mirror, jewelry, iron projectile points, an iron dagger, and bronze and iron horse trappings. Older and recent research on the burials and artifacts is presented and compared to materials more recently excavated at sites in southern Eurasia. The disposition of these materials following the Soviet invasion, civil war, and Taliban era, is also reviewed. “Standardization in Pattern-Burnished Kushan Ceramics” by Charlotte Maxwell-Jones (University of Michigan). Paper Abstract: Kushan rule in Central Asia (1st-3rd centuries CE) grew out of the nomadic incursions that contributed to the downfall of the Graeco-Bactrian and Indo-Greek kingdoms in Bactria, Sogdiana, Gandhara, and Arachosia. Although there is a dearth of written Kushan material, there are rich numismatic and ceramic traditions. In the late Kushan

era, there are two types of highly standardized table vessels that stand out from other table wares: the carinated, hemispherical bowl and the vertical-rim plate. Produced with high quality paste and semi-glossy red slip, both vessel types have consistent sizes and proportions as well as stylized pattern-burnished decoration, yet there are local idiosyncrasies, particularly in the details and methods of decoration. Bactra, the previous capital of the Graeco-Bactrian kingdom and a key Silk Road city during the Kushan period, has recently been identified as a major production center for these vessel types. Fused wasters discovered in the most recent excavations provide evidence of local production and thousands of sherds attest to their popularity. I define the diagnostic features of these vessel types from Bactra as well as other regional production centers, then discuss how they illuminate more tightly knit patterns of trade and stylistic influence than previously identified.

Forthcoming Professional Meetings

Archaeological Institute of America Annual Meeting, San Francisco CA, USA, 7-9 January 2016. Symposium: 4E: "Archaeometric Approaches to the Mediterranean Bronze Age" included: "Chemical Characterization of EBA/MBA Pottery from Ognina (Sicily): A Comparison of XRF and pXRF for Analysis of Ancient Pottery" by Davide Tanasi (Arcadia University), S. Hassam (University of Wisconsin-Milwaukee), F. Pirone, University of South Florida), A. Raudino (LaTrobe University), P. Trapan (Independent Researcher), R. H. Tykot (University of South Florida), and A. Vianello (Independent Researcher); "Rub-a-dub-dub: Organic Temper and Shared Practice in the Production of Bathtubs in the LHIII B-III C Saronic Gulf" by William D. Gilstrap (Missouri University Research Reactor), and Peter M. Day (University of Sheffield); and "Potters' Choices and Vessels Performance on the Island Gran Canaria (Canary Islands, Spain) during Aboriginal Times. First Results" by Miguel del Pino Curbelo (University of Sheffield), Noémi S. Müller (British School at Athens), Jaume Buxeda i Garrigós (University of Barcelona), Amelia Rodríguez Rodríguez (University of Las Palmas de Gran Canaria), Peter M. Day (University of Sheffield), José Mangas Viñuela (University of Las Palmas de Gran Canaria), and Vassilis Kilikoglou (National Center for Scientific Research "Demokritos"). Symposium 6A: "Pottery in Context" includes: "Tarquinia, the Affecter, and Athenian Vases Abroad" by Sheramy D. Bundrick (University of South Florida St. Petersburg); "Interactive Imports: Exploring the Relationship of Imported to Local Pottery at Geraki in Laconia" by Elizabeth M. Langridge (American College of Greece, DERE); "Athenian Moldmade Relief Bowls on Delos" by Susan L. Rotroff

(Washington University in Saint Louis); and "Exploring the Beginning of the Kerameikos of Pella in the Hellenistic Period: Evidence from a Deposit East of the Agora" by Alexandros Laftsidis (University of Cincinnati). Session 5H: "Undergraduate Paper Session" has two ceramic contributions: "Formative Period Cylinder Stamps from Tlatilco, Mexico: An Iconographic and Functional Analysis of Proto-Writing" by Carly Pope, Princeton University; and "The Coroplast's Network: Identifying Stylistic and Cultural Exchange Patterns through Examination of Sicilian Terracotta Figurines" by Sarah Gorman (Old Dominion University).

The remaining pottery papers are: "Breaking the Silence: Philomela in the Athenian World of Images" by Danielle Smotherman (Bryn Mawr College); "Body Hair and the Greek Ideal" by Timothy J. McNiven (Ohio State University); "The Gates of Hades and the Infernal Waters: Exploring the Significance of the Topography of the Greek Underworld on Attic Vases" by Kara K. Burns (University of South Alabama); "The Hunt in Courtship Scenes: A Reevaluation" by Andrew Lear (AIA member at large); "Provenance Determination of Mycenaean Pottery from Alalakh" by Sila Votruba (Koç University); "Metals and Metallurgy at Bronze Age Ayia Irini, Kea" by Natalie Abell (University of Michigan) and Myrto Georgakopoulou (University College London-Qatar); "Alloying with a Purpose: Comparing Object Typologies and Chemical Compositions at Neopalatial Mochlos" by Jesse Obert (University of California, Berkeley); "Slags and Ores: Archaeometallurgy and the Geometric Settlement of Zagora, Andros, Greece" by Ivana G. Vetta (University of Sydney); "Trial Trench B1 in Alepotrypa Cave in Diros Laconia: Structures, Stratigraphic and Pottery Sequence" by Barbara Katsipanou (Ephorate of Antiquities of Messenia, Hellenic Ministry of Culture, Education and Religious Affairs); "Keeping an Even Temper in Times of Trouble: Continuity and the Maintenance of Ceramic Traditions in Late Roman Corinth" by Mark D. Hammond (AIA Member at Large) and Heather Graybehl (AIA Member at Large); "The Late Helladic I Ceramic Sequence at Mitrou, East Lokris: Chronology and Wider Cultural Implications" by Christopher Mark Hale (The Australian Archaeological Institute at Athens) by Salvatore Vitale (Università degli studi di Pisa) and Aleydis Van de Moortel (University of Tennessee, Knoxville); "Organic Pottery Residues at Agia Triada Cave: A Preliminary Analysis" (Poster) by Rachel Vykukal (University of Tennessee); "A New Protopalatial Ceramic Deposit: Exploring Local Pottery Production and Consumption in Mochlos from the Middle Minoan I-IIB" by Georgios Doudalis (Ruprecht-Karls-Universität Heidelberg); "Not Sloppy but Hasty: Late Athenian Black-Figure" by Kathleen M. Lynch

(University of Cincinnati); "A Military Kiln Complex at Vindolanda: Production for the Local and Regional Military Economy" by Alexander Meyer (University of Western Ontario); and "2013-2015 Survey of Neolithic Agricultural Sites in the Tavoliere (Italy): A Report on Ceramic and Lithic Finds as well as Aeria" by Robert H. Tykot (University of South Florida), Craig Alexander (University of Cambridge), Keri A. Brown (University of Manchester), Kyle P. Freund (Indian River State College), and Italo M. Muntoni (Soprintendenza per i Beni Culturali della Puglia).

Society for Historical Archaeology Annual Conference, Washington, DC, 6-10 January 2016 which commemorates the 100th Anniversary of the National Park Service (NPS) and the 50th Anniversary of the National Historic Preservation Act (NHPA). The full program and abstracts of papers and posters is available at <https://www.conftool.com/sha2016/sessions.php>. SYM-118a: The Production and Archaeological Analysis of 18th and 19th Century American Ceramics, Part 1: "The potters of Charlestown (Boston), MA, their wares, and their archaeological contributions" by Joseph Bagley (City of Boston); "The Fallacy of Whiteware" Patrick H. Garrow (Cultural Resource Analysts, Inc.); "Ceramics and the Study of Ethnicity: A Case Study from Schoharie County, New York" by Jamie M. Meinsen (SUNY New Paltz); "In a New York State of Mind: Developing Stoneware Traditions in Virginia from Richmond to the Upper Shenandoah Valley" by Kurt C. Russ (Mountain Valley Preservation Alliance); 18th Century Stoneware From New Jersey" by William B. Liebeknecht (Hunter Research, Inc.); "American Stoneware, What it Looks Like from an 18th Century Point of View" by Meta F. Janowitz (AECOM); "...Much improved in fashion, neatness and utility.": The Development of the Philadelphia Ceramic Industry, 1700-1800" by Deborah L. Miller (AECOM); "Slipware Philadelphia Style: Case Study from Recent Excavations at the Museum of the American Revolution Site" by Juliette J. Gerhardt (JMA). SYM-118b: The Production and Archaeological Analysis of 18th and 19th Century American Ceramics, Part 2: "Movement of Potters and Traditions: A View from Washington County, Virginia" by Chris T. Espenshade (Commonwealth Cultural Resources Group, Inc.); "Defying Isolation: Pre-Civil War American Pottery Production and Marketing" by Brenda Hornsby Heindl (Museum of Early Southern Decorative Arts); "East Tennessee Earthenware: Continuing The Tradition" by Stephen T. Rogers (Tennessee Historical Commission); "Slipped, Salted and Glazed: An Overview of North Carolina's Pottery from 1750-1850" by Mary L. Farrell (Westmoor Pottery) and F. Carnes-McNaughton (Fort Bragg Cultural Resources Program); "and European Style

Pottery Making in South Carolina: 1565-1825" by Carl Steen (Diachronic), Daniel T. Elliott (Lamar Institute), and Rita F. Elliott (Lamar Institute).

Other presentations include: "Thomas Jefferson's Acquisition of Transfer Printed Ceramics for Poplar Forest" by Jack A. Gary (Thomas Jefferson's Poplar Forest); "Excavations at the Howe Pottery: A Late Nineteenth-Century Kiln in Benton, Arkansas" by Karla M. Oesch and C. Andrew Buchner (Panamerican Consultants, Inc.); "Identification of Coarse Earthenware Potters on Production and Consumption Sites in Charlestown, Massachusetts Using Biometric Identification" by Jennifer Poulsen (Peabody Museum, Harvard University) and Joseph Bagley (Boston Archaeology Program, City of Boston); "A Socioeconomic Interpretation of 19th Century Archaeological Ceramics found at Contemporaneous, Culturally Diverse Sites on Ballast Point in San Diego, California" by Michelle D. Graham (California Department of Parks and Recreation); "Clay Fingerprints: The Elemental Identification of Coarse Earthenwares from the Mid-Atlantic" by Lindsay C. Bloch (UNC-Chapel Hill); "Ceramic Research is Alive and Well" by Robert Hunter (*Ceramics in America*); "Colonowares and Colono-kachinas in the Spanish-American Borderlands: Appropriation and Authenticity in Pueblo Material Culture, 1600-1950" by Matthew Liebmann (Harvard University); "Identifying Japanese Ceramic Forms and their Use in the American West" by Renae J. Campbell (University of Idaho); "Ceramic Production on Barbados Plantations: Seasonality Explored" by Dwayne Scheid (Illinois State Archaeological Survey); "Preliminary Observations on the Nathaniel Clark Earthenware Pottery at Marietta, Ohio" by Wesley S. Clarke (The Castle Museum); "Plants, People, and Pottery: Looking at the Personal Agriculture of the Enslaved in South Carolina" by Nicole M. Isenbarger (Archaeological Research Collective, Inc.); "Interpreting the Sherds: Ceramic Consumption Practices in a Nineteenth Century Detroit Riverfront Neighborhood" (Poster) by Susan Villerot, Samantha Ellens, and Don Adzigian (Wayne State University); "Globalizing Lifeways: An Analysis of Local and Imported Ceramics at an Aku Site in Banjul, The Gambia" (Poster) by Rosemary M. Hammack (St. Mary's College of Maryland); "Potteries: Ceramics and the 50th Anniversary of the Society for Post-Medieval Archaeology" (Poster) by Alasdair Brooks (Society for Post-Medieval Archaeology); "Asian Export Porcelain at the New York City Archaeological Repository" by Sarah Kautz (University of Chicago); "Breaking News: Mended Ceramics in Historical Context" by Angelika R. Kuettner (Colonial Williamsburg Foundation); "An Archaeological

Examination of Cookware from the Storm Wreck, 8SJ5459 [St. Augustine, Florida]" by Annie E. Carter (Flinders University); "Household Artifacts from the Storm Wreck" Christopher McCarron (Southeastern Archaeological Research, Inc.: SEARCH); "Pottery and Potters in Quebec City in the 17th Century: An Archaeometric Study of Local Ceramic Production" by Huguette Lamontagne (Laval University, Canada), Allison Bain (Laval University, Canada), Pierre Francus (National Institute for Scientific Research: INRS), and Geneviève Treyvaud (National Institute for Scientific Research: INRS); and "Pots, Pipes & Plantation: Material Culture & Cultural Identity in Early Modern Ireland" by Rachel S. Tracey (Queen's University Belfast, UK).

The 10th International Congress on the Archaeology of the Ancient Near East is scheduled for 25-29 April, 2016 at OREA (Institute for Oriental and European Archaeology), the Austrian Academy of Sciences, Vienna, Austria. The focus of the 10ICAANE comprises Ancient Near Eastern Archaeology, with special attention to Prehistoric studies, Ancient Near Eastern, and Egyptian Archaeology, as well as Islamic Archaeology. A specific focus will be given to connections between the Ancient Near East and the Early Aegean. Additional information is available at [http://www.orea.oeaw.ac.at/fileadmin/user_upload/veranstaltungen/2016/1st Circular 10 icaane Call for papers.pdf](http://www.orea.oeaw.ac.at/fileadmin/user_upload/veranstaltungen/2016/1st_Circular_10_icaane_Call_for_papers.pdf) and 10icane@oeaw.ac.at

Internet Resource

Immensa Aequora: Database of Ceramics Produced in Italy. Archaeologic and Archaeometric Data Bank of Ceramics Produced in Italy / Banca Dati Archeologici e Archeometrici delle Ceramiche Prodotti in Italia: This database was designed to provide archaeologists - as well as a wider audience - with a reference tool on the topic. It contains archaeological, topographical, chemical and mineralogical data, both published and unpublished, regarding the ceramics produced in Central and Southern Italy on which laboratory analyses have been carried out (thus far, the regions under review are: Tuscany, Lazio, Campania and Sicily). One section of the database is entirely devoted to shipwrecks which carried amphorae and ceramics produced in Central and Southern Italy, together with victuals, through the Mediterranean Sea. Database queries may concern the location of production sites (and shipwrecks), the extrapolation of the ceramics produced in a specific site or in an area, the linking up between archaeological data (typological and epigraphic data) and lab-analyses. It is also possible to examine the whole bibliography about production areas and relevant ceramics. The Web site includes a 19-page "Users'

Manual" (in Italian), an atlas, ceramic fabrics (with color images of thin sections), data on shipwrecks, research map, news, and publications (5 monographs and 67 papers by G. Olcese, and 12 papers by other authors). See http://www.immensaequora.org/database_e.html

BOOK REVIEWS

David Hill, Associate Editor

Radiocarbon Dating: An Archaeological Perspective (2nd edition). R.E. Taylor and Ofer Bar-Yosef. Forward by Colin Renfrew. Left Coast Press, Walnut Creek, California. 404 pp. / 8.50 x 11.00 / Hardback (978-1-59874-590-0) \$129.00. eBook (978-1-61132-749-6) \$59.95.

Reviewed by Ronald H. Towner, Laboratory of Tree-Ring Research, The University of Arizona.

As a general rule, second editions of anything don't really deserve reviews. After all, what new can be said and who would be interested? The first edition said it all, and the second is usually just a few tweaks here and there, a new figure or two, and an updated bibliography. It's an opportunity to sell more books.

There are exceptions to every rule, of course. The second edition of *Radiocarbon Dating: An Archaeological Perspective* is not just an exception, but also a demonstration of the value of well-crafted second editions. Written by two giants in the field, R.E. Taylor and Ofer Bar-Yosef, this edition contains three new chapters and more than twice as many pages as the 1987 original. Size matters, but in this case it is the detailed discussions and nuanced explanations that make this such an outstanding contribution.

The first chapter "Basic Elements" covers much of the same ground as the original, such as ¹⁴C dating fundamentals, limits, assumptions, and the radiocarbon cycle. A nice new addition to this chapter, "Prominent Applications: Scientific and Historic," includes short discussions of interesting projects such as Kennewick Man, the Dead Sea Scrolls, and Shroud of Turin.

Chapter 2, "Major Anomalies", is, like the first edition, a nuanced discussion of how variations in the radiocarbon record have been addressed. Rigorous testing of the method via known historical and dendrochronological samples, as well as assessing the impact of contamination and fractionation, constitutes the bulk of the chapter. A new section, "Recent Anthropogenic Anomalies",

provides a welcome, detailed examination of the de Vries, Seuss, and Libby effects.

Chapters 3 (Samples and Sample Pretreatment), 4 (Measurement of Natural Radiocarbon), and 5 (Critical Evaluation of Radiocarbon Data) are not tremendously different from those in the 1st edition. This does not mean they can be skipped; they are the bread-and-butter of understanding how radiocarbon dating works, how different sample types and different counting methods affect the dates, and how such dates are calibrated.

Chapter 6, “Radiocarbon Dating in Old World Archaeology”, is one of the new chapters in the second edition. It illuminates the role ¹⁴C dating has played in some of the big questions about the human past. What was the relationship between Neanderthals and Early Modern Humans? When were Australia and New Guinea colonized? What were the processes of the transition from foraging to farming in the Near East? These are big, important questions not just in archaeology, but also in understanding our collective past. The chapter ends with short case studies of (a) dating the eruption of Santorini and its implications for understanding Aegean prehistory, and (b) long-standing debates about the dating of King David and the beginnings of the Iron Age.

Chapter 7, “Radiocarbon Dating in New World Archaeology”, is another new, and very welcome, addition to the second edition. It provides a discussion of dating the colonization of the New World with brief mentions of sites such as Tule Springs, Old Crow, Meadowcroft Rockshelter, and Pendejo Cave, among others. The case studies in this chapter include more detailed examinations of Kennewick Man and Monte Verde, two of the most controversial topics in New World archaeology in the past 25 years. I would have liked more detailed discussion of the north-south differences in radiocarbon in this chapter, but that is a minor distraction.

Chapter 8, although not new, is a much updated history of radiocarbon dating. This is one of my only quibbles with the second edition, and it is a minor one. As a historical science, perhaps the history of the field should have been placed nearer the beginning of the book. It is a fascinating tale of W.F. Libby, J.R. Arnold, E.C. Anderson and others involved in the development of the “radioactive carbon” method of dating, complete with original sketches and notes.

Although not a textbook, this edition could certainly be used as one in the appropriate setting. The production values are far superior to the original 1987 version. The writing is clean, the figures are sharp, and the volume is

handsomely produced. *Radiocarbon Dating: An Archaeological Perspective* was groundbreaking in its original form. This new edition deserves not only to be on every archaeologists’ bookshelf, it should be required reading for every archeologist who ever uses radiocarbon dates—that means most archaeologists working today. This book simply is that good.

UPCOMING CONFERENCES

2015

2-4 December AAA Australian Archaeological Association Conference: “On the Edge: The Archaeology of Adaptation and Transition”, Fremantle, WA Australia
General information: https://www.conferenceonline.com/abstract/alogin/?clear=1&warehouse_id=1342

11-12 December. Middle Palaeolithic in the Desert II. Bordeaux, France. General information: <https://sites.google.com/site/middlepalaeolithicdesert/home>

14-18 December. American Geophysical Union Fall Meeting, San Francisco, CA USA. General information: <http://fallmeeting.agu.org/2014/2015-fall-meeting/>

2016

6-9 January. Society for Historical Archaeology Conference, Washington D.C. USA. General information: http://www.sha.org/index.php/view/page/annual_meeting_s

8-11 January. Archaeological Institute of America Annual Meeting, San Francisco, CA USA. General information: <http://www.archaeological.org/annualmeeting>

3-5 February. International Conference of Aerial Archaeology, titled “From Aerostats to Drones: aerial imagery in Archaeology” Rome, Italy. General information: lbtat@unisalento.it

6-10 March. Pittcon Conference and Expo, Atlanta, Ga USA. General information: <http://www.pittcon.org/>

13-17 March. 249th National Meeting and Exposition, American Chemical Society. Denver, CO USA. General information: <http://www.acs.org>.

18-19 February. “Evaluating the Early Anthropocene Hypothesis: The Impact of Early Farming Economies on the Environment in East and West Asia” Copenhagen,

Denmark. Abstract deadline 1 December. General information: <http://eeah.ku.dk/>

29 March-2 April. 44th International Conference on Computer Applications and Quantitative Methods in Archaeology (CAA). Oslo, Norway. General information: <http://caaconference.org>

29 March -2 April. Association of American Geographers Annual Meeting, Chicago. IL USA. General information: <http://www.aag.org>

6-10 April. Society for American Archaeology. 81st Annual Meeting, Orlando, FL USA. Abstract deadline September 10 2015. General information: <http://www.saa.org/Default.aspx?TabId=1419>

12-16 April. American Association of Physical Anthropologists Annual Meeting. Atlanta, GA. General information: <http://physanth.org/annual-meeting>

15-20 May. International Symposium on Archaeometry, Kalamata, Greece. Abstract deadline December 15 2015. General information: <http://isa2016.uop.gr>

9-12 June. DIG 2015 Sardinia. General information: <http://www.developinginternationalgeoarchaeology.org/first.html>

26 June-1 July. Goldschmidt Conference, Yokohama, Japan. General information: <http://goldschmidt.info/2016/>

1-3 June. International Obsidian Conference Lipari (Italy). Abstract submission deadline: January 31, 2016 General Information: <http://rtykot.myweb.usf.edu/Obsidian%202016/>

31 July-5 August. Gordon Research Conference: Scientific Methods in Cultural Heritage Research, Newry, ME, USA. General information: <http://www.grc.org/grc/programs.aspx?id=15101>

28 August-2 September. World Archaeological Congress, Kyoto, Japan. <http://wac8.org/>

4-8 September. Society of Glass Technology Centenary Conference (SGT100) and European Glass Society Meeting. Sheffield, UK. General information: <http://www.centenary.sgt.org/Conference.htm>

18-23 September. SciX Conference 2016. Minneapolis, MN, USA. General information: <https://www.scixconference.org/>

28 Nov-2 Dec. The Sixth International Congress on Underwater Archaeology (IKUWA6) Fremantle WA Australia General information: <http://www.aima-underwater.org.au/ikuwa6-2016/>

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