SAS BULLETIN

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Supporting Student Research- R.E. Taylor Poster Award Competition

To kick off the first issue of Vol. 37 (and the first one of 2014), I want to remind our student members about the R.E. Taylor Poster Award Competition taking place at the SAA's 79th Annual Meeting in Austin, TX (April 23-27). The award acknowledges innovative student contributions to archaeological research through the use of scientific methods. It is named in honor of Prof. Emeritus R. Ervin Taylor of U.C. Riverside for his outstanding contributions in the development and application of radiocarbon dating in archaeological research and his dedication to the founding of the SAS.

The recipient will be awarded $100 (USD), a one-year SAS membership and an *SAS Bulletin* subscription. Entries will be judged on the significance of the archaeological problem, appropriateness of the methods used, soundness of conclusions, quality of the poster display, and oral presentation by the student at the SAA poster session. Details about the the application process and a list of past recipients are available on the SAS website (www.socarchsci.org/awards.html). The deadline for applications is April 1, 2014.

This issue features an article by the 2013 R.E. Taylor Poster Award recipient R. Kyle Bocinsky. In the research presented, Kyle determined if selecting where to locate a site is based on how well it can be defended (*socarchsci.org/poster/BOCINSKY_NW_Defense_10.pdf*)

In This Issue

Working with data from pre- and post-contact archaeological sites in the Gulf of Georgia and lower Fraser River valley of British Columbia, he analyzed a digital elevation model to assess visibility and elevation advantage, as a means of estimating defensibility. For the article in this issue, Kyle is working with DEMs again, but this time offers a very useful "how to" for fixing problems caused in the appearance of landscapes that include reservoirs or dammed lakes. He offers step by step instructions on how to correct for the flat appearance of these features and represent the landscape accurately.

Also in this issue are great contributions by our Associate Editors that include book reviews, conference announcements/reviews, recent publications, an article on blogging in bioarchaelogy, our occasional specialized topic maritime archeology, and much more. I hope learning about the ongoing research in archaeological sciences will inspire students to enter the R.E. Taylor Poster Award Competition to highlight their work (or make Advisors/Supervisors/P.I's encourage their students to enter). Good luck to all those who apply!

Vanessa Muros, Editor

Drain Your Dammed DEMs! Here's How.

R. Kyle Bocinsky
Dept. of Anthropology, Washington State University

It's a great time to be analyzing archaeological landscapes. Thanks to high-resolution satellite and LiDAR imagery readily available on federal databases, the days of painstakingly digitizing contours from the old USGS quads are thankfully behind us. All it takes is a quick visit to the USGS National Elevation Dataset (NED; http://ned.usgs.gov) website to get a custom-clipped elevation model that will allow you to set about analyzing viewsheds, calculating least-cost paths, and predicting site locations until the cows come home, or at least until next field season. The possibilities seem endless.

But then, in the midst of a Tobler-induced euphoria, you realize all of your imaginary Swiss army men are hiking *directly across* Glen Canyon; or perhaps just a *bit too much* of a valley is visible from that Iron Age ring fort; or maize productivity in Dolores Canyon is just *too good to be true*. You check your parameter settings, cranking up the costs for hiking into canyons or discounting the productivity of alluvial soils, but nothing seems to fix the problem. Then, after cursing ESRI for the hundredth time, you notice something about the DEM on your screen. That canyon does not seem quite as steep or deep as it should be! That valley does not exist in the DEM at all! You realize that the high-resolution, free and accessible DEM that was making all of this possible has a critical flaw for archaeological research: reservoirs. Modern dammed lakes appear as flat surfaces (elevation at full-pool!) in *all* of the modern, wide-coverage DEMs. You need to drain those reservoirs, much as your prior euphoria drained at the prospect of hours spent manually correcting DEMs.

If you think that I am over-stating the problem, think again. A quick review of articles published in *American Antiquity* since the year 2000 reveals that the problem is quite ubiquitous among the relevant research in our field. There have been eight papers in the last 13 years in which region-scale DEMs have factored substantially, and not one mentions draining modern reservoirs in its study area. One of these studies (Varien et al. 2007) concerns research on which I am a collaborator (the Village Ecodynamics Project, or VEP), and in which the impact of un-drained DEMs is significant. Everything from our potential maize paleoproduction model, to our simulation of faunal resources and fuel wood distribution, to the recent work by Crabtree (2012) on regional food exchange would look different given a DEM with reservoirs removed.

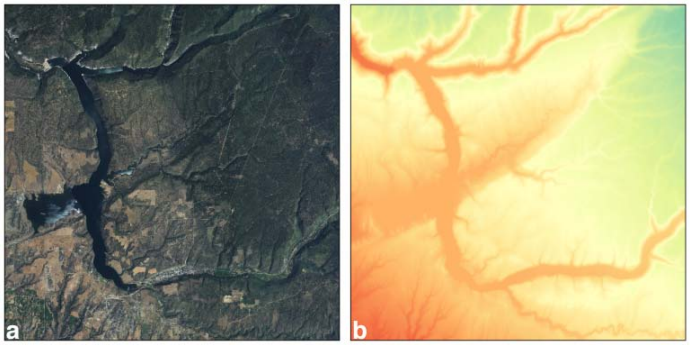

Figure 1. (a) Satellite image of McPhee Reservoir and Dam. The Dolores River enters the reservoir from the south, and the dam is in the northwest corner of the frame. Ortho-image from the National Map. (b) A 30m DEM derived from the 1 arc-second NED. Notice the elevation discontinuity following the McPhee Dam in the northwest corner of the frame.

Figure 1 presents the area in and around McPhee reservoir (previously Dolores Canyon) in southwestern Colorado, which is within the VEP study area; Figure 1 shows a modern satellite image of the region alongside a 30m DEM derived from the 1 arc-second NED. Notice how elevation within the modern reservoir is flat, then drops precipitously after McPhee Dam.

To further illustrate the problem, in the left panel of Figure 2 I plot the locations of two hypothetical sites on either side of the modern-day McPhee reservoir and calculate the shortest paths between them using the un-drained 30m NED DEM and Tobler's hiking function. As you can clearly see, the paths meander down to the lake's edge then cut straight across it before venturing up the opposite bank to the other site. The effect of the flat plane of the lake is obvious—and troubling.

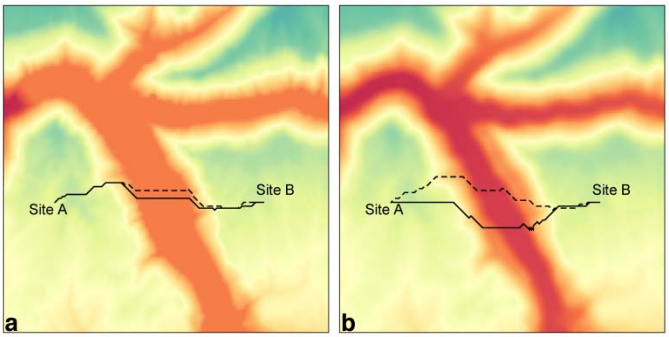

Figure 2. Shortest paths between two imaginary sites on either side of the Dolores River, computed on the un-drained (a) and drained (b) 30 m DEM derived from the 1 arc-second NED.

Hopefully a researcher interested in only the least cost path between these two sites would recognize this problem and correct the DEM before interpreting such an analysis, but what if they were performing dozens, or even thousands of least cost path analyses over several reservoirs, or calculating paths over vast distances? Recognizing and correcting all of the problem-areas would be a daunting task, indeed. Our hypothetical researcher would have to first identify the "problem areas" in her study area—the reservoirs and large dams; locate some representation of the pre-reservoir topography, such as an historic USGS topographic map; digitize the contours; convert them into a similar raster format to the DEM; embed the contour raster into the DEM; and manually correct any inconsistencies. She must then repeat this process for each modern reservoir in her study area. By the end of it, I doubt the return of analysis-induced euphoria is even a remote possibility. It should come as no surprise that so many of us have enthusiastically ignored the problem altogether. Ignorance, even feigned, is indeed bliss.

But the reservoir problem remains. What we need is a standardized workflow for systematically draining reservoirs from our DEMs that is quick, thorough, and general. Here, I present one such method. My goals in developing this method were three-fold:

1) Drain modern reservoirs from a DEM, generating an approximation of the topography under the reservoir,
2) Use only freely available data from the federal government, to assure that the method could be applied anywhere in the continental United States, and
3) Do so in a way that is highly automated—i.e., with minimal decision-making along the way—in order to assure standardization among reservoirs in a study area, and among research projects.

The method I present here has been developed in the context of my work with the VEP as an acknowledgement and attempted resolution to the reservoir problem in our own study areas. The first draft of a package for the R statistical framework that drains DEMs in the method described here is posted publically on the VEP website (village.anth.wsu.edu/DrainYourDEM), and in the future I hope to develop tools for use in ArcGIS and GRASS.

How to drain your DEM

Overview of the method

Imagine a modern reservoir such as McPhee, introduced above. The Dolores River flows into McPhee just south of Dolores, Colorado, and it flows out of the reservoir below the McPhee Dam several miles to the north. We can imagine the old flow of the Dolores river, meandering along the bottom of Dolores Canyon, gradually descending from where it hits the lake to its present exit point below the dam. If we assume that its descent was uniformly gradual we can estimate the unknown elevations along its course. The same goes for any secondary streams that flow into the canyon to meet the Dolores under the present-day reservoir—once we have elevation estimates along the Dolores River we have end elevations for the adjoining streams and can estimate elevations along their respective trajectories. The same can be done for tertiary streams that meet the secondary streams, and so on. Once we have elevation estimates along the network of streams that once flowed under the present-day reservoirs and dams, we can use a simple spatial interpolation method to fill the gaps between the streams and the reservoir shore.

Details of the method

The idea is fairly simple: we can generate elevation estimates along the courses of rivers and streams, and then interpolate from the known and estimated elevations to the unknown elevations. Let's move through it step-by-step. Here I detail the tools you can use to accomplish these steps in ArcGIS and GRASS; please refer to the source-code and documentation at village.anth.wsu.edu/DrainYourDEM for exhaustive details on how I do this using open-source tools in R. The method incorporates the following data sources:

- Old river courses (lines) and modern-day reservoir boundaries (polygons) from the *National Hydrography Dataset* (NHD), a product of the USGS,
- The spatial extent of modern dams (both earthen and concrete) from the Natural Resources Conservation Service (NRCS) soil surveys (via the SSURGO2 database), a product of the USDA,
- Any DEM, of any reasonable resolution, which the user wishes to drain.

1) *Retrieve stream courses*. The pre-reservoir courses of streams and rivers can be retrieved from the NHD in the *NHDFlowline* layer. Identify which NHD subregions lay within your study area using the National Map viewer (viewer.nationalmap.gov), and download them. Spatially join the subregions. Remove any canals and other linear features using a query. The remaining streams will be in many segments that meet end-to-end which must be joined; do so using the "dissolve" tool in ArcGIS or the "v.edit" tool with the "tool=merge" option in GRASS.
2) *Retrieve reservoir boundaries*. Modern reservoir boundaries can be retrieved from the NHD in both the *NHDWaterbody* and *NHDArea* layers. Most reservoirs are held in *NHDWaterbody*; *NHDArea* contains area polygons for large Bureau of Reclamation reservoirs and wide rivers. Spatially join the waterbody and area layers, and query to remove the rivers polygons. Reservoirs in the *NHDWaterbody* layer are not always coded as such, so we will define a reservoir as a body of water retained by a modern dam, as in the next step.
3) *Retrieve dam boundaries*. The NHD contains the point locations of dams, but not polygons of their spatial extents. Instead, fairly accurate polygons of dams can be retrieved from the NRCS soils data available from the USDA. First, download the NRCS soil data availability shapefile (available at http://websoilsurvey.sc.egov.usda.gov) and identify which soil surveys overlap with your study area. Then, download the survey data for those study areas using the USDA Web Soil Survey. Load the MapUnits shapefile, which is in the downloaded

directory /Spatial/soilmu_a_[AREA_SYMBOL].shp. You also need the map unit metadata (/Tabular/mapunit.csv). The mapunit table contains two columns of interest: the second column (*muname*) and the 24th column (*mukey*). Man-made earthen, stone, or concrete dams in the soils database are coded as "Dam" in the *muname* column; the *mukey* values correspond with each of the map unit polygons in the shapefile. Select only the *mukey* values whose corresponding *muname* values are "Dam," and then query the shapefile for the selected *mukey* values. The result will be a series of dam polygons.

4) *Identify reservoirs from dam adjacency.* Not all modern reservoirs are coded as such in the NHD, so we must identify reservoirs by their adjacency to modern dams. The dams and reservoirs come from different databases and their geometries do not usually perfectly align; however, they are almost always within less than 50m of each other. Establish a 50m buffer around each dam (using the "Buffer" tool in ArcGIS or "v.buffer" in GRASS), and then select reservoirs that overlap with the buffered dams (using "Overlay" in ArcGIS or "v.overlay" in GRASS); discard the rest.
5) *Discard DEM data for raster cells in reservoirs and dams.* Now that we have accurate polygons of modern reservoirs and dams, it is time to erase their elevation data from your DEM. In ArcGIS, use the "Extract by Polygon" tool with the "extraction_area=OUTSIDE" parameter to output a DEM with missing data in the reservoirs and dams. In GRASS, use the "v.to.rast" tool to create a raster representation of the reservoirs and dams, then use "r.mapcalc" to remove those areas from the DEM.
6) *Extract elevation information along stream courses.* Next, extract the elevations for all DEM cells along each stream course. What you want is a series of elevations that give the descent profile of the river. There should be gaps in the profiles, as missing values represent where streams flow under the reservoirs and dams. Some streams will have missing values for the entirety of their lower reaches; these are the secondary streams that flow into the reservoirs and join up with primary channels. Extract elevation profiles using the "3D Analyst" extension in ArcGIS. Convert each stream to a 3D line using the "Features to 3D" tool, then create the profile graph with the "Create Profile Graph" tool, and export the graph data for further analysis. In GRASS the process is similar to step (5): use the "v.to.rast" tool to create a raster representation of each stream, then use "r.mapcalc" to extract elevations for the raster cells through which the streams pass.
7) *Estimate elevations along "gapped" stream courses.* Now, iterate through your gapped stream courses, and when you come to a gap that has both a beginning and an end (a stream that runs completely through a reservoir), fill in the gap with a simple linear interpolation between the two end-points. Here, you are making the assumption that the stream—and, therefore, the bottom of the reservoir— descends at a constant rate from where it enters the reservoir to where it exits. Just as a refresher from high-school geometry: a line through two points can be described by simplifying the equation,
   $y-y1=m\cdot(x-x1)$
   where,
   $m=(y_1-y_2)/(x_1-x_2)$
   and (x_1,y_1) and (x_2,y_2) represent points on the line. In our case the y-values represent the elevations and x-values represent the index position of points along our stream. Simply plug in the end-points of your gap and you can calculate the elevation of any of the gapped points. This can be accomplished using a statistical package like R, Stata, or SAS, but can also be done using Microsoft Excel.
8) *Update the DEM with the interpolated stream elevations.* You can now update your DEM with the iterated elevations along the stream courses. If you've created and updated 3D polyline features in ArcGIS, use the "Polyline to Raster" tool with the "value" field set to the elevation parameter of your 3D polyline; then, combine the DEM with missing values and the rasterized polylines using the "Weighted Overlay" tool, giving preference to the non-missing DEM values. In GRASS, use the "r.mapcalc" tool to assign the revised elevation values to the DEM.
9) *Bootstrap until all gapped streams have been filled.* "Bootstrapping" an analysis means repeating that analysis using the results of its prior iteration. By updating the DEM in step (8), you have provided end-elevations for any secondary streams that flow into the primary streams running through your reservoirs. Thus, you can repeat steps (6), (7), and (8) to generate elevations under these secondary streams. Repeat the process again to generate elevations for any tertiary streams, and so on until all streams have their gaps filled with interpolated elevation information.
10) *Interpolate remaining missing data on the DEM.* Finally, once elevations have been estimated for all streams that flow under the reservoirs and dams, we have enough information about the bottom of the reservoirs to fill in the remaining missing data in our DEM. Use a local spatial interpolation method such as the Inverse Distance Weighted (IDW) interpolation to estimate missing values. In ArcGIS, first use the

"Raster to Point" tool to convert the DEM into a set of spatial points, dropping the points with missing data. Then use the "IDW" tool to create an interpolated raster from the known data points. Finally, use the "Weighted Overlay" tool to combine the interpolated raster with the DEM, giving preference to the non-missing DEM values. In GRASS, use "r.surf.idw" to interpolate the non-missing values of the raster, then "r.mapcalc" tool to assign the interpolated elevation values to the DEM.

See Figure 3 for the result drained DEM of this method, and the right panel of Figure 2 for a shortest-path analysis on the drained DEM.

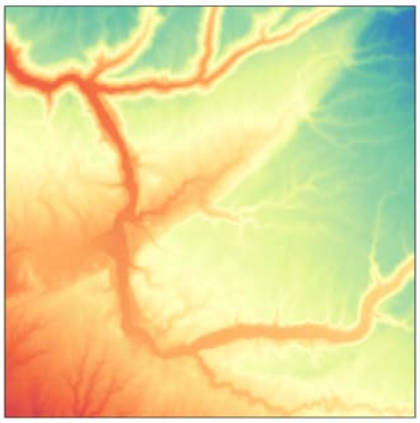

Figure 3. A 30 m DEM derived from the 1 arc-second NED, after draining.

If sufficiently automated—using Python scripting or the model-builder in ArcGIS, or scripting in GRASS or R—this workflow can rapidly, robustly, and most important of all, *reproducibly* drain a very large DEM with numerous reservoirs in a matter of minutes. It is, of course, only an approximation of what the pre-reservoir valley might have looked like, and it is likely that other methods—such as using a different spatial interpolation algorithm than IDW—will generate more realistic pre-reservoir topographies. I have provided this workflow as a starting point to demonstrate that draining DEMs is indeed feasible using publicly available data and in a general, standardized way. My hope is that others will help to develop these methods further, perhaps here in the pages of the *SAS Bulletin*.

For now, though, my message is simple: Drain your dammed DEMs!

References cited

Crabtree, S.A. (2012) *Why Can't We Be Friends? Exchange, Alliances and Aggregation on the Colorado Plateau*. Unpublished M.A. thesis, Department of Anthropology, Washington State University, Pullman, Washington.

Varien, M.D., Ortman, S.G., Kohler, T.A., Glowacki, D.M., and Johnson, C.D. (2007) Historical ecology in the Mesa Verde region: Results from the Village Ecodynamics Project. *American Antiquity*, 72, 273–299.

ANNOUNCEMENTS

Position Available, Center for Materials Research in Archaeology and Ethnology, MIT

The Center for Materials Research in Archaeology and Ethnology (CMRAE) invites applications for a full-time technical instructor/laboratory supervisor at the CMRAE Graduate Laboratory. The appointment is open now, and the position will remain open until filled. The Graduate Laboratory is the primary facility where all CMRAE graduate and undergraduate instruction takes place in the materials science and engineering of archaeological materials. Graduate students carry out their Ph.D. research and undergraduates their senior thesis research in this facility. Applicants must be skilled microscopists with considerable experience in either or both metallography [of metals, slags] and thin section, petrographic analysis of samples [ceramics, rocks, cements] with the polarizing microscope. Expertise in photography of archaeological artifacts and in handling a variety of laboratory computers and computer programs, especially Photoshop, is required. The position includes the opportunity for the laboratory supervisor to conduct independent, ongoing research and to work with faculty jointly on research projects. Experience in laboratory instruction of undergraduate students is important. Applicants must have the Ph.D., or MA/MS degree and at least three years of experience. Applications are welcome from geologists, materials engineers, archaeological scientists, and others.

Laboratory supervisor's responsibilities include, Instruction: one-on-one supervision of all users of the laboratory, working closely with CMRAE faculty on design and teaching of CMRAE laboratory courses, preparation of protocols for use of all major pieces of lab equipment, computer-aided documentation of all lab procedures; Research and documentation: work with faculty/staff/students on research projects and preparation of high quality research reports that include a range of inorganic materials, develop, maintain, and document reference collections of archaeological materials; Equipment maintenance: purchase of minor pieces of equipment and all lab supplies, maintenance of equipment in all CMRAE facilities, major responsibility for maintaining CMRAE lab computers and installing state-of-the-art software.

Please send application letter, including a statement of research interests and details of laboratory experience and teaching, CV, and names, electronic and postal addresses, and telephone and fax numbers of three references to: Prof. Heather Lechtman, MIT, Rm. 8-437, Cambridge, MA 02139, or via email to lechtman@mit.edu.

Call for Papers
2015 AIA Annual Meeting, New Orleans, LA, Jan 8-11th
"Getting Elemental: Integrating Isotopes and Archaeology"
Co-organizers: Catherine M. Kearns (Cornell University) and Jeffrey F. Leon (Cornell University)

Archaeometric investigations of stable and radioisotopes have, since the establishment of radiometric dating methods in the 1950s, become increasingly common in archaeological investigations. From analyses of local herding practices to broader models of past climate, new work continues to highlight the potentials for isotopic analyses in reconstructions of ancient social, political, and cultural practices. These advances are possible because interdisciplinary approaches are integrating archaeological and isotopic data, thus avoiding the unproductive "gap" between archaeology and the natural and physical sciences. This AIA colloquium aims to draw examples of these new applications into dialogue, examining the limitations and challenges of isotopic research, while also exploring its potential to answer social, economic, and political questions about the ancient world.

We invite abstracts from a broad range of perspectives that emphasize the integration of isotopic and archaeological data from all regions of the ancient Mediterranean world, extending from earliest prehistory. Possible topics include (but are not limited to): tracking mobility and movement of faunal and human populations, diet and foodways, palaeoclimatic and palaeoenvironmental proxies, compositional analysis of materials, radiometric analysis, and residue analysis. Papers should either consider methodological aspects (e.g. how to effectively collect and collate isotopic data for archaeological applications; statistical approaches that are useful in presenting, analyzing and interpreting data in archaeological pursuits; limitations of isotopic analyses), or present current research projects employing isotopic approaches to answer archaeological research questions. Papers that link explicit archaeological questions with isotopic data and methods (rather than simply showing isotopic data-points) will be given priority. Anonymous abstracts of no more than 400 words should be sent to archisotope@gmail.com, with identifying information in the email. Abstracts must follow the AIA guidelines, which can be found here: http://aia.archaeological.org/pdfs/annualconference/AIA_Style_Guidelines.pdf. In the body of the email, please confirm that you are a current AIA member. The deadline for submission of abstracts is 5 pm, March 4th, 2014. Once a panel with AIA member contributions is composed, it will be submitted to AIA for approval.

Call for Papers/ Conference Announcement
"Interdisciplinary Studies of Ancient Materials from the Mediterranean"
Sept. 17-19, 2014, University of Cyprus, Nicosia
NARNIA Research Network

The conference will provide an opportunity for new and established researchers to share research in an international forum and to exchange ideas on the latest interdisciplinary approaches, analytical techniques and methodologies for the integrated study of ancient materials, technologies and the environment. The NARNIA network is a collaboration of researchers who are engaged in the holistic study of ancient materials to facilitate a better understanding of the strategies associated with the production and the consumption of material culture and its impact on the historic and ancient environment.

We invite oral and poster presentations of research projects that cut across disciplines, and combine archaeological and analytical data to aid archaeological and historical interpretation. Contributions that discuss ancient production techniques, the history of technology, cultural transformation at both local and regional scales are especially welcome. In addition to the papers that will be presented by the twenty NARNIA fellows, we encourage presentations by other research teams or individuals outside of the NARNIA network.

Submitted papers and posters should fall under one or more of the following themes, which correspond to the work areas of the NARNIA project:

1. The interdisciplinary study of ancient ceramics
2. Ancient and historical glass production and trade
3. Copper metallurgy across the Mediterranean
4. Interdisciplinary assessments of architectural decoration (mosaics, wall-paintings, stone buildings)
5. Dating techniques and the palaeo-environment
6. pXRF application in Archaeology.

Abstracts of a maximum of 250 words should be submitted by March 31, 2014. More details about the abstract submission process and format can be found at: http://narnia-itn.eu/highlights/narnia-international-

conference-interdisciplinary-studies-of-ancient-materials-from-the-mediterranean/ For further information you may also contact Dr. Maria Dikomitou-Eliadou, email: m.dikom@ucy.ac.cy

ARCHAEOLOGICAL CERAMICS

Charles C. Kolb, Associate Editor

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

Book Reviews on Ceramics

Pottery in Archaeology, 2nd ed., Clive Orton and Michael Hughes, Cambridge Manuals in Archaeology, Cambridge and New York: Cambridge University Press, 2013. xvii + 340 pp., 62 figures, 9 tables; ISBN-10: 1107401305, ISBN-13: 978-1107401303, $99.00 (hardcover), $39.99 (paperback). This volume is a substantial revision and updating of a 1993 work also published by Cambridge University Press. Clive Orton, Paul Tyers, and Alan Vince were the authors of the first edition of *Pottery in Archaeology*, (1993), xvii + 269 pp., 65 figures, 12 tables. Orton was then at the Institute of Archaeology, University College and Tyers was Orton's Research Assistant. Tyers is a specialist in Roman ceramics: *Roman Pottery in Britain*, first published in 1996, reprinted in1999 and 2003, and succeeded by *Atlas of Roman Pottery in Britain* (2012). The late Alan George Vince (30 March 1952- 23 February 2009) was at the University of York and previously at City of Lincoln Archaeology Unit and the Museum of London's Department of Urban Archaeology. In 1999 he left York and established an archaeological consultancy; see "Obituary: Alan G. Vince," *SAS Bulletin* 32(2):24-25, 2009. Vince's research focused on Saxon, medieval and early modern ceramics through the application of petrographic analysis. All three authors of the first edition have substantial publications on European pottery.

Twenty years later Orton is, since 2008, Emeritus Professor of Quantitative Archaeology at the Institute of Archaeology, University College London. He received the London and Middlesex Archaeological Society Ralph Merrifield Award for service to London Archaeology and the British Archaeological Awards Lifetime Achievement Award. Orton is a member of the Archaeology Data Service (ADS) Management Committee, a member of the advisory board for *Journal of Quantitative Archaeology*, the editor of *London Archaeologist*, a member of the editorial board for *Archaeologia e Calcolatori*, chairman of Southwark and Lambeth Archaeological Excavation Committee and chair of Gresham Ship Steering Committee. His most recent books include *The Pottery from Medieval Novgorod and its Region* (2006) and *Sampling in Archaeology* (2000). Michael Hughes was Principal Scientific Officer at The British Museum, Department of Conservation and Scientific Research and Senior Lecturer in Forensic Science and Bioscience at the University of East London. He has published in *Archaeometry*, the *Journal of Archaeological Science*, *Studies in Conservation*, *Medieval Archaeology*, *Medieval Ceramics*, and the *Oxford Journal of Archaeology*.

Portions of this revised edition are similar to the first edition, some chapters are revised, other expanded, and new ones added. In this review, I shall compare and contrast the two editions and emphasize the contents of the 2013 volume. The new volume (xvii + 340 pp., 62 figures, 9 tables) is considerably longer than the 1993 work (xvii + 269 pp., 65 figures, 12 tables); in addition, the new edition uses a smaller font and many of the illustrations from the 1993 book are now reduced in size. The "Preface" (pp. xvii-xviii) and "Acknowledgments" (pp. xix-xx) in the 2013 work are, of course, revised and expanded; 1993 "Preface" (pp. xiv-xv) and "Acknowledgments" (pp. xvi-xvii). The structure of the volume remains basically the same with three Roman-numeral parts but there are 19 chapters instead of 17, plus revised and expanded appendices. The 2013 "Bibliography" (pp. 291-328) now has 725 entries versus 473 (pp. 243-263) in the first edition; notably, the "Index" (conflated topics and proper noun entries) now is 12 pages in length (pp. 329-340) rather than five (pp. 263-269).

Part I: "History and Potential," with two chapters by Orton (2013 = pp. 3-37; 1993 = pp. 1-35), are substantially the same. Chapter 1: "History of Pottery Studies" (pp. 3-23, 3 figures, 1 table) has eight components: There are three phases -- Art-History (1450 ff.), Typological (1860 ff., including Pitt-Rivers and Kidder), and Contextual (1956 ff., marked by Anna Shepard's work); four themes -- Ethnography (1782 ff.), Production Technology (1675 ff.), Scientific Method (dating, provenance, and functional studies), and Quantification. "The Way Ahead" is a component added in the 2013 edition. Chapter 2: "The Potential of Pottery as Archaeological Evidence" (pp. 24-37, 3 figures) is substantially revised and has four sections: Foundations data (made when, where, how and for what purpose), Integrated data, Interpreting data, and Implications for practice.

Part II: "Practicalities: A Guide to Pottery Processing and Recording" (2013 = pp. 41-117; 1993 = pp. 37-109) has seven chapters by Orton. Chapter 3: Integration with Research Designs" (pp. 41-45) is an expansion on research design concepts. Chapter 4: "Life in the Pot Shed" (pp. 46-70, 3 figures) focuses on pottery collections, identification, recording, workspace, and resources. There is a useful section on policies and practices: initial processing, equipment, retrieval, cleaning and drying, initial recording, processing, "spot-dating," sorting, physical reconstruction, cataloging, the use of computers, and "to keep or not to keep." Chapter 5: "Fabric Analysis" (pp. 71-80, 1 figure) is also an enlarged version of the 1993 chapter and focuses on equipment, firing characteristics (color, hardness, fracture, and slips and glazes); the identification of inclusions, textual parameters, and the matrix. Creating and using a fabric type-series is particularly elaborated. Chapter 6: "Classification of Form and Decoration" (pp. 81-92, 2 figures) concerns vessel form data, creating a form type-series, and shape descriptions. Significantly augmented are discussions of vessels vs. sherds and decoration (surface applications, surface modifications, and decoration type-series). In Chapter 7: "Illustration" (pp. 93-103, 3 figures) Orton reviews the purpose of illustrations, drawings, and photography. A discussion on SEM microphotographs in the 1993 volume has been moved to a new Chapter 13. Chapter 8: "Pottery Archives" (pp. 104-112, 3 figures) includes a discussion about the use of archives, practical issues (five types of storage), display vs. storage, indexing by computer, and the disposal of pottery. Lastly, Chapter 9: "Publication" (pp. 113-117), has been significantly revised and includes commentary on the purposes of reporting; layout, indexing, and publication standards), "computer media," and specialist reports. The 1993 discussions of presenting data on microfiche and microtype have been deleted.

Part III: "Themes in Ceramic Studies" (pp. 121-178) in the new edition contains ten chapters while the 1993 edition had eight chapters (pp. 111-228) two new chapters, rearranged and lengthened presentations, in the main, by Hughes. Chapter 10: "Making Pottery" (pp. 121-139, 5 figures, 1 table) reviews the stages of pottery manufacture from raw materials (clay, non-plastic inclusions, water, and fuel), clay preparation, (forming (hand-forming, wheel-throwing, and composite techniques), surface treatments (three brief paragraphs), drying, and firing (open firing and kiln firing). Chapter 11: "Archaeology by Experiment" (pp. 140-143, 1 figure) – three and one-half pages – is a new chapter that focuses on technical and social aspects of production (elaborated in Chapters 10, 13, and 14), and use (Chapter 18); experimental firing is mentioned. Chapter 12: "Craft Specialization and Standardization of Production" (pp. 144-149) reviews archaeological evidence in terms of: 1) structure (workshops and kilns), 2) technical aspects (clay selection through firing methods), 3) standardization and diversity, and 4) scale of production (one paragraph citing Orton's 2012 work but not Cathy Costin's contributions – these do appear in the bibliography). Theoretical implications are also noted. Chapter 13: "Pottery Fabrics" (pp. 150-189, 5 figures, 1 table) is substantially revised and augmented versus the 1993 chapter. The importance of fabrics are stressed including relationships to manufacturing techniques, provenance, visual examination (color [Munsell and GSA], hardness, inclusions, identity [D. P. S. Peacock's *Pottery in Early Commerce*, 1977], frequency, size and sorting, and roundness). A new section on archaeometry documents compositional data and fabric analysis emphasizing techniques such as petrography (thin-section and textual analysis). Research by Louise Joyner, Alan Vince, and others are cited but not publications by Chandra Reedy (*SAS Bulletin* 31(4):18-20, 2008); Bettina Bader and Mary Ownby (*SAS Bulletin* 36(4):10-13, 2013); and Patrick Quinn (*SAS Bulletin* 36(3):7-10, 2013). Heavy mineral analysis, and compositional data are reviewed; five approaches are documented: ICPS, XRF, NAA, ICP-MS, and IXP-AES (AAS has been deleted from the 1993 discussion). The authors touch on clay preparation, post-depositional environments, and sampling; the 2012 presentation adds analytical measurements, statistical analysis (principal components, cluster, and discriminate analyses), and multivariate statistics. The chapter includes information on SEM and Material Science Approaches (fabrics, surface treatments, glazes, and body fabrics). Integrating scientific and archaeological data is stressed, and the chapter concludes with mention of OES, MS, X-Ray, petrological analyses and uCT, Micro-CT, and X-Ray microtomography.

Chapter 14: "Forms" (pp. 190-202, 6 figures) is Chapter 12 in the 1993 volume. The focus is on approaches to the classification of shape (case studies are presented): type-series (Samian ware), formal classification and measurement based systems (Roman amphorae), and classification based on manufacturing sequences (Romano-British coarse ware). Geometric shapes, mathematical curves, and shape classifications are reviewed; the automatic capture of shapes (e.g. 3-D scanning) is added and the envelope system is deleted from the 1993 presentation. An example of a decision-making tree typology (following Schuring's Roman amphorae study, 1984) is included. Chapter 15: "Quantification" (pp. 203-218, 4 figures, 2 tables) includes a discussion of sampling basics, assemblage comparisons, assessments of measurements,

"practicalities" (lumpers vs. splitters, vs. fence sitters), EVREP (EVR), and assemblage sizes. There are two case studies: chronological (Pueblo de los Muertos) and functional/social patterns (Winchester Medieval tenement). Chapter 16: "Chronology" (pp. 219-234, 8 figures) reviews determinations of dates of manufacture and ranges of use, problems of intrusiveness and residuality, seriation (rewritten from 1993), and correspondence analysis. The case study involves Romano-British ware.

Chapter 17: "Production and Distribution" (pp. 235-245, 2 figures) focuses on artifact distribution (adding GIS and GIA to the 1993 discussion), artifact type distribution (with a case study on Roman Argonne ware), sources of supply (Chelmsford pottery assemblages), and identifying sources from distribution patterns. Chapter 18: "Pottery and Function" (pp. 246-261, 2 figures) is the old Chapter 17 from 1993. Individual vessel functions, functional categories, written sources, physical properties, traces of use and wear patterns (references to John Arthur's Ethiopian work [*SAS Bulletin* 31(1):19-21, 2008] appear but not Jim Skibo's two books [*SAS Bulletin* 35(4):28-30, 2012]), organic contents, deposits and residues. The 2013 edition adds GC-C-IRMS, HPLC and MALDI techniques and mentions C-3 plants as an example, pottery reuse (work by Sandra López Varela *et al*. in *JAS* 2002 is noted), and symbolic meaning. Chapter 19: "Assemblages and Sites" (pp. 262-271, 3 figures) is Chapter 13 from the 1993 book. The discussion on pottery life expectancy cites Carol Kramer (1985) and George Foster (1960) and a Yorkshire case study. Field survey data and "life after burial" (British and Gaulish examples) and the role of quantification are also discussed. A "Conclusion" (pp. 273-274) postulates the future of pottery studies and suggests three topics deserving attention. There are two appendices: "Appendix 1: Suggested Recording" (pp. 275-285, 6 figures, 4 tables) and "Appendix 2: Scientific Databases" (pp. 286-290).

This revised edition provides a relatively up-to-date account of different kinds of information that may be obtained through the study of pottery through an archaeological perspective. The authors consider scientific and quantitative techniques that are now available to the archaeologist, and assess their value for answering a range of archaeological questions. The case studies and other examples are overwhelmingly British. Over the past six decades, we have had relatively few general "ceramics in archaeology" texts available for pedagogy. Notable among these are Anna O. Shepard's *Ceramics for the Archaeologist* (1956); Prudence M. Rice's *Pottery Analysis: A Sourcebook* (1987); Carla M. Sinopoli's *Approaches to Archaeological Ceramics* (1991); Clive Orton, Paul Tyers, and Alan Vince's *Pottery in Archaeology*, 1st ed. (1993); and Alex M. Gibson and Ann Woods's *Prehistoric Pottery for the Archaeologist* (1997). Rice's has been the most comprehensive and is considered by many as the "Bible" for archaeological ceramic studies. Both volumes by Rice and Sinopoli are still in print. I have had the opportunity to review both volumes: *Pottery Analysis: A Sourcebook* by Prudence M. Rice, Chicago: University of Chicago Press, 1987. *American Scientist* 76(4):408-409, July-August 1988; *Decoding Prehistoric Ceramics* by Ben A. Nelson; and *Pottery Analysis: A Sourcebook* by Prudence M. Rice. *Journal of Field Archaeology* 17(1):93-98, Spring 1990; and *Approaches to Archaeological Ceramics* by Carla Sinopoli, New York: Plenum Press, 1991. *American Journal of Archaeology* 96(4):763-764, October 1992. We are definitely in need of a comprehensive and up-to-date text – no small order – and Orton and Hughes currently fill this gap. I have heard that two textbooks on archaeological ceramics are in various stages of preparation – they are being written by well-known American scholars and I await their publication.

Ceramics, Production, and Exchange in the Petexbatun Region: The Economic Parameters of the Classic Maya Collapse, Antonia E. Foias and Ronald L. Bishop, Vanderbilt Institute of Mesoamerican Archaeology Series 7, Nashville, TN: Vanderbilt University Press, 2013. xx + 554 pp., 217 black-and-white illustrations, 58 color plates, 76 tables, 4 appendices, references, ISBN-10: 0826518400, ISBN-13: 978-0826518408, $125.00 (cloth binding). Antonia E. Foias is Associate Professor of Anthropology at Williams College, Williamstown, MA, and serves as Department Chair. She received her doctorate in Anthropology from Vanderbilt University in 1996, specializing in Mesoamerica, especially the ancient Maya, and has published on the topics of ceramic analysis, economy and the evolution of complex society. She co-edited (with Sandra L. López Varela) *Geographies of Power: Understanding the Nature of Terminal Classic Pottery in the Maya Lowlands* (2005) and authored *Ancient Maya Political Dynamics* (2013). Since 1998 Foias has directed the multifaceted archaeological research at the site of Motul de San José, located in the Central Petén jungle of Guatemala. As senior author, Foias wrote nine of the 13 chapters and prepared all four appendices. Her co-author, Ronald L. Bishop, Senior Research Archaeologist at the National Museum of Natural History, Smithsonian Institution, Washington, DC, also serves as Curator for Mexican and Central American Archaeology. Bishop co-wrote four of the chapters with Foias. Both authors are well-known

Mesoamerican scholars, with Bishop especially known for scientific analyses of pottery with more than 140 significant publications: http://scholar.google.com/citations?hl=en&user=pOGhAswAAAAJ&view_op=list_works&cstart=120 .

Foias and Bishop previously wrote "Changing Ceramic Production and Exchange in the Petexbatun Region, Guatemala: Reconsidering the Classic Maya Collapse," *Ancient Mesoamerica*, 8(2):275-291(Fall 1997). Their 2013 volume expands greatly that article. The Classic Maya collapse has engendered a great deal of debate for more than five decades. The "collapse" was a highly variable phenomenon that did not affect the whole Maya region, so the specific events and processes taking place in different regions affected by this "transition" necessitated further exploration. In the volume under review, the authors examine the economic parameters of the collapse in the Petexbatun region from the eighth through the eleventh centuries A.D. by a meticulous examination of ceramic manufacture, production, consumption, and exchange. In this new assessment, they review this critical time period through ceramic analysis, including type-variety classification, standardization studies, and chemical provenance research. The ceramic data and analyses are employed in a reevaluation of different paradigms that have been used in explaining the Classic Maya collapse: foreign invasion theory, commercialization hypothesis, and internal warfare model. The authors conclude that the internal warfare hypothesis is supported by their interpretations of the data.

The Petexbatun Regional Archaeological Project (1989-1994) overseen by Arthur A. Demarest, Ingram Professor of Anthropology at Vanderbilt University, involves the study of a group of cities in Guatemala during the Classic Maya period that includes Seibal, Itzan, Dos Pilas, Aguateca, Tamarindito, Punta de Chimino, Nacimiento, and others. This region, characterized as the Petexbatun State by most archaeologists, was the first to be abandoned in the Late Classic, when the Maya Collapse occurred in a south to north pattern. The project has produced a series of significant publications about the region and the Foias and Bishop volume is the seventh in the series.

In the following review, I shall indicate the order of authorship of the individual, sometimes co-written, chapters. The volume begins with lists of tables, figures, and color plates plus "Acknowledgments" (pp. xix –xx) written by Foias. A summary of the contents of the 13 chapters and four appendices follow; there are 800 "References" (pp. 515-554) but no index; however, the "Contents" (pp. iii-ix) is very detailed with paginated sections and subsections in each of the chapters.

1. Introduction: Ceramic Production and Exchange Systems and the Classic Maya Collapse in the Petexbatun Region" (pp. 1-11, 1 figure). Late Classic Maya economy is characterized with attention to ceramic production and distribution. Theories explaining the collapse are reviewed and the historical context presented, and the authors also delineate the goals and methodologies of research (type-variety, standardization, and INAA). The three primary theories about the collapse are discussed briefly. 2. "Mesoamerican Ceramic Research" (pp. 13-39, 1 figure, 1 table). Foias defines craft specialization in ceramic production, ceramic exchange mechanisms, and reconstructing exchange in past societies. Nine ceramic production and distribution examples in Mesoamerica are noted: Central Mexico ("Thin Orange" pottery); Oaxaca Valley, Mexico: Tuxtla Mountains, Veracruz (Matacapan); Veracruz; Western Maya Lowlands (Palenque); Central Petén (Tikal); Maya Fine Paste Ceramics; Southeast Maya Periphery (Copan and Copador Polychromes; and the Maya Polychrome Ceramics Project. Eight studies of ceramic economies beyond Mesoamerica are also reviewed: North America (Chaco Canyon); North America (Upper Rio Grande Valley); Inka south America (Mantaro Valley); Southwest Asia (Tell Leilan); Southeast Asia (Vijayanagara, India); Southeast Asia (the Philippines); Europe (amphorae of the Roman Empire); and North Africa (Islamic el-Basra). 3. "Petexbatun Ceramic Research: Goals and Methodology" (pp. 41-54) written by Foias and Bishop. The Petexbatun ceramic collection is discussed in terms of excavation strategies and research objectives and the employment of the type-variety system (overview, problems, modification, and descriptive analyses). Second-level analyses (standardization and INAA) are mentioned briefly.

The six subsequent chapters prepared by Foias characterize the ceramic complexes from 600 B.C. to A.D 1300; wares, groups, and types are detailed within each of the chronological ceramic complexes. 4. "Excarvado Mamon Ceramic Complex (600-300 B.C.)" (pp. 55-76, 5 figures, 1 table): 5,841 specimens. Uaxactun Unslipped Ware (2 groups), Pablo Caballo Waxy Ware (2 groups), and Mars Orange Ware are documented. 5. "Faisan Chicanel Ceramic Complex (300 B.C.-A.D. 350)" (pp. 77-109, 10 figures, 1 table): 6,307 specimens. Provenience data is presented initially, comparisons made and questions raised about the Late Preclassic and Protoclassic, The wares, groups and types include Uaxactun Unslipped Ware (1 group) and Paso Caballo

Waxy Ware (6 distinctive groups). 6. "Jordan Tzakol Ceramic Complex (A.D. 350-600)" (pp. 111-140, 13 figures, 1 table): 4,427 specimens. The ceramic complex is reviewed and the issue of an Early Classic "decline" or an analytical problem is discussed. The wares, groups and types include Uaxactun Unslipped Ware (1 group) and Petén Gloss Ware (4 delineated groups). 7. "Nacimiento Tepu Ceramic Complex (A.D. 600-830)" (pp. 141-258, 80 figures, 5 tables): 185,351 specimens. Foias reviews the Early, Full, and Late Facets of the complex and details the wares, groups, and types which are comprised of Uaxactun Unslipped Ware (1 group) Petén Gloss Ware (6 different groups), Fine Gray Ware (1 group), and Dos Pilas Volcanic Brown Ware (1 group). 8. "Sepens Boca Ceramic Complex (A.D. 830-950)" (pp. 259-278, 16 figures, 1 table): 13,965 specimens. Interregional comparisons of the complex are detailed and five wares documented: Uaxactun Unslipped Ware (1 group), Petén Gloss Ware (3 groups), Fine Orange Ware (2 groups), Fine Gray Ware (1 group), and Plumbate Ware (1 group). 9. Tamarindo New Town Ceramic Complex (A.D. 950-1300)" (pp. 279-310, 3 figures, 1 table): 634 specimens. Comparisons within the complex are considered and three wares characterized: Volador Dull Slipped Ware (2 groups), Monticulo Unslipped Ware (1 group), and Uapake Unslipped Ware (1 group). 10. "Ceramic Production and Standardization in the Petexbatun Region" (pp. 311-341, 53 tables). Foias considers the metrics of standardization, rim and lip forms, and basal forms, as well as paste attributes ands and firing cores focusing on diversity within the wares. She details Monochrome Bowls (Subin Red), Impressed Monochrome Bowls (Chaquiste Impressed), Monochrome Jars (Tinaja Red and Pantano Impressed), and Polychrome Serving Vessels (tripod plates, cylindrical vases, round bowls, and flared and outcurved wall bowls). Variations in calcite temper and volcanic ash temper are elucidated as are metric form attributes of the tripod plates, cylindrical vases, round bowls, and flared and outcurved wall bowls. 11. "Interregional Ceramic Exchange Results of Instrumental Neutron Activation Analyses of Nonlocal Pottery of the Late and Terminal Classic" (pp. 343-361, 3 figures, 4 tables) prepared by Bishop and Foias. The authors comment on local versus imported ceramics and focus on the interregional production and exchange of volcanic ash-tempered Polychromes (three clusters are detailed) and the interregional production and exchange of Fine Paste Wares (previous and new research are contrasted) with concentration on the periods A.D. 760-830 and 830-950. 12. "Intraregional Ceramic Manufacture: Results of Instrumental Neutron activation Analyses of Local Pottery of the Late and Terminal Classic" (pp. 363-378, 6 figures, 7 tables) written by Bishop and Foias. The interregional production of carbonate pottery in the Petexbatun region is characterized and chemical analysis helps to define low-calcium and high-calcium subsets. Changes in production and exchange patterns are also discussed. 13. "Changing Ceramic Production and Exchange in the Petexbatun Region of Guatemala: Reconsidering the Maya Collapse" (pp. 379-391, 1 table) by Foias and Bishop. Ceramic manufacturing changes during five chronological periods are documented: Preclassic period: Excarvado (600-300 B.C.) and Faisan (300 B.C.-A.D. 350) phases; Early Classic period Jordon phase (A.D. 350-600); Late Classic period Nacimiento phase (A.D. 600-830); Terminal Classic period Sepens phase (A.D. 830-950); and Early to Middle Postclassic period Tamarindo phase (AD 830-950). Standardization and changes in monochrome and polychrome pottery production are reviewed, and INAA data results demonstrate shifts in interregional exchange in volcanic-tempered Polychromes and Fine-Paste ceramics. The theories of Classic Maya Collapse are then reconsidered briefly.

The volume concludes with the four appendices and "References" (pp. 515-554). Appendix A: "Ceramic Analysis Forms of the Petexbatun Regional Archaeological Project" (pp. 393-399); Appendix B: "Catalog of Stamp Designs" (pp. 401-410); Appendix C: "Catalog of Complete or Partial Polychrome Vessels of the Petexbatun Regional Archaeological Project" (pp. 427-505); Appendix D. "List of Archaeological Contexts Used in the Standardization Study" (pp. 507-514). The 58 Color Plates are inserted as pages 411-426.

This monograph is a signal achievement in helping determine the efficacy of the various models explaining the Classic Maya Collapse. An incredible amount of detail is presented on the ceramic assemblage (342,525 specimens) characterized extremely well by Foias. This is a model of data presentation. The INAA datasets (548 locally manufactured sherds) from the project are hosted at the University of Missouri Research Reactor (MURR) and the interpretations reflect Bishop's meticulous work and knowledge of the region. This is a valuable contribution to ceramic studies and methodology.

Archaeological Chemistry VIII, Ruth Ann Armitage and James H. Burton (eds.), ACS Symposium Series 1147, Washington, DC, American Chemical Society, Washington, DC, 2013. ISBN13: 9780841229242, eISBN: 9780841229259, DOI: 10.1021/bk-2013-1147. See http://pubs.acs.org/isbn/9780841229242 ; three of 23 contributions have ceramic content, one is online: Aaron Shugar, "Portable X-ray Fluorescence and Archaeology: Limitations of the Instrument and Suggested Methods to

Achieve Desired Results," pp. 173-19 https://www.academia.edu/4956152/_2013_Portable_X-ray_Fluorescence_and_Archaeology_Limitations_of_the_Instrument_and_Suggested_Methods_To_Achieve_Desired_Results; Robert H. Tykot, N. M. White, J. P. Du Vernay, J. S., Freeman, C. T. Hays, M. Koppe, C. N. Hunt, R. A. Weinstein, and D. S. R. A. Woodward, "Advantages and Disadvantages of pXRF for Archaeological Ceramic Analysis: Prehistoric Pottery Distribution and Trade in NW Florida," pp. 233-244; and Hasan J. Ashkanani, and R. H. Tykot, "Interregional Interaction and Dilmun Power in the Bronze Age: A Provenance Study of Ceramics from Bronze Age Sites in Kuwait and Bahrain using Non-destructive pXRF Analysis," pp. 245-267.

Postgraduate Course

"Postgraduate Course in Prehistoric, Greek and Roman Pottery: An Intensive Primer for the Study of Pottery in Greece" is scheduled 5-18 April 2014. Pottery is central to the study of archaeology in the Mediterranean. As the most numerous finds from survey and excavation, ceramics not only provide our main chronological frameworks but also direct insights into a range of issues from ancient economies to questions of identity and agency. A working knowledge of ceramics is essential for anyone considering field-work on Greece, and the ability to assess critically publications and debates about pottery is vital to an understanding of practically any issue in Mediterranean archaeology. This knowledge can only be gained by first hand exposure to the original material. This intensive course gives participants a unique opportunity to gain hands-on experience with one of the major pottery sequences in Greece, guided by leading specialists in the field. Based at the British School's Study Centre at Knossos, it makes use of the rich holdings of the Stratigraphic Museum which include material from across the Mediterranean in all periods from the Early Bronze Age to Late Roman. Strewing and examining key pottery groups will allow participants to learn the key points of identification and major debates for each period. Essential skills, like drawing or macroscopic fabric analysis, are taught in supporting workshops, and a series of lectures will introduce themes, problems and methods in the study and publication of ceramics. The course also includes visits to local potters specializing in traditional techniques and the replication of ancient technologies. The course is primarily intended for postgraduate students wishing to acquire or strengthen vital archaeological skills, but applications from late stage undergraduates with a strong intention to continue their studies will also be considered. The course fee of £750 includes accommodation at the British School Study Centre at Knossos, 24-hour access to the library, and BSA membership. Students are recommended to apply to their universities for assistance with the fees. Bursaries may be available from the BSA for those who would be otherwise unable to attend. Places are limited to 12 participants. For further information contact the Knossos Curator, Dr. Matthew Haysom (knossoscurator@bsa.ac.uk). Application forms can be downloaded from the British School website (www.bsa.ac.uk). Completed application forms and an academic reference letter should be emailed to the Knossos Curator by 17 January 2014 (knossoscurator@bsa.ac.uk). Website: www.bsa.ac.uk.

Previous Professional Meetings

The American Anthropological Association annual meeting was held in Chicago in November and reported in the previous *SAS Bulletin*. There were some changes to the symposium, "Ceramic Ecology XXVII" organized by Kostalena Michelaki (Arizona State University) and Sandra L. Lopez Varela (Universidad Autónoma del Estado de Morelos); Chaired by Sandra L. Lopez Varela (Universidad Autónoma del Estado de Morelos). The papers: "Charles C. Kolb and the Sociology of Knowledge: A Personal View" by Dean E. Arnold (The Field Museum); "Cross-Cultural Ceramic Ecology: Albania and Yucatán in the Keck Lab at Millsaps College" by Michael L. Galaty (Mississippi State University), George Bey (Millsaps College), and Timothy J. Ward (Millsaps College); "Long-Term Ceramic Taskscapes: Examining Materials, Tasks and Skill in Prehistoric Calabria, Italy" by Kostalena Michelaki (Arizona State University); "State Style and Household Production: Tarascan Ceramics" (title change from "Geological and Behavioral Choice in Tarascan Ceramic Pastes" by Amy J. Hirshman (West Virginia University); "Investigating the Production and Circulation of Pottery Vessels in Peripheral Tikal During the Classic Period" by Kirk Damon Straight (Pennsylvania State University); "The Conundrum of Volcanic Ash Temper in Ancient Maya Ceramics" by Anabel Ford (University of California Santa Barbara); "Pottery, People, and pXRF: Toward the Development of Intraregional Provenance Assays for Southeast Mesoamerican Ceramics" by David Rafael McCormick (University of South Florida) and E. Christian Wells (University of South Florida); "Of Polychrome and Politics in Southern Veracruz, Mexico" by Philip Arnold (Loyola University Chicago); "Using Ceramic Ethnoarchaeological Models to Evaluate the Organization and Scale of Production of Utilitarian Pottery in Tlajinga 33, Teotihuacan, Mexico" by James J. Sheehy (Pennsylvania State University / Juniata College) was not presented; "Clay Phoenix? Three Historical Moments of Decline and Revival in a Costa Rican Ceramic Tradition" by Jim Weil (Science Museum of

Minnesota / Monteverde Institute, Costa Rica); "Using Traditional Pottery As a Tool for Reviving Local Identity" by Aleksandra A. Wierucka (University of Gdansk, Poland); and "Landscapes of Memory: Pots and Griddles as Hermeneutic Expressions of Tlaloc at Tejalpa, Morelos" by Sandra L. López Varela (Universidad Autónoma del Estado de Morelos) and Daniel Aguilar Escobar (Universidad Autónoma del Estado de Morelos). Discussants: Christopher A. Pool (University of Kentucky) and Charles C. Kolb (Retired, National Endowment for the Humanities).

"Archaeological Research in the Kurdistan Region of Iraq and the Adjacent Areas" organized by the University of Athens and the University of Cambridge, was held in Athens, Greece, 1-3 November 2013. The program and abstracts of the presentations are online: https://www.dropbox.com/s/rkxaro9px22c833/Program.pdf One session dealt with ceramics. "Session III: Ceramic, Artifactual and Ecofactual Analysis" chaired by Georgia Kourtessi-Philippakis (University of Athens) and Maria Grazia Masetti-Rouault (Ecole Practique des Hautes Etudes, Sorbonne, Paris). Six papers concerned ceramics: Olivier Nieuwenhuyse (Leiden University) "Revisiting the Halaf period of Northern Iraq"; Claudia Beuger (Martin-Luther University of Halle-Wittenberg) "The pottery sequence of Tell Nader (Erbil) – reflections on pottery research of the Early Chalcolithic Iraqi Kurdistan"; Valentina Orsi (University of Florence) "Interaction and exchange in the ceramic traditions of the northern Jezirah at the turn of the 3rd millennium BC"; Dorota Ławecka (Warsaw University) "Ninevite V - culture or regional pottery style?"; Stuart Blaylock (Independent Scholar) "The pottery repertoire of the Garzan Valley, Batman, South-East Turkey, in the Second and First Millennia B.C: Four seasons at Gre Amer Höyük"; and Katia Gavagnin (University of Udine) "The Land of Nineveh Regional Project: Continuity and change in the ceramic tradition from the 5th Millennium BC to the Neo-Assyrian period." One additional presentation was presented in another session: Chikako Watanabe (Osaka Gakuin University) "Philological and scientific analysis of cuneiform tablets housed in Suleimaniyah Museum" (read by Tatsundo Koizum, Waseda University, Tokyo).

Forthcoming Professional Meetings

The Society for American Archaeology 79th annual meeting is scheduled 23-27 April 2014 in Austin, Texas, USA. The online Preliminary Program has been available since 16 December 2013 at http://bit.ly/PrelimSAA or http://www.saa.org/AbouttheSociety/AnnualMeeting/PreliminaryProgram/tabid/187/Default.aspx Of special interest to readers of this column are: Thursday, 24 April morning: "Poster Session on Archaeological Ceramics"; "Symposium: Characterization of Andean Ceramics" (Isabelle Druc, Chair). Friday, 25 April afternoon: "Symposium: Old World Ceramics" (Susan Kane, Chair). Saturday, 26 April morning: "Symposium: New World Ceramics" (Elizabeth Watts, Chair). Sunday, 27 April, morning: "Symposium: Pottery in the Southwest" (Patrick Lyons (Chair); "Symposium: Trade and Ceramics in the Uruk Expansion: Recent insights from Archaeometric Analyses" (Geoff Emberling and Leah Minc, Chairs).

The International Symposium on Archaeometry (ISA 2014) will be meeting in Los Angeles, California, USA, 19-23 May 2014, hosted by the Getty Conservation Institute and the University of California Los Angeles (UCLA). See http://www.archaeometry2014.com for details. Two keynote speakers for ISA 2014 have been announced: Ian Freestone (University College London): "Small Compositional Groups, Production Events and the Organisation of Production" and Terry Brown (University of Manchester): "The DNA Sequencing Revolution: New Opportunities for BioMolecular Archaeology."

The European Association of Archaeologists 20th annual meeting is scheduled 10-14 September 2014 in Istanbul Turkey. Ancient Technologies in Social Context" (To3) is one of the themes on which the meeting is focused and within this framework, is the session "Pottery as Experiment: Shifting and Adapting Production Technologies, Functions and Styles" (To3So16). Abstracts of a maximum of 200 words were due by 27 January 2014. Additional information is available at www.eaa2014istanbul.org eaa2014potteryexperiemnt@gmail.com and https://www.academia.edu/5459085/Pottery_as_Experiment_-_Call_for_Papers

ARCHAEOMETALLURGY

Thomas R. Fenn, Associate Editor

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

New Books

Archaeometallurgy in Global Perspective: Methods and Syntheses, edited by Benjamin W. Roberts and Christopher P. Thornton, 2014, Springer, Berlin/New York, xiii, 868 p., 327 illus., 150 illus. in color,

Language: English, ISBN: 9781461490166 (hbk.); 9781461490173 (e-book),Cost: $229.00 (hardcover), $179.00 (eBook).

The study of ancient metals in their social and cultural contexts has been a topic of considerable interest in archaeology and ancient history for decades, partly due to the modern dependence on technology and man-made materials. The formal study of Archaeometallurgy began in the 1970s-1980s, and has seen a recent growth in techniques, data, and theoretical movements. This comprehensive sourcebook on Archaeometallurgy provides an overview of earlier research as well as a review of modern techniques, written in an approachable way. Covering an extensive range of archaeological time-periods and regions, the 28 chapters in this volume will be a valuable resource for those studying archaeology worldwide. It provides a clear, straightforward look at the available methodologies, including: Smelting processes; Slag analysis; Technical Ceramics; Archaeology of Mining and Field Survey; Ethnoarchaeology; Chemical Analysis and Provenance Studies; and, Conservation Studies. With chapters focused on most geographic regions of Archaeometallurgical inquiry, researchers will find practical applications for metallurgical techniques in any area of their study.

Contributions to the volume are: "Introduction" (Christopher P. Thornton, Benjamin W. Roberts; p. 1), "From Ores to Metals" (David J. Killick; p. 11), "Metals" (Michael R. Notis; p. 47), "Metallography and Microstructure of Metallic Artifacts" (David A. Scott; p. 67), "The Investigation of Archaeometallurgical Slag" (Andreas Hauptmann; p. 91), "Technical Ceramics" (Marcos Martinón-Torres, Thilo Rehren; p. 107), "Methods of Mining Archaeology (Montanarchäologie)" (Thomas R. Stöllner; p. 133), "Experimental Archaeometallurgy" (Julia Heeb, Barbara S. Ottaway; p. 161), "Ethnoarchaeological and Historical Methods" (Louise Iles, S. Terry Childs; p. 193), "Chemical and Isotopic Studies of Ancient Metals" (A. Mark Pollard, Peter Bray; p. 217), "Provenance Determination of Archaeological Metal Objects" (Ernst Pernicka; p. 239), "A Conservator's Perspective on Ancient Metallurgy" (Deborah Schorsch; p. 269), "Copper Working Technologies, Contexts of Use, and Social Complexity in the Eastern Woodlands of Native North America" (Kathleen L. Ehrhardt; p. 303), "Mesoamerican Metallurgy: the Perspective from the West" (Dorothy Hosler; p. 329), "Andean Metallurgy in Prehistory" (Heather Lechtman; p. 361), "Production Networks and Consumer Choice in the Earliest Metal of Western Europe" (Benjamin W. Roberts; p. 423), "Aspects of Metalworking and Society from the Black Sea to the Baltic Sea from the Fifth to the Second Millennium BC" (Tobias L. Kienlin; p. 447), "Early Metallurgy in the Central Mediterranean" (Andrea Dolfini; p. 473), "Cairo to Cape: The Spread of Metallurgy through Eastern and Southern Africa" (David Killick; p. 507), "Organization and Specialization of Early Mining and Metal Technologies in Anatolia" (Joseph W. Lehner, K. Aslıhan Yener; p. 529), "Who Dunnit? New Clues Concerning the Development of Chalcolithic Metal Technology in the Southern Levant" (Jonathan Golden; p. 559), "Ancient Metallurgy in the Caucasus from the Sixth to the Third Millennium BCE" (Antoine Courcier; p. 579), "The Emergence of Complex Metallurgy on the Iranian Plateau" (Christopher P. Thornton; p. 665), "Production and Consumption of Copper-Base Metals in the Indus Civilization" (Brett C. Hoffman, Heather M.-L. Miller; p. 697), "Early Metal in South India: Copper and Iron in Megalithic Contexts" (Praveena Gullapalli; p. 729), "Metals, Society, and Economy in the Late Prehistoric Eurasian Steppe" (Roger Doonan, Bryan Hanks, Dmitry Zdanovich, Elena Kupriyanova, Derek Pitman, Natal'ya Batanina, James Johnson; p. 755), "Metallurgy in Ancient Eastern Asia: Retrospect and Prospect" (Katheryn M. Linduff, Jianjun Mei; p. 785), and "The Transmission of Early Bronze Technology to Thailand: New Perspectives" (Joyce C. White, Elizabeth G. Hamilton; p. 805). More information on the book and purchase information can be found at the publisher: http://www.springer.com/social+sciences/anthropology+%26+archaeology/book/978-1-4614-9016-6.

Metal Matters. Innovative Technologies and Social Change in Prehistory and Antiquity, edited by Stefan Burmeister, Svend Hansen, Michael Kunst, and Nils Müller-Scheeßel, 2013, *Menschen - Kulturen - Traditionen. Studien aus den Forschungsclustern des Deutschen Archäologischen Instituts*; Forschungscluster 2; Innovationen: technisch, sozial, Band 12, Deutsches Archäologisches Institut, Verlag Marie Leidorf (VML), Rahden/Westf., 290 p., 188 illus., 5 tabs ; 21.0 x 29.7 cm, Language: English, ISBN: 3867573921 (pbk.), 9783867573924 (pbk.), Cost: €79.80.

Today metal is a substance without which everyday life in the industrial nations would be unthinkable, and still metallurgy is a relatively recent innovation only dating back to the early 5th mill. BC. The papers of this volume are products of several workshops of the study group "Metal" of DAI-Cluster 2 held in Madrid in 2007, Torres Vedras in 2008, and Almería in 2009. An introduction by the editors is followed by articles on raw material supply and social development in 4th-mil. Egypt, Chalcolithic metallurgy in the Southern Levant in the 5th/4th mil., prehistoric mining and metal production in Jordan, copper

metallurgy in Sinai, early metallurgy in Iran, copper, gold, and silver in the Black Sea Region and the Carpathian Basin in the 5th/4th mil., early metal production in the Northern Alpine Region, copper metallurgy and social complexity on the Iberian Peninsula in the 3rd mil., the technological and social patterns of innovation in metallurgy on the Iberian Peninsula, the development of metallurgy on the Iberian Peninsula, the Roman municipium of Munigua and mining in the Hispanic south-west, Roman mining innovations on the Iberian Peninsula, as well as Roman lead production.

Contributions to the volume are: "Innovation as a Multi-faceted Social Process: an Outline" (Stefan Burmeister, Nils Müller-Scheeßel; p. 1), "Raw Material Supply and Social Development in Egypt in the 4th Millennium BC" (Ulrich Hartung; p. 13), "Innovations in Chalcolithic Metallurgy in the Southern Levant During the 5th and 4th Millennium BC. Copper-production at Tall Hujayrāṭ al-Ghuzlān and Tall al-Magaṣṣ, Aqaba Area, Jordan" (Florian Klimscha; p. 31), "Technological Innovations and Organisational Structures of Prehistoric Mining and Metal Production – Examples from Faynan, Jordan" (Andreas Hauptmann, Ingolf Löffler; p. 65), "Archaeometallurgy in Sinai. The Innovation of Copper Metallurgy" (Kristina Pfeiffer; p. 91), "Early Metallurgy in Iran – an Innovative Region as Seen from the Inside" (Barbara Helwing; p. 105) "Innovative Metals: Copper, Gold and Silver in the Black Sea Region and the Carpathian Basin During the 5th and 4th Millennium BC" (Svend Hansen; p. 137), "Innovation and Tradition. The Structure of the Early Metal Production in the North Alpine Region" (Martin Bartelheim; p. 169), "The Innovation of Copper Metallurgy on the Iberian Peninsula: Its Significance for the Development of Social Complexity in the 3rd Millennium BC" (Michael Kunst; p. 181), "The Development of Metallurgy on the Iberian Peninsula. Technological and Social Patterns of a Long-term Innovation Process" (Roland Gauß; p. 209), "Iberia: Technological Development of Prehistoric Metallurgy" (Salvador Rovira, Ignacio Montero-Ruiz; p. 231), "Retaining and Renewing. The Roman Municipium Munigua in the Light of Technical Developments in Mining in the Hispanic Southwest" (Juan Aurelio Pérez Macías, Thomas G. Schattner; p. 241), "*Tertia ratio opera vicerit Gigantum*: Innovations in Roman Mining on the Iberian Peninsula" (Helmuth Schneider; p. 261), and "The Romans and their Lead – Tracing Innovations in the Production, Distribution, and Secondary Processing of an Ancient Metal" (Peter Rothenhoefer, Norbert Hanel; p. 273). More information on the book and purchase information can be found at the publisher: http://www.vml.de/e/detail.php?ISBN=978-3-86757-392-4.

Neue Untersuchungen zur Archäometallurgie des Sinai: Die Entwicklungsgeschichte der Innovation »Kupfermetallurgie« [=New Studies on the Archaeometallurgy of the Sinai. The Developmental History of the Innovation of "Copper Metallurgy"], by Kristina Pfeiffer, 2013, *Menschen - Kulturen - Traditionen. Studien aus den Forschungsclustern des Deutschen Archäologischen Instituts*; Forschungscluster 2; Innovationen: technisch, sozial, Band 11, Deutsches Archäologisches Institut, Verlag Marie Leidorf (VML), Rahden/Westf., x+156 p., 73 illus, 20 tabs, 21.0 x 29.7 cm, Language: German, with extended English summary, ISBN: 3867573913 (pbk.), 9783867573917 (pbk.), Cost: €59.80.

The "Sinai Project" (2006-2009) of the German Archaeological Institute, the German Mining Museum, and the Faculty of Geology at Giza University Cairo studied early copper production in Sinai. It examined metal technology as an innovative practice and its function within trade networks. This study has four main topics: copper metallurgy, the origin of metallurgical technologies, provenance studies with regard to raw material supply or exchange and the impact of metallurgy on social structure. Focusing on ore deposits, smelting sites, workshops, and dwelling/camp sites, 28 find spots were visited during field work. This revealed copper ore, crucibles, smelting furnaces, copper slag, lumps, prills, and hammer/grinding stones. Crucible-smelting originated in the Southern Levant in domestic contexts of the 5th mil. and spread to Sinai and Egypt. By 3,200/100 B.C. wind-powered furnaces appeared in the Sinai and shifted to the Levant and Egypt. However, this innovation did not bring about social change, new find types or changed deposits in the Sinai in contrast to the Levant and Egypt, where specialized workshops allowed large-scale production and complex societies emerged since the late 4th mil.

The contents of the volume are: 1) Introduction; 2) Geography and Climate; 3) On the Chronology Problem in the Sinai; 4) The History of Settlement in the Sinai; 5) Geological Survey and Natural Resources; 6) Technology – the "*chaîne opératoire*"; 7) Innovation: Conceptual and Theoretical Concepts; 8) Technology Sequence Using the Example of the South Levant; 9) Innovation in Copper Technology: Sinai; 10) Provenance Studies of Copper in the Sinai; 11) Results and Summary; 12) Bibliography; 13) List of Figures; and, 14) English Summary. More information on the book and purchase information can be found at the publisher: http://www.vml.de/e/detail.php?ISBN=978-3-86757-391-7.

Gold and Gold Mining in Ancient Egypt and Nubia: Geoarchaeology of the Ancient Gold Mining Sites in the Egyptian and Sudanese Eastern Deserts, by Rosemarie Klemm and Dietrich Klemm, 2013, *Natural Science in Archaeology*, Springer, New York/Berlin, xx, 649 p. : 587 ill., 519 col., maps (some col.), 26 cm, Language: English, ISBN: 9783642225079, € 83.29 (eBook); € 105.95 (hardcover).

The book presents the historical evolution of gold mining activities in the Egyptian and Nubian Desert (Sudan) from about 4000 BC until the Early Islamic Period (~800–1350 AD), subdivided into the main classical epochs including the Early Dynastic – Old and Middle Kingdoms – New Kingdom (including Kushitic) – Ptolemaic – Roman and Early Islamic. It is illustrated with many informative color images, maps and drawings. An up to date comprehensive geological introduction gives a general overview on the gold production zones in the Eastern Desert of Egypt and northern (Nubian) Sudan, including the various formation processes of the gold bearing quartz veins mined in these ancient periods. The more than 250 gold production sites presented, are described both, from their archaeological (as far as surface inventory is concerned) and geological environmental conditions, resulting in an evolution scheme of prospection and mining methods within the main periods of mining activities. The book offers for the first time a complete catalogue of the many gold production sites in Egypt and Nubia under geological and archaeological aspects. It provides information about the importance of gold for the Pharaohs and the spectacular gold rush in Early Arab times.

The contents of the volume are: 1) Archaeological Chronology of Gold Mining in Ancient Egypt and Nubian Sudan; 2) Value of Gold in Ancient Egypt; 3) On the Regional Geology and Genesis of Gold Deposits in Egypt and Nubian Sudan; 4) Analyses of Gold and Observations on Ancient Egyptian Gold Metallurgy; 5) Gold Production Sites and Gold Mining in Ancient Egypt; 6) Gold Production Sites and Gold Mining in Nubia/Sudan; 7) Sequential and Spatial Distribution of Gold Mining Sites in the Egyptian and Nubian Eastern Deserts; Appendix; Glossary; References; and, Index.

New Articles/Book Chapters

The most recent edition of ***The Crucible*** (Issue 84, Winter 2013) is available from ***The Historical Metallurgy Society (HMS)***. The issue includes 20 pages of news, correspondence, interviews, meeting notes, book reviews, and more. A PDF version of the issue can be found at: http://hist-met.org/images/hmsnews84.pdf.

The book ***Archäometrie und Denkmalpflege 2013: Jahrestagung an der Bauhaus-Universität Weimar, 25. - 28. September 2013***, edited by Andreas Hauptmann, Oliver Mecking, and Michael Prange, 2013, *Metalla* Sonderheft 6, Deutsches Bergbau-Museum, Bochum, Germany, 343 p., illus., Language: German/English, ISSN: 0947-6229 (pbk.), contains a number of short extended abstracts on recent archaeometallurgical research. These include "Die Bedeutung von Formen in Schmeidesdeschlacken -- Rückschlüsse auf die formen der Fertigprodukte und Ihren Herstellungsprozess" (Maria Smetten, Sabine Hornung, Andreas Kronz; pp. 34-37), "Studien zu Frühmittelalterlichen Schwertschmeidetechniken Mittels 3-D-Röntgen-Computertomografie" (Ulrich Lehmann; pp. 38-43), "Provenienzstudien an Latènezeitlichen Eisenartefakten: Bleiisotopenanalysen an Eisen im Fokus" (Eveline Salzmann, Andreas Stracke, Ünsal Yalçın, Thomas Stöllner, Manuel Zeiler; pp. 44-48), "Archäometrische Forschungen zum Mittelalterlichen Bardowick" (Daniel Fellenger, Robert Lehmann, Jan-Joost Assendorp, Carla Vogt; pp. 49-52), "The Polymetallic Roman Mining Districts of Shashkoc/Šaškovac and Janjevë/Janjevo -- Economic Foundation of the Municipium Ulpiana (Kosovo)?" (K. J. Westner, G. Gassmann, G. Körlin, S. Klein; pp. 53-57), "Mobile Röntgenfluoreszenzanalytik an Tang-Zietlichen Silbergefäßen aus dem Grab der Li Chui -- Ergebnisse und Möglichkeiten" (Florian Ströbele, Jiafang Liang; pp. 58-61), "Analysis of Slag, Ore, and Silver from the Tashkent and Samarkand Areas: Medieval Silver Production and the Coinage of Samanid Central Asia" (S. Merkel, L. Sverchkov, A. Hauptmann, V. Hilberg, M. Bode, R. Lehmann; pp. 62-66), "Die Geochemische Charakterisierung von Bronzezeitlichen Gold aus Vorderasien Mittels LA-ICP-MS" (Moritz Jansen, Sabine Klein, Michael Seitz, Andreas Hauptmann; p. 67), "Methodenentwicklung für die Bestimmung von Osmiumisotopenverhältnissen für die Herkunftsanalyse von Artefakten" (Michael Krüger, Moritz Jansen, Robert Lehmann, Ingo Horn, Andreas Hauptmann, Carla Vogt; pp. 68-69), "Ancient Technology, Modern Science: Archaeometallurgy in Northern Chile" (Blanca Maldonado, Carlos Morales-Merino, Hans-Joachim Mucha; pp. 70-74), "Metallurgical and Typometrical Investigations into Early Book Printing Types from Wittenberg, Germany" (Daniel Berger, Holger Rode, Sophia L. Stieme; pp. 75-79), "Mineralogische Untersuchungen an Vererzungen in der Historischen Bergbauregion Westlicher Thüringer Wald" (S. Zierold, J. Majzlan, L. Viereck; pp. 80-84), "Materialanalytische Untersuchungen an Attischen Silberpräungen" (Oliver Baehre, Gerald Eisenblätter, André Eilert, Reinhard Denecke, Gert Kloess; pp. 85-88), and "Anwendung Röntgen- und

Neutronencomputertomographie -- ein Blick in das Innere Antiker Römischer Kupfermünzen" (Gerald Eisenblätter, Alexandra Franz, Nikolya Kardjilov, Gert Kloess; p. 89).

In the book ***The Oxford Handbook of the European Bronze Age***, edited by Harry Fokkens and Anthony Harding, 2013, *Oxford handbooks*, Oxford University Press, Oxford, xxxi, 979 pages : illustrations, maps ; 26 cm, Language: English, ISBN: 9780199572861, 0199572860, are several contributions of archaeometallurgical relevance. These include "Hoards and the Deposition of Metalwork" (Richard Bradley; pp. 121-139), "Copper and Bronze: Bronze Age Metalworking in Context" (Tobias L. Kienlin, pp. 414-436), "Bronze Age Copper Mining in Europe" (William O'Brien, pp. 437-453), and "Gold and Gold Working of the Bronze Age" (Barbara Armbruster, pp. 454-468).

From the book ***Mining and Quarrying in the Ancient Andes: Sociopolitical, Economic, and Symbolic Dimensions***, edited by Nicholas Tripcevich and Kevin J. Vaughn, 2013, *Interdisciplinary Contributions to Archaeology*, Springer, Berlin/New York, comes "Mining Under Inca Rule in North-Central Chile: The Los Infieles Mining Complex" (Gabriel E. Cantarutti; pp. 185-211), "Amalgamation and Small-Scale Gold Mining in the Ancient Andes" (William E. Brooks, Gabriela Schwörbel, and Luis Enrique Castillo; pp. 213-229), "Silver Mines of the Northern Lake Titicaca Basin" (Carol A. Schultze; pp. 231-251), "Mining, Commensal Politics, and Ritual under Inca Rule in Atacama, Northern Chile" (Diego Salazar, César Borie, and Camila Oñate; pp. 253-274), "Economic, Social, and Ritual Aspects of Copper Mining in Ancient Peru: An Upper Ica Valley Case Study" (Hendrik Van Gijseghem, Kevin J. Vaughn, Verity H. Whalen, Moises Linares Grados, and Jorge Olano Canales; pp. 275-298), "Mining Archaeology in the Nasca and Palpa Region, South Coast of Peru" (Markus Reindel, Thomas R. Stöllner, and Benedikt Gräfingholt; pp. 299-322), and "Discussion: Mineral Resources and Prehispanic Mining" (Izumi Shimada; pp. 335-353).

From the book ***Archaeometry and Cultural Heritage: the Contribution of Mineralogy. Seminario celebrado en Bilbao, 27 de Junio de 2012***, edited by José Miguel Herrero and Marius Vendrell, 2012, *Seminarios de la Sociedad Española de Mineralogía* Vol. 9, Sociedad Española de Mineralogía, Museo Geominero del Instituto Geológico y Minero de España, Madrid, comes "Archaeometallurgy: The Contribution of Mineralogy" (G. Artioli; pp. 65-78).

From the ***Journal of Archaeological Science*** (2013, Vol. 40, No. 12) comes "Glass and Metal Analyses of Gold Leaf Tesserae from 1st to 9th century Mosaics. A Contribution to Technological and Chronological Knowledge" (Elisabetta Neri, Marco Verità; pp. 4596-4606), "Iron Smelting and Smithing in Major Urban Centers in Israel during the Iron Age" (Adi Eliyahu-Behar, Naama Yahalom-Mack, Yuval Gadot, Israel Finkelstein; pp. 4319-4330), "Metallurgical Ceramics from Mayapán, Yucatán, Mexico" (Jennifer L. Meanwell, Elizabeth H. Paris, Wilberth Cruz Alvarado, Carlos Peraza Lope; pp. 4306-4318), "Copper Quality and Orovenance in Middle Bronze Age I Byblos and Tell Arqa (Lebanon)" (Ziad El Morr, Florence Cattin, David Bourgarit, Yannick Lefrais, Patrick Degryse; pp. 4291-4305), "Selected with Care? – The Technology of Crucibles in Late Prehistoric Scotland. A Petrographic and Chemical Assessment" (Daniel Sahlén; pp. 4207-4221).

From ***European Journal of Archaeology*** (2012, Vol. 15, No. 3) comes "Flint Daggers, Copper Daggers, and Technological Innovation in Late Neolithic Scandinavia" (Catherine J. Frieman; 440-464). From ***The British Museum Technical Research Bulletin*** (2012, Vol. 6) comes "An Economic History of the post-Medieval World in 50 Ingots: The British Museum Collection of Ingots from Dated Wrecks" (Paul Craddock, Duncan Hook; pp. 55-68), and "Investigating and Interpreting an Early-to-mid Sixth-century Frankish Style Helmet" (Jamie Hood, Barry Ager, Craig Williams, Susan Harrington, Caroline Cartwright; pp. 83-95).

Doctoral & Master Theses

Metalworkers and Smelting Precincts: Technological Reconstructions of Second Millennium Copper Production around Phalaborwa, Northern Lowveld of South Africa, by Thomas Panganayi Thondhlana, (Doctor of Philosophy thesis, UCL Institute of Archaeology, University College London, UK), September 2012, 482 pages, 108 figures, 31 tables, 6 appendices. This thesis examines metal production debris with the aim of reconstructing extractive metal technologies employed around Phalaborwa during the second millennium AD. Mining and metallurgy were previously identified as exclusive pulling factors for Iron Age human settlement in this agropastoral marginal area. Several Iron Age settlements with extensive metal production evidence were previously documented. This thesis places emphasis on extractive copper metallurgy previously neglected for several reasons. The early second millennium AD site of Shankare is used as the main case study. Whilst previously excavated metallurgical assemblages from late second millennium AD sites are re-investigated to explore diachronic changes in smelting technologies. The thesis is

inspired by contemporary theoretical developments in the field of 'Anthropology of Technology'.

Standard archaeological fieldwork procedures together with post-fieldwork laboratory studies were employed. Separation of copper from iron production debris visually was impossible but a combination of field observations and archaeometric approaches offered the answer. Archaeological ores, slags and technical ceramics were subjected to optical microscopy, energy dispersive x-ray fluorescence (XRF), scanning electron microscopy energy dispersive spectrometry (SEM-EDS).

Copper smelting slags differ significantly from iron smelting slags in their chemistry and microstructure. There are subtle differences in copper slags from different archaeological sites. Earlier copper slags are heterogeneous with notable unreacted minerals fragments. Despite these differences both copper and iron slags are linked to the same ore deposit at the Palabora Igneous Complex.

The metallurgical *chaînes opératoires* employed in the research area are reconstructed. At Shankare copper production is represented by crushed furnaces slags and secondary refining ceramic crucibles. Iron slags are confined to dedicated metallurgical middens whereas copper production debris is present at low density scatters and domestic middens. This spatial configuration confirms recent observations by other archaeologists in Southern Africa. These results permit preliminary discussions of sociotechnical systems of Iron Age metalworkers in the Northern Lowveld.

The Archaeology and Technology of Metal Production in the Late Iron Age of the Southern Waterberg, Limpopo Province, South Africa, by Foreman Bandama, (Doctor of Philosophy thesis, Department of Archaeology, University of Cape Town, South Africa), August 2013, xiv, 286 pages, 62 figures, 11 tables, 7 appendices. The inception of metallurgy in southern Africa was relatively late, compared to other regions in Africa, and as a result, this part of the sub-continent was mistakenly thought to have been less innovative during the Iron Age. On the contrary, dedicated materials analyses are showing that starting from the terminal first millennium AD, southern Africa is replete with innovations that include the growth of state systems, specialized long-distance trading, the re-melting of glass beads, the working of ivory, and the weaving of cotton using ceramic spindle whorls. Additionally, the appearance of gold and tin production, against a background of ongoing iron and copper metallurgy, has been interpreted by some as intimating innovation in metal technology. While some research energy has been invested into these novelties, there has only been incidental concern with the innovation in tin and bronze production. This study investigates the context of this novelty in the metallurgy of the Southern Waterberg, an area that hosts one of the unequivocal cases of pre-colonial tin mining in southern Africa. Recent trace element studies have indicated that bronzes from several elite sites in the region, were produced using tin that was sourced from the Southern Waterberg. The current chronology from the Southern Waterberg does not capture the full tin sequence that is implicated by the trace-element analyses of tin and bronze from dated contexts elsewhere and falls short by at two centuries. To bridge this gap, the present study sought, to explore the visibility of tin production in the Southern Waterberg at sites that are contemporary with the appearance of tin and bronze in southern Africa, and to investigate how this innovation was integrated into on-going iron and copper production. Rigorous methodological and theoretical approaches that include ethno-historical, archaeological and archaeometallurgical studies were employed in order to glean relevant information required to address these issues.

Ceramic typological and settlement pattern studies were used to establish the culture-historical context, while optical microscopy, x-ray fluorescence analysis and scanning electron microscopy of metallurgical remains were used to identify the metals and techniques that were employed. Ceramic technological studies were used to establish relationships between the metallurgy and the ceramic typological identities. The results suggest that the Southern Waterberg may have participated in the innovation of tin production in southern Africa. More research may strengthen this observation but it is entirely appropriate, in view of several metallurgical and non-metallurgical innovations that were on-going in societies throughout the region at large. Researchers now need to engage more with innovations and actively explore the various novelties that southern Africa exhibited during the Iron Age.

Indigenous Iron Production South of the Luvuvhu River, Limpopo Province, South Africa, by Ndivhuho Eric Mathoho, (Master thesis, Department of Archaeology, University of Cape Town, South Africa), February 2012, 125 pages, 39 figures, 6 tables. This study investigates the sociology and technology of indigenous iron production in Venda, northern South Africa. The methodological framework fuses ethnographies, historical documents, interviews and detailed archaeological and archaeometallurgical studies. The study revealed that indigenous iron production in the

study area, like elsewhere in southern Africa, was based on the direct process in which iron ores were reduced to metallic iron and slag waste products in charcoal fuelled furnaces. The technology used high grade hematite and magnetite ores which were often extracted from open shaft mines within the vicinity of smelting areas. This technology was also associated with rituals and taboos which connected the smelters to both the dead and the living. Although new furnace types appeared with new groups such as the Venda, the technology of iron smelting was relatively stable during the Early and Late Iron Ages.

Forthcoming Meetings and Conferences

The spring meeting of ***The Historical Metallurgy Society (HMS)*** is entitled "*Irish Iron: an Introduction to Ironworking in Ireland*" and will be held from April 12-13, 2014, in Blarney, County Cork, Ireland. The meeting will combine field trips with talks and an exhibition. Base camp is Blarney, just outside Cork city, where attendees can stay at the Blarney Woollen Mills Hotel. From here, on Saturday, attendees will visit east County Clare where an extensive charcoal blast furnace industry was established in the 17th century around several rich hematite mines. Three of the four well-preserved furnaces will be visited, two dated to the early seventeenth century, the other possibly nearly a century older. On Sunday morning, the little-known site of the East India Company ironworks near Bandon (Co. Cork) will be visited. This site, dating to the 1610s, is exceptional because of its heavily fortified nature. In the early afternoon, Tim Young, who has examined numerous Irish slag-assemblages, and Paul Rondelez, in the final stages of his PhD-research on late medieval ironworking in Ireland, will present an overview of the history of ironworking in Ireland. This will be accompanied by an exhibition of some of the more exceptional remains of early Irish ironworking, such as blooms, a preserved slag-pit furnace, various tuyère types, etc. For more information, and to register, visit: http://hist-met.org/meetings/spring-meeting-irish-iron.html.

The Historical Metallurgy Society (HMS) conference "*Metals Used in Personal Adornment*" and annual general meeting will be held from May 31 to June 1, 2014, at the Birmingham Museum and Art Gallery, Birmingham, England. For many centuries metal, especially precious metals, has been the dominant material used on the construction of jewelry and other items of personal adornment. The basic form of personal adornment varies over time, location and culture. This influences not only the style of the pieces but also impacts the method of manufacture. This conference therefore provides an opportunity to examine metals used and the metalworking techniques carried out to produce these pieces. Papers will cover topics on all aspects of metal use and manufacture of items of personal adornment (or specifically jewelry) from any period, location or culture. The program will be announced in early February. As part of the conference there will be a tour of the *Museum of the Jewellery Quarter*, and a behind the scenes tour of the *Birmingham Museum* conservation department where they are working on the Staffordshire Hoard. For more information, and to register, visit: http://hist-met.org/meetings/personal-adornment.html.

The ***International Symposium on Archaeometry (ISA)*** will be held from May 19-23, 2014, at the Getty Conservation Institute (GCI) and the University of California Los Angeles (UCLA), both in Los Angeles, California. The ISA will be a valuable opportunity to apply and demonstrate the latest research and findings of archaeometric research on a broad range of topics across time and space. The symposium will draw on examples and best practices from interdisciplinary research at the interface between the natural sciences, engineering and archaeology to reconstruct and understand human behavior through the study of material culture. Taking place in Los Angeles, the ISA will bring together internationally renowned archaeological scientists and archaeologists with museum professionals, conservation scientists, policy-makers, representatives from non-governmental organizations and industry, natural scientists, engineers and other interested groups to discuss new findings and innovations in technology and scientific research, and address current and global challenges in archaeology and cultural property ranging from the looting and illicit trafficking of antiquities to the archaeology of transitional periods.

There will be two oral sessions and a poster session including papers of archaeometallurgical interest. The oral sessions consist of "***Metals and Metallurgical Ceramics: Technology and Provenance"***, convened by Dave Killick and David Scott, and a special session ***"The Transition from the Bronze to the Iron Age",*** convened by Mark Pollard and Stuart Manning. There also is a "***Metals and Metallurgical Ceramics"*** section within the overall poster sessions. More information on registration and conference details can be found at: http://www.archaeometry2014.com/**.**

The Historical Metallurgy Society (HMS) conference entitled "*Metallurgy in Warfare – A Spur to Innovation and Development*" and will be held from October 3-5, 2014, at the City Hall (Malthouse Lane), Salisbury, Wiltshire, England. This meeting is timed to coincide with commemorations of the outbreak of the First World War – "The Great War" of its generation. Salisbury has

been chosen as the venue because of its convenient location for many military museums, two of them associated with weapons inconceivable without metals, the *Bovington Tank Museum*, and the *Museum of Army Flying* at Middle Wallop. Museum trips can be scheduled for Sunday, October 4, 2014. Salisbury City Hall is itself a Memorial Hall for the Second World War.

The scope of the conference is not limited to any particular historical or pre-historical period. Although any relevant contribution will be considered, the organizers are particularly hoping for papers on the following themes:

- Developments in metallurgy arising from particular military needs
- Developments in weapons or military organization arising from metallurgical innovation
- Developments in the organization and management of metal/metal artifact production required as a result of urgent military demands

Offers of papers or posters are welcome on any of these themes. There will be facilities available for posters and time will be allocated for a poster session. The maximum size for posters is A0 (841 x 1189 mm – upright/portrait format). Abstracts for papers and posters should be submitted by February 28, 2014. Abstracts should be sent by e-mail to HMSannualconf@hist-met.org in Word format and should be no longer than 250 words. Please include the name and affiliation of all authors and indicate the presenting author in bold letters. Alternatively you can send abstracts by mail to: Eddie Birch, 1 Fields End, Oxspring, Sheffield, S36 8WH. For more information please contact mejbirch@aol.com. For more information, and to register, visit: http://hist-met.org/meetings/annual-conference-2014-metallurgy-in-warfare.html.

Previous Meetings and Conferences

The ***Society for Historical Archaeology*** held its annual meeting, ***SHA Québec 2014***, "***Questions That Count: A critical evaluation of historical archaeology in the 21st century***" January 8-12, 2014, in Québec City, Québec, Canada. There were a handful of presentations and posters at the conference of archaeometallurgical interest. These included "Searching for Mineral Wealth: A Preliminary Investigation into the Metallurgical Assemblage from Cartier-Roberval" by Marcos Martinón-Torres and Yves Monette, "Stories Bricks Can Tell: Elizabethan Texts and 3-D Scanning Inform Archaeological Interpretation of Roanoke Colony Metallurgical Research" by Ervin Lane and Brent Lane, "Wendat Use of Introduced Copper-Base Metal: Evolution of Forms and Motifs from the Seventeenth to Nineteenth Centuries" by Lisa Marie Anselmi, "Morphological and Geochemical Analysis of Columbus-era Wrought Iron Artifacts of Caballo Blanco Reef, Dominican Republic" by Matthew Maus and Charles Beeker, "'Matters are Very Well Handled There, and No Expense is Spared to Make Them Profitable': Accokeek Furnace and the Early Iron Industry in Virginia" by Joseph Blondino, and "A Geochemical Approach to Inuit-European Contact" by Tyrone Hamilton. The program and abstracts for the conference can be found at: http://www.sha2014.com.

The 8th ***Experimental Archaeology Conference*** of the United Kingdom was held from January 10-11, 2014, in Oxford, UK. **The conference comprised** two days of papers, posters, workshops and activities. The conference was held jointly between Merton College and the Research Laboratory for Archaeology and the History of Art. A few papers of archaeometallurgical interest presented at the conference include "**Reproduction and Use of Sicilian Early Bronze Age Axes"** by *Claudia Speciale*, Kati Caruso, Claudio Cavazzuti, Francesca Grillo, Luca Pellegrini, and Federico Scacchetti, and "**The Carburization of Iron Objects in a Pottery Kiln" by** *Adrian Wrona*. Presentation titles and abstracts for papers and posters can be found at: http://experimentalarchaeology.org.uk/2013/12/21/schedule-for-the-8th-experimental-archaeology-conference/.

Research Opportunities

Heinrich Winkelmann Fellowship of the Deutches Bergbau Museum Bochum. The German Mining Museum Bochum (Deutches Bergbau-Museum [DBM] Bochum) provides two international postdoctoral fellowships for three months to support researchers who work in mining history, archaeology of mining or archaeometallurgy. Applications are preferred that show a direct relation to the main research focuses of the DBM. The formulation of an application for third party funds to achieve an extended research project at the DBM can be a part of the research stay and is specifically supported. The records of the mining archive, the collections and the scientific library of the DBM are available for research to the fellowship holders. The DBM also closely cooperates with the Department of History and the Department of Archaeological Sciences at the Ruhr University Bochum. Those research facilities also are available to the fellows. The fellows are expected to participate actively in the events and research discussions of the DBM and the Ruhr University of Bochum. Successful applicants need to have a PhD degree in history, archaeology, archaeometry or adjacent disciplines if coupled with a keen interest in the history or archaeology of mining. The fellowships

will be awarded for three months and will include a grant of 2,000 Euros per month and free accommodation nearby the German Mining Museum Bochum. Please send in your application - in German or English - by 31 January 2014 including the following materials:

- Curriculum Vitae
- Publication list
- Project proposal (max. 5 pages).

Queries and applications should be sent to: Prof. Dr. Thomas Stöllner (archaeology of mining, archaeometallurgy) or Dr. Lars Bluma (history of mining), Deutsches Bergbau-Museum Bochum, Am Bergbaumuseum 28, 44791 Bochum, Germany. The URL for these positions can be found at: http://hsozkult.geschichte.hu-berlin.de/chancen/id=9516&type=stipendien. Additional information about the German Mining Museum Bochum can be found at: http://www.bergbaumuseum.de.

Early Stage Researcher (ESR16) Fellowship: Bronze Age Metallurgical Ceramics from Cyprus. The Department of History and Archaeology and the Archaeological Research Unit of the University of Cyprus announce one (1) full time position for an Early Stage Researcher, for a period of 7.5 months, within the framework of the FP7 Marie Curie Initial Training Network New Archaeological Research Network for Integrating Approaches to material studies (NARNIA). The deadline for applications is Friday, January 24, 2014.

The successful candidate will be based in Cyprus and become part of an already established research team, which works on the study of Cypriot archaeometallurgy and is coordinated by Professor Vasiliki Kassianidou. This research project is a novel attempt to approach ancient Cypriot metallurgy and metalworking through the study of metallurgical ceramics. Metallurgical ceramics (remains of smelting furnaces, crucibles, tuyères and bellows), will be studied and assessed for their compositional and technological characteristics, employing a combination of macroscopic and microscopic methods of analysis. This project aims at a better understanding of the technological know-how, the raw materials and the techniques used in the production and use of metallurgical ceramics. Examples from different ancient workshops will be studied comparatively and interchangeably for the formation of a more comprehensive and concrete understanding of the organization of the Cypriot metal industry in the Bronze Age.

Eligible applicants for this Early Stage Researcher position (equivalent to a PhD position) must hold a Master's degree (MA/MSc) in the field of archaeometallurgy, or archaeological sciences or archaeology, or materials science, or chemistry. According to the Marie Curie ITN guidelines "the candidate must be, at the time of selection by the host organization, in the first four years (full-time equivalent) of their research careers." This is measured from the date when they obtained the degree which would formally entitle them to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the research training is provided, irrespective of whether or not a doctorate is envisaged. Eligible candidates must not have resided or carried out his/her main activity (work, studies, etc) in Cyprus for more than 12 months in the 3 years immediately prior to the 1st of March 2014. Short stays, such as holidays, are not taken into account. Good knowledge of the English language is essential. Holding a citizenship of the Republic of Cyprus is not a requirement. The starting date of the fellowship has been set for March 1, 2014. The fellowship will have a duration of 7.5 months. The fellowship covers a monthly salary in line with the FP7-PEOPLE-2010-ITN. The gross monthly salary will be approximately €2.728 before tax and national insurance deductions, including both the employer's and employee's contributions to social insurance. The project provides an additional mobility allowance, which will be paid to the fellow on a monthly basis. The project does not provide 13th salary or medical insurance coverage.

Interested candidates must submit the following, by **Friday, January 24, 2014**:

1. Updated Curriculum Vitae
2. Letter of interest describing their research interests and activities
3. A list of publications, if any, or, a sample of written work
4. Names and contact details of two academic referees who will be contacted directly by the evaluation committee if the candidate is in the short list. The referees will be asked to submit their recommendation letters, by February 7, 2014.

All application documents should be in English and should be sent to Dr Maria Dikomitou-Eliadou (m.dikom@ucy.ac.cy), by Friday, January 24, 2014. Applications that do not include the abovementioned information will be rejected. For more information on NARNIA please visit the following link: http://www.narnia-itn.eu or contact the project manager Dr Maria Dikomitou-Eliadou (email: m.dikom@ucy.ac.cy, office tel. 00357-22893573). For more information about the Department of History and Archaeology and the Archaeological Research Unit of the

University of Cyprus please visit the following links: http://www.ucy.ac.cy/hisarch/en/ and http://www.ucy.ac.cy/aru/en/. More information about the fellowship can be found at: http://narnia-itn.eu/fellowships/esr16-fellowship-metallurgical-ceramics-from-cyprus/.

Summer School Course: Ancient and Historic Metals: Technology, Microstructure, and Corrosion, University of Southern California (USC), Monday to Friday, June 23–27, 2014. The course is limited to 10 participants only. This five-day course will act as both an introduction and a focus of more intensive study dealing with the examination, analysis, metallographic examination and deterioration of ancient and historic metals. The course is designed to benefit conservators, scientists, conservation scientists, archaeologists and those especially interested in ancient metals who wish to learn how to prepare metallic samples for metallographic study, learn something of the technological aspects of the working and structure of metals, and how corrosion and microstructure can be discussed and examined.

Over the past 30 years an unrivalled collection of mounted metallographic samples has been assembled, which are studied as part of the course practical work, involving both polarized light microscopy and metallographic microscopy of both freshly polished and etched samples. These samples range from cast iron from China to wootz steel from India, bronze coinage alloys from the Roman Empire to high-tin bronze from ancient Thailand, silver alloys from the Parthian period to ancient Ecuador, gilded copper and tumbaga from Peru and Colombia, to mention only a few of the geographical areas covered by available samples. Course participants will be instructed in the use of polishing and etching in the examination of ancient metals and are encouraged to keep digital images of the samples they have prepared during the week. Students may also bring their own samples for examination if mounted and ground, or if not mounted, then one or two samples may be brought which can be mounted and prepared during the course.

The course instructor is Professor David A. Scott, Founding Director of the MA program in Archaeological and Ethnographic Conservation at UCLA, 2003-2011, and Professor, Department of Art History. His book, *Copper and Bronze in Art: Corrosion, Colorants, Conservation* won the prize from the Association of American Publishers as the best Scholarly/Art book published in the USA in 2002. Professor Scott has published over 115 papers in the peer-reviewed literature and is an Editor for the journal *Studies in Conservation*. The course will be held over five days from Monday 23rd June to Friday 27th June. The course will be held at the Archaeological Research Center at the University of Southern California at the Ahmanson Center, Room ACB335 (ARC Lab) and Room ACB330 (Gallery Room) on the USC campus in Los Angeles from 9:15 am to 5:00 pm each day. More detailed directions will be distributed to course participants. The cost of the instruction for the five days will be $850. This cost also includes a free copy of the textbook for this course: *Ancient Metals: Microstructure & Metallurgy Volume I: Copper and Copper Alloys*, published in 2013. For details of payment and to register for this course, as well as to receive information concerning nearby hotels in the USC vicinity, please contact the course organizer and director: Professor David A. Scott, Room A410, The Cotsen Institute of Archaeology, UCLA, 405 Hilgard Avenue, Los Angeles CA 90095-1510, USA <dascott@ucla.edu>.

Course Details:

Monday: Introduction, use of the metallurgical microscope, the mounting and polishing of samples, their preparation, use of resins, grinding and polishing. Introduction to phase diagrams and their application. Students will begin with the simple eutectic alloys of silver and copper and then progress to more complex phase diagrams to describe the alloying systems of copper-arsenical, copper-nickel, and copper-tin alloys. Casting and working of metals and aspects of bronze casting in the ancient world. Etching of some copper alloys. Recording of samples with digital camera and case studies in the examination of a group of copper alloy plaques and a bronze figurine of the god Osiris will be discussed.

Tuesday: Continuation of the examination of copper-tin and copper-tin-lead alloys. Ancient coinage alloys of the Roman period, examination of copper-arsenic bronzes, aspects of the corrosion of bronze and copper alloys. The Pourbaix diagram and some of its applications in examination of the corrosion of metallic artifacts.

Wednesday: The phase diagram for copper-silver and lead-tin alloys. Examination of silver and debased silver alloys. Surface enrichment and corrosion. Problems in the authentication of ancient silver and bronze alloys. Metallographic examination of ancient silver alloys and techniques of etching silver. Discontinuous precipitation phenomena and the age of silver alloys. Color etching of both copper alloys and silver alloys. The Philosopher plate and the Strozzi silver basin: case studies from the J. Paul Getty Museum.

Thursday: Mounting of samples brought by students. Examination of some ternary phase issues in relation to gold-silver-copper alloys. The corrosion of tumbaga alloys and aspects of the Pourbaix diagram. Video concerning the extraction of iron and steel. Introduction

to iron and steel. The principles of corrosion and the eight types of corrosion of metals. The examination of iron from meteorites. The technology of ancient iron and steel in the West, in India and in China will be contrasted and samples illustrating these different technologies examined. The metallography of ancient iron alloys.
Friday: Corrosion issues of iron and steel. Weathering steel and patinas, the nature of iron corrosion products and their implications for the stabilization of iron artifacts during conservation treatments. Gold and gold alloys: gilding: examination of gold alloys. Lecture on the technology of ancient gold alloys in South America. Continuation of laboratory work in the examination of mounted samples.

BIOARCHAEOLOGY

Katy Meyers, Associate Editor and
Kristina Killgrove, Division of Anthropology and Archaeology, University of West Florida

At the Society for American Archaeology conference in April, there will be a follow-up to 2011's blogging archaeology session, titled "Blogging Archaeology, Again." In advance of the session, Doug Rocks-Macqueen has been hosting a monthly blog carnival (http://dougsarchaeology.wordpress.com/) in which archaeology bloggers respond to prompts. Questions have focused on the benefits and issues associated with this form of communication, and all bloggers' answers are shared at the end of the month in a single post. In December, 58 bloggers responded to "The Good, The Bad, and the Ugly of Blogging Archaeology." Compared to the 2011 blog carnival leading up to the SAA session, which had around a dozen bloggers, today's blogosphere is replete with diverse voices. Blogging as a medium of communication between archaeologists and with the public is clearly growing.

The same growth in blogs, however, is not seen within bioarchaeology. Only three blogs are frequently referenced within this sub-discipline: *Powered by Osteons* written by Kristina Killgrove, *Bones Don't Lie* written by Katy Meyers, and *These Bones of Mine* written by David Mennear, which are cited in the *Oxford Bibliographies Online* entry on Bioarchaeology (Killgrove 2013) and the *SAS Bulletin* 34(4) (Rakita 2011). More recently, *Powered by Osteons*, *Bones Don't Lie*, *Ancient Bodies, Ancient Lives*, and *Past Thinking* were listed as top digital resources in the "Relevance, Education, and the Future"chapter of *Bioarchaeology: An Integrated Approach to Working with Human Remains* (Martin et al. 2013:249), and *Powered by Osteons* posts have been cited in *American Anthropologist* and *Journal of the Royal Anthropological Institute* articles. As the respective authors of *Bones Don't Lie* and *Powered by Osteons*, we have found many positive benefits from our involvement in social media and outreach, including publications, citations, funding, contract writing jobs, and new connections with science reporters, colleagues, students, and the public.

Bioarchaeology bloggers serve an important role within the digital community. As experts on skeletal analysis and mortuary treatment, bloggers can serve as an educated voice countering sensationalized news stories. In the last few years, evidence of anomalous burial treatment has been used by journalists to demonstrate belief in vampires, zombies, and witches, the everlasting power of love, and differing sexualities in the past. Such popular gems include titles like "First Homosexual Caveman Found" (*Telegraph* 2011), "Roll Over Dracula: 'Vampire Cemetery' Found in Poland" (*Spiegel* 2013), and "Archaeologists find prehistoric Romeo and Juliet locked in eternal embrace" (*USA Today* 2007). Behind many of these fantastical titles are journal articles written by bioarchaeologists that explain the actual burials, surrounding context, and evidence, and the more appropriate interpretations of their meaning. Most journal articles, however, are written in scholarly language and are rarely freely available to the public.

By breaking down complicated publications laden with jargon and getting to the facts behind sensational headlines, bioarchaeology bloggers explain to the public what the evidence actually reveals. For example, in April of 2011, the British *Telegraph* and *Daily Mail* first broke the story of the "gay caveman." This burial was anomalous compared to the other strongly gendered burials in the area, and the lead archaeologist speculated that the person therefore had a non-normative sexual orientation. The news of the so-called gay caveman spread quickly around the world. Kristina Killgrove immediately deconstructed the news stories at *Powered by Osteons*, followed by similar take-downs by John Hawks on his eponymous blog and Rosemary Joyce at *Ancient Bodies, Ancient Lives*. These three bloggers' opinions were then picked up by news outlets like *LiveScience*, *CNN*, *Salon*, and *Jezebel*, which broadcast a more nuanced anthropological explanation for the burial to the public. Putting ourselves out there as experts in the field of bioarchaeology provides an important counterpoint to sensationalism in print and online media, particularly in the case of high-profile historical questions, such as the reconstruction of Mona Lisa's face and the idea that disinterring Shakespeare could tell us if he smoked marijuana.

As academics, scientists, and scholars, we have a duty to both share information and make it accessible to a non-specialist audience. Blogging helps many of us fulfill this duty, as posts are typically written in more colloquial language, consist of shorter, less formal interpretations, are discoverable via web searches, and are completely free to readers. Despite the importance of this type of communication and the importance of diversity in representing our field, bioarchaeology hasn't seen the increase in blogging that other disciplines have. We can think of a couple potential reasons for this. First, bioarchaeologists contend not only with the deceased but also with their direct descendants and mourners, some of whom may be reading our work, and their cultural baggage, which necessitates a high level of sensitivity. For example, while infanticide was practiced in some societies in the past, bloggers must be careful when discussing this topic, particularly if a current society traces its history to the past one. Second, practical concerns may limit the representation of bioarchaeology bloggers, such as how blogging affects the job search or tenure file, whether a blogger is willing to open herself up to personal criticism, and whether the blogger has the time necessary to write a thoughtful, scholarly blog. In spite of the high level of post-publication peer review, blogging is often perceived as less worthwhile a venture than the publication of a journal article. These concerns may prevent a new blogger from continuing or may deter those who are considering blogging.

There is hope for bioarchaeological blogging, however. Within the past half-decade, blogging has increased as a legitimate form of publication in the academy, and most institutions view blogging as valuable public outreach, as blog posts can reach many more people than journal articles can. For example, Kristina Killgrove's 2012 post on lead poisoning in Rome, which includes some of her own skeletal data, has been viewed over 35,000 times, thanks to links from social media sites like *Wikipedia* and *Reddit*. Her peer-reviewed article on which the post is based, however, has been cited just six times since its publication in 2010. Blogging as a new form of research dissemination is being brought full-circle by organizations such as Open Lab, which curates the best science blog posts on the web. The lead poisoning post will be included in the *2013 Open Lab Anthology*, a free digital publication that consists of 40 posts from over 1,000 nominated entries. Another example is the Joukowsky Institute's (Brown University) "Archaeology for the People" essay competition, which offers a monetary reward for the most accessible archaeological writing and publication of the top essays in a printed volume. Writing for both a specialized audience and for the public is therefore being rewarded in academic circles, and blogging can be used as both a publication venue and a public service.

New bioarchaeology blogs are popping up all the time. Some of the latest include Alison Atkin's *Deathsplaining*, Dolly Stolze's *Strange Remains*, Jess Beck's *Bone Broke*, and Scott Haddow's *A Bone to Pick*. Only time will tell, though, whether these blogs -- along with *Powered by Osteons*, *Bones Don't Lie*, and *These Bones of Mine* -- will remain current as their authors transition between stages of life and take different paths in academia. In order to have staying power, blog authors need to embrace the latest news stories about bioarchaeology and need to approach the stories with the latest in the blogging arsenal. We would like to see two improvements along this line. First, more bioarchaeology blogs could include video discussions or vlog posts. For example, Caitlin Doughty's *Ask a Mortician* series boasts tens of thousands of *YouTube* views for each episode and succeeds by offering irreverent-yet-sympathetic answers to questions about the often taboo topic of death. Vlogging about bioarchaeology has the potential to attract numerous viewers who want more in-depth information and images than a news piece can provide. Second, bioarchaeology bloggers should consider including audio. Podcasting requires little equipment other than a microphone and may reach a greater or more diverse audience than the written word. Many people want to listen to interesting stories during their commute times or at the gym; a podcast about bioarchaeology could fill this need. The new podcast *Ancient Studies Articles* includes some bioarchaeology articles read out loud and *Indiana Jones: Myth, Reality, and 21st Century Archaeology* touches on bioarchaeological topics sometimes, but there is currently no Q&A format podcast relevant to bioarchaeology.

As the popular news cycle becomes more enamored with anomalous burials, ancient cultures, and the lives and deaths of historical figures and as fictional TV shows such as Fox's *Bones* continue to promote myths about the field, more bioarchaeology bloggers are needed to champion the tenets of anthropology and counteract misconceptions about skeletons and burials. A chorus of diverse voices can make a difference in the reporting of new finds. Adding your perspective is not as arduous or as insignificant as it may seem at first: hosting sites like WordPress and Blogger remove technological barriers, and blogging is increasingly being recognized as a form of scholarly communication and as an important public service. This trend should continue in the future, particularly since new forms of open digital communication are being utilized more frequently by

scholars of bioarchaeology. What else can we do to increase participation in blogging? We are hopeful about the growing relevance of bioarchaeology blogging but will be trying to answer this question in more detail at the SAA Blogging Archaeology session in April, and we hope you'll join us there!

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BOOK REVIEWS

David Hill, Associate Editor

Interpreting Archaeological Topography: 3D Data, Visualisation and Observation. Rachel S. Opitz and David C. Cowley (eds). 2013. Oxbow Books, Oxford, UK 268 pp. $80.00 (hardback), ISBN 978-1-84217-516-3

Reviewed by John F. Weishampel, University of Central Florida

"It is only after you have come to know the surface of things" states Italo Calvino's title character *Mr. Palomar* (1983) translated by William Weaver "that you can venture to seek what is underneath. But the surface of things is inexhaustible."

As the culmination of a series of European-based networking activities, the No. 5 Publication of the Aerial Archaeology Research Group *Interpreting Archaeological Topography: 3D Data, Visualisation and Observation* (2013) edited by Rachel S. Opitz and David C. Cowley delivers a much needed summary of the state-of-the-art (circa 2012) of the application of technologies that enable the digital preservation and exploration of historic artifact, construction, and landscape surfaces. The indentations and protrusions of cultural heritage embody overlapping memories of anthropogenic and natural processes. A topographic surface, comprised of bumps and humps, ridges and furrows, dimples and pimples, represents a messy palimpsest where layers of previous modifications are not completely erased. *Interpreting Archaeological Topography* uses numerous case studies from Neolithic, Roman, Medieval, and more recent eras that extend from western Ireland to eastern Austria to southern Norway to Mediterranean France to illustrate the variety of remote sensing devices and digital analysis techniques that are being used to help archaeologists view, record, and decipher complex histories. For fine-scale artifact surfaces (tools, bones, sculptures, etc.), laser scanning confocal microscopy is described. For coarser-scale, ground-based surface measurements (pottery, facades, buildings, cave interiors, etc.), 3D photogrammetric surveying and terrestrial lidar (light detection and ranging) approaches are explained. For broad-scale landscape surfaces (large structures, settlement patterns, canal and road networks, etc.), airborne-derived measurements using passive remote sensing, i.e., more traditional aerial photography methods are presented. But the bulk of the book is devoted to broad-scale landscape surface measures using active, airborne remote sensing, i.e., lidar, which has captured the imagination of the general public and taken archaeology by storm over the last decade.

Interpreting Archaeological Topography is an edited volume consisting of 20 chapters organized into an introduction and three sections. The introductory chapters written by the editors provide a solid overview to how the sensors work and associated software tools that are in current use. The first section supplies the background, history and philosophy of understanding archaeological topographies. The second focuses on data collection/interpretation, tools/techniques, and associated experiences of practitioners. The last provides several examples of applications of how to optimize the distribution and use of these information-rich and often many-gigabyte-sized datasets which are becoming increasingly available. Given the visual nature of the medium, the book contains a rich collection of sharp, colored images which help the reader understand the digital manipulations and archaeological applications of these topographic datasets. There is a somewhat sparse, incomplete glossary at the end and sadly there is

no index so the ability to quickly look-up terms, concepts, study objects, geographic regions, methodologies, etc. is not feasible.

From the diversity of remotely-sensed surfaces, techniques to emphasize details of the interpolated x, y, z points are demonstrated. These surface renderings permit the virtual exploration of historic micro- to macro-scopic elevations. Though simple hillshading (simulating reflectance and shadowing from a particular solar azimuth and altitude angle) is the most widely-used approach, different authors provide different methods to accentuate specific details and how to integrate the topographic surfaces with additional data sets (e.g., from different sensors, field data, GIS layers) to assist with interpretation. Being an edited volume there is a certain unevenness in terms of what is being covered within each chapter and chapter-to-chapter cohesiveness is lacking. That said, it is a good first book for the neophyte, who is investigating the collection and/or analysis of topographic data for an archaeological study, and it is a good resource for the practitioner, who needs a refresher or perhaps a different perspective through the eyes of another researcher. However, given innovations in scanning sensors and the explosion of applications of these technologies to archaeological studies, this book will quickly find itself outdated. Even with the ramping up of lidar usage among archaeologists (as of 10/2013 there were more than 5000 Google Scholar hits on the combination of "lidar" and "archaeology"), as Mr. Palomar would attest, we and this book are just scratching the surface, so to speak.

From Prehistoric Villages to Cities: Settlement Aggregation and Community Transformation, edited by Jennifer Birch. Routledge Studies in Archaeology, 2013.
Reviewed by Scott G. Ortman, University of Colorado—Boulder.

This volume derives from a 2011 Society for American Archaeology Symposium and, in the words of the editor, explores "the social processes involved in the creation and maintenance of aggregated settlements and how they brought about transformations that affected virtually every aspect of a society and its culture." Case studies are drawn from across the New World and Europe and focus on situations where the population size of settlements rapidly transcended the scale of effective kin-based integration, generally from settlements of a few hundred to a few thousand people. Specific chapters focus on the spatial organization of Çatal Höyük in Neolithic Anatolia (Düring), tribal cycling in the Neolithic and Bronze Age Hungarian Plain (Duffy et al.), the emergence of the city-state in Early Iron-Age Crete (Haggis), the emergence of ceremonial platform centers in the Middle Formative Lake Titicaca Basin (Beck), the growth of proto-historic Pueblo towns in the Salinas Basin of New Mexico (Rautman), Late Classic Period Hohokam aggregation in the Tucson Basin (Wallace and Lindeman), the coalescence of Proto-historic Wendat (Iroquoian) communities in Ontario (Birch and Williamson), and the archaeology of 18th-century Cherokee townhouses in Appalachia (Rodning). The editor sets the stage for the case studies in an introductory chapter, and Stephen Kowalewski synthesizes them in a final chapter.

The volume has many strengths. One is its broad geographic coverage. That there are cross-cultural patterns in the settlement aggregation process is not surprising, but exactly what these patterns are emerges much more clearly when one has a quiver of detailed case studies, like the ones presented here, to generalize from. It is unlikely that readers will be intimate with the primary data from all or even most of the case study regions, but the extensive bibliography associated with each provides useful entrees into a variety of local literatures, thus greatly expanding the empirical basis for theory-building.

Another strength is an interesting dialogue between contingency and regularity that runs through the volume. Most of the case studies are geared toward understanding specific episodes, and are thus appropriately-immersed in local literature and debates. But there is still an eye towards generalization due to Birch's framing and editorial hand, and there is an excellent piece of generalization from the specific in Kowalewski's concluding chapter. For example, an important insight is that, for all the case studies where regional data are available, the aggregation process took place at a spatial scale much larger than that of the largest political unit. This by itself is sufficient to undermine models in which settlement aggregation is directed by aggrandizing leaders. Another important generalization is that the case studies generally find the aggregation process associated with a collectivist impulse. This once again suggests a broad cultural process is at work, and that ultimate explanations for aggregation lie in cultural forms that harness groupish aspects of human nature in the service of social integration, whether these derive from collective labor in building a Pueblo (Rautman), organization for defense in war (Birch and Williamson), new religious ideas (Beck), or sodality institutions that weave kin groups together (Haggis).

It is also especially encouraging to see data from cultural resource management play an important role in several of the case studies (Wallace and Lindeman, Birch and

Williamson, Rodning). The archaeological record is everywhere but until recently research has tended to focus in areas where this record has tangible, sensory appeal. A great advantage of CRM is that it is shining light on a wider range of contexts where the record may not be spectacular but the bits of human history represented are just as important. Several of the case studies in this volume would not have been possible a few decades ago, and in some cases appear to represent innovative approaches within their respective regions. That a wider range of human experience is now contributing to understandings of settlement aggregation is an important positive step.

A final strength of the volume is that the case studies are empirically-rich, making use of either long-term academic research projects (Düring, Rautman, Beck) or extensive cultural resource management work (Birch and Williamson, Rodning, Wallace and Lindeman). The empirical bases for most of the interpretations offered here are solid, relative to the standard in archaeology just a few decades ago. Good archaeology takes a lot of work and takes a long time to do well, but this volume is a great advertisement for the benefits good archaeology can offer the social sciences.

There are a few areas where I think future research could build on the work presented here. First, this volume recognizes the problems related to social integration and resource access that need to be solved through institutional development as societies coalesce, but it tends to overlook the opportunities for specialization and coordination of labor that come into being as settlements grow. So although several authors recognize the intensification of production that accompanied settlement aggregation in the past, there is little attention given to the economic impacts of this process. There is a burgeoning literature in economics which suggests human social networks become more efficient and more productive as they get larger, not through the directed actions of leaders but through the intuitive decisions of individuals in the networks themselves. A common refrain in this volume is that productive intensification is the handmaiden of aggregation, but I'm not sure this is the whole story. If there are also economies of scale to discover, then coalescence provides opportunities not available to smaller groups through specialization and coordination of labor. My hope is that future research will pay more attention to these network effects, which are most fully-developed in complex systems approaches, in studies of settlement aggregation.

Another area where there could be increased focus is in untangling cause and effect in the various processes that generally accompany episodes of settlement aggregation. The contributors to this volume identify these correlates well—demographic expansion, warfare, agricultural intensification, collective labor projects, public architecture, environmental change, trade—and there are certainly proposals made in specific chapters regarding what leads to what. But in many cases the archaeological record is not sufficiently fine-grained to substantiate such claims directly. Thus, to make further progress, we need to think more carefully about the underlying social processes that produce the archaeological record, and figure out more precise ways of monitoring them, in order to define and test more robust hypotheses regarding causal pathways.

A final area that I hope will receive increased focus is the role of cultural ideas themselves in coalescence. Many archaeological narratives of aggregation remain decidedly functionalist in tone, where aggregation requires new means of social integration, and thus societies transform themselves to solve these problems. A moment's reflection on contemporary politics should tell us that things are not so simple. People don't really know what will work better beforehand, and there are always competing proposals on how to frame issues and how to solve them. This suggests that social and political discourse, of the sort reflected in symbolic material culture, plays an important role in the process by which a group of people transform the ways they relate to each other and to the surrounding world. Symbolic material culture is discussed in a few of the case studies (Düring, Beck, Rodning), but only Rodning attempts to specify the discourses that promoted coalescence in a particular setting, aided by ethnographic and historic sources. If, as Kowalewski summarizes, the question is "How did people come together, how did they rapidly and fundamentally alter their ways of life?" and the answer is "they created a lot of new culture, from materials on hand, and they created new institutions, many of which were collectivist," then it would seem that understanding how ideas become norms, values, institutions and behavioral habits is the key to further progress in understanding coalescence. There would seem to be a lot of basic work still to be done in this area.

Hopefully these suggestions also serve to highlight just how much has been learned about the settlement aggregation process over the past few decades and the extent to which this volume carries the discussion forward. This book is an important contribution to the literature on settlement aggregation in a cross-cultural context, for which Jennifer Birch and the other contributors should be congratulated.

MARITIME ARCHAEOLOGY

Nicolás Ciarlo, Associate Editor

Current Research

Patacho of Pedro Dias

The Patacho of Pedro Dias Project, developed by the Institute of Nautical Archaeology and Centro de História de Além-Mar (FCSH-UNL/UAç), started in 2007 with the discovery of historical records pertaining to the wreck of a *patacho* or *caravela* in 1608 in Baleeira Cove (Figure 1). This cove is one of the inlets located at *Sagres Promotorium* in the southern part of Algarve, Portugal, the last obstacle when sailing from the Mediterranean before rounding towards northern Europe and vice versa. For centuries, the wind pattern in the area required navigation to halt and for ships to wait for prevailing winds to change in order to be able to continue the voyage. Thus was the case for Pedro Dias Carlos's light Atlantic vessel, which was returning from the New World on a commercial endeavor for the Kingdom of Spain. Archival research was followed by a preliminary survey to determine the potential for underwater cultural heritage (UCH). The survey concluded that the sandy bottom of the cove is conducive to long-term survival of submerged archaeological sites as long they remain buried and relatively undisturbed.

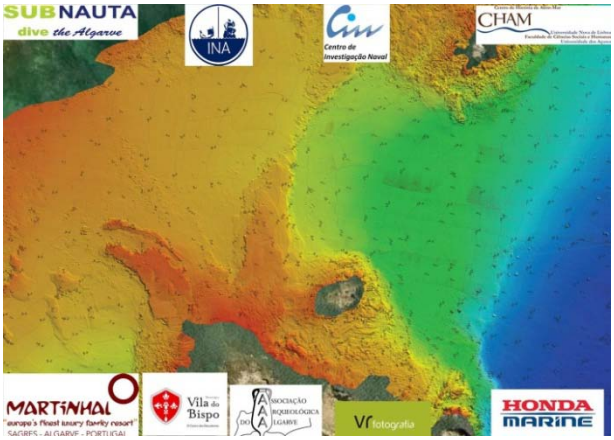

Figure 1. Multibeam survey of Baleeira's cove depth and extend.

The current project intends to: chart the known cultural heritage of the bay in GIS format; conduct preliminary analyses of the located shipwrecks; and, subsequently carry out an in-depth study of selected wrecks. In our case, besides allowing for the customary merging of data (historical charts, UCH sightings and project results), the GIS is utilized in a two pronged approach: providing cultural heritage management agencies with UCH updated; and, permitting an analyses of the local heritage in conjunction with the urban development in Baleeira Cove and the commercial activities in these sites (commercial fishing, scuba, spear-fishing or sports fishing). Our preliminary analyses of the located wrecks will try to determine a basic chronology and if possible a probable provenance. Our last goal is to identify and present an in-depth analysis of this class of light trans-Atlantic Iberian vessel.

Although these vessels were widely used in the early modern age, given the paucity of information on their construction and use, they are little understood. Portugal and Spain have the largest collection of treaties of shipbuilding of the early modern age and a well-developed historiography on ships of discovery. Notwithstanding, descriptions of the *patacho*, for example, are scant in documentary sources. One example is the anonymous *Livro náutico e o memorial das várias coisas importantes* (1575-1625). Another example, which provides a glimpse into the technological characteristics and specificities of both the *patacho* and *caravel* is the *Livro de Traças de Carpintaria*, written by Manuel Fernandes in 1616. Thus the current knowledge of these types of vessels in Portuguese historiography, which appear to be similar in hull shape and function (but not size) by the beginning of the 17th century, is limited. Most Iberian nautical archaeological research has tended to focus on ship types associated with the initial stages of Iberian maritime expansion, which do not include the class likely represented by Dias's lost vessel. This raises worthwhile questions related to the study of Iberian shipbuilding. Are the typological signatures of early expansion vessels present in these early 17th-century vessels? If this is not the case, can this type of vessel provide data that confirms propositions of a wider European shipbuilding tradition? Regarding the design of the vessel types themselves, comparisons with the descriptions given in *Livro de Traças* would make it possible to set some level of confidence about this historical resource, resulting in a beneficial study of all the other vessels presented in Fernandes's manuscript.

The project proposes to achieve these goals through a multi-layered interdisciplinary approach. Historical research in national and international archives is conducted to determine the number of recorded wrecks in the area and to ascertain probable locations within the cove (currently numbering twelve). Interviews and collaboration with local communities, both to ascertain local known wrecks and navigation costumes in the area have resulted in the location of two wrecks in the cove and the existence of two cannon groups in the area. This interaction has another benefit, which is the raising of awareness and understanding of the value of cultural heritage to the local community, which in turn aims to increase declarations of fortuitous finds. Archaeological surveying, including remote sensing missions in the areas

determined by historical and local information is gradually expanding to encompass the entire bay. Finally, ground-truthing of anomalies, including the recording of significant cultural resources, has resulted in the discovery of one previously unknown 19th-century wreck.

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Development of Tools and Techniques to Survey, Assess, Stabilize, Monitor and Preserve Underwater Archaeological Sites: SASMAP

SASMAP's purpose is to develop new technologies and best practices in order to locate, assess and manage Europe's underwater cultural heritage in a more effective way than is possible today. SASMAP will take holistic and process-based approaches to investigate underwater environments and the archaeological sites contained therein.

SASMAP will benefit the management of underwater cultural heritage in Europe and in the rest of the world by providing valuable tools to plan the preservation of offshore archaeological sites and their contents in accordance with both the Treaty of Valletta (1992) and research driven investigations. The need for SASMAP is based on the results from previous and current EU initiatives, the networks resulting from these projects and ongoing research at the consortium's institutions.

Within SASMAP a holistic approach will be taken at locating, assessing, monitoring and safeguarding underwater cultural heritage. This will involve developing and utilizing tools and technologies to allow "down-scaling" from the large scale regional level, moving on to the local site level and finally to the individual components of a site. Results obtained from the down-scaling approach at the proposed study areas will show the effectiveness of such an approach for locating and detailed mapping of archaeological sites (for more information, see www.sasmap.eu).

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Recent Publications

Oxford Handbook of Maritime Archaeology (edited by A. Catsambis et al., in 2011), Oxford University Press, USA., has an appendix with a list of the scientific analysis and dating techniques usually used in maritime archaeology, presented by type of material. A more comprehensive and detailed source about the available instrumentation for materials characterization in archaeology can be found in *Analytical Archaeometry: Selected Topics* (edited by H. Edwards & P. Vandenabeele, 2012), The Royal Society of Chemistry, Cambridge, UK. It is worth mentioning the article "The Application of Analytical Archaeometry in Underwater Cultural Heritage. A Case Study from Patagonia, Argentina" (D. Elkin et al.).

International Journal of Nautical Archaeology (*IJNA*), a leading peer-reviewed journal of the Nautical Archaeology Society (UK), has some papers about archaeometric studies conducted at underwater and coastal sites -prehistoric and historical, with emphasis on shipwrecks from Classic to Modern times- and associated materials.

From *IJNA*, Vol. 42, No. 1: "A Late Bronze Age Shipwreck with a Metal Cargo from Hishuley Carmel, Israel" (E. Galili et al.); "A Multi-disciplinary Approach to the Archaeological Investigation of a Bedrock-Dominated Shallow-Marine Landscape: an Example from the Bay of Firth, Orkney, UK" (M. Bates et al.); "The Roman Shipwreck of Antirhodos Island in the Portus Magnus of Alexandria, Egypt"(P. Sandrin et al.); "The Belgammel Ram, a Hellenistic-Roman Bronze Proembolion Found off the Coast of Libya: Test Analysis of Function, Date and Metallurgy, with a Digital Reference Archive" (J. Adams et al.); "Maritime Site Protection and the Fetch Method: An Example from Rogaland, Norway" (M. Nitter et al.); "Dendro-chronological Dating and Provenancing of Timbers from the Arade 1 Shipwreck, Portugal" (M. Domínguez-Delmás et al.); and "The 19th-Century Akko 1 Shipwreck, Israel: Hull-Construction Report" (D. Cvikel & Y. Kahanov).

From *IJNA*, Vol. 42, No. 2: "Mapping Submerged Archaeological Sites using Stereo-Vision Photogrammetry" (J. Henderson et al.); "Survey Results from Lagos Bay, Portugal" (T. Fraga); "High-Resolution 3D Marine Seismic Investigation of Hedeby Harbour, Germany" (C. Mueller et al.); "Early Modern Merchant Ships, Nicolaes Witsen and a Dutch-Flush Index" (T. Maarleveld); and "The Mechanism and Kinetics of In Situ Conservation of Iron Cannon on Shipwreck Sites" (I. MacLeod).

The ***Journal of Archaeological Sciences*** has some very exciting works and strongly recommend checking this source. Reviewing the numerous papers published during 2013, it is worth mentioning the following articles: *JAS*, Vol. 40, No. 8: "Modeling Distance with Time in Ancient Mediterranean Seafaring: A GIS Application for the

Interpretation of Maritime Connectivity" (J. Leidwanger); *JAS*, Vol. 40, No. 10: "Explaining the Monopoly in Shell-bead Production on the Channel Islands: Drilling Experiments with Four Lithic Raw Materials" (B. Nigra & J. Arnold); *JAS*, Vol. 40, No. 11: "Bulbs of Onion (*Allium cepa* L.) and Garlic (*Allium sativum* L.) from the 15th-century Copper Wreck in Gdańsk (Baltic Sea): a part of victualling?" (M. Badura et al.); and *JAS*, Vol. 40, No. 12: "An Island-wide Assessment of the Chronology of Settlement and Land Use on Rapa Nui (Easter Island) based on radiocarbon data" (M. Mulrooney).

Previous Meetings and Conferences

46th Annual Conference on Historical and Underwater Archaeology. Last year, the Society for Historical Archaeology Annual Conference was held in Leicester, UK, from January 9th to12th. The crosscutting theme "Globalization, immigration, transformation" was put across outstandingly well. Besides two general sessions on scientific and technological applications in historical and underwater archaeology, other papers which include data from analytical methods and techniques were also presented on specific symposiums. It is worth noting those related to remote sensing, dendrochronology, geomorphology, sedimentology, digital imaging, modeling, and materials characterization.

Among them, the following papers can be highlighted: "The Naval Dockyard at Praça D. Luís I, Lisbon (Portugal): An Insight into a Structure from the Age of Discovery" (T. Alves de Freitas et al.); "When Medieval becomes Early Modern – Changing Interpretations of the Poel 11 and Hiddensee 12 Ships from the Southwestern Baltic Sea in Germany" (M. Belasus); "Archaeo-metallurgy of an 18th Century Shipwreck: The Sloop-of-war HMS Swift (1770), Santa Cruz, Argentina" (N. Ciarlo); "Buoyancy and Stability of the Warwick: Analytical Study of Ballast" (J. Delsescaux & P. Bojakowski); "Remote Sensing and Coastal Site Management of the Underwater Cultural Heritage of Cascais and Oeiras (Portugal): The Case of the São Julião da Barra Site" (J. Freire et al.); "Using GIS and Underwater Dampling in the Armação de Pêra Bay, Portugal" (L. Infantini); "Advanced Digital Modeling of the Newport Medieval Ship" (T. Jones et al.); "Dynamic Models for Reconstructing Ancient Coastal Landscapes: the Use of the MAXENT Algorithm" (M. Lorenzini & P. Spanu); "Three-Dimensional Structural Recording of HMS Investigator at 74° North" (J. Moore et al.); "Shipwreck 43 and the Formation of the Ship Graveyard in the Central Basin at Thonis-Heraclion, Egypt" (D. Robinson & D. Fabre); "3D Laser Scanning for the Digital Reconstruction and Analysis of a 16th Century Clinker Built Sailing Vessel" (P. Tanner); "Geoarchaeological and Historical Research on the Redistribution of Beeswax Galleon Wreck Debris by the Cascadia Earthquake and Tsunami (A.D. 1700), Oregon, USA" (S. Williams et al.).

I Congreso de Arqueología Náutica y Subacuática Española. This other major conference focusing on maritime archaeology took place in the *Museo Nacional de Arqueología Subacuática* (ARQUA), Cartagena, Spain, March 14th to 16th. Many interesting studies on Classic navigation and commerce, as well as from Medieval and Modern sites, were presented. Those papers which have dealt with the stabilization and conservation of organic and inorganic materials located at waterlogged and underwater environments, from Neolithic to recent times, deserve special recognition. The conference program is available for download from: http://en.museoarqua.mcu.es/index.html

***Conference of the Australasian Institute for Maritime Archaeology*.** The annual conference of the AIMA, was held in Canberra from October 3rd to 6th, and focused on the *UNESCO 2001 Convention for the Protection of the Underwater Cultural Heritage*. The program included presentations that explored digital applications to underwater cultural heritage (UCH), as well as some papers on materials characterization (centered on provenance assessment). Within the session about commercial exploitation of UCH, it is worth mentioning the intriguing paper: "Shipwrecks as Stock for Particle Physics Experiments: New Uses of Underwater Cultural Heritage" (E. Perez-Alvaroi & F. Gonzalez-Zalba).

Upcoming Conferences

8th Annual FRAUG Meeting. The Faro and Rhino Archaeological Users Group (FRAUG) was established in 2006 as a research network for individuals and organizations using the Faro Arm contact digitizer and Rhino CAD software to record ships and ship timbers. The aim of FRAUG is to share ideas, discuss best practices for the digital recording, digital and physical modeling of ships as well as exploring methods of reconstruction and effective archiving and access. The *8th Annual FRAUG Meeting* will be hosted by Traditional Boats of Ireland Project in Baltimore, West Cork, Ireland, May 5th to 10th, 2014. The proposed format is a practical hand on workshop in one of the last traditional wooden boatbuilding yards, followed by practical on the water experience before returning to the digital restoration world and finishing with the usual project presentations and AGM. For further information and booking form please contact Pat Tanner to: pattanner@eircom.net.

Conferences also taking place this year: ***The Asia-Pacific Regional Conference on Underwater Cultural Heritage***, Honolulu, Hawaii, 12th to16th May 2014, http://www.apconf.org/; and the **IKUWA V (*5th International Congress on Underwater Archaeology*)**, Cartagena, Spain, 15th to 19th October 2014, http://museoarqua.mcu.es/

Upcoming Conferences

Rachel S. Popelka-Filcoff , Associate Editor

2014

2-6 March. Pittcon Conference and Expo, Chicago, IL USA. General information: http://www.pittcon.org/

16-20 March. 247th National Meeting and Exposition, American Chemical Society. Dallas, TX USA. General information: http://www.acs.org

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

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

13-16 April. ACOVS10 – 10th Australasian Conference on Vibrational Spectroscopy, Glenelg, SA Australia. Session on Vibrational Spectroscopy in Forensics, Art and Archaeology. General information: http://www.acovs10.net/mainpage/

3-5 June. 9th International Symposium on the Conservation of Monuments in the Mediterranean Basin, Ankara, Turkey. General information: http://monubasin9.org

8-13 June. 20th World Congress of Soil Science. Jeju, Korea. General information: http://www.20wcss.org

8-13 June. Goldschmidt, Sacramento, CA USA. General information: http://goldschmidt.info/2014/

25-28 June. New Zealand Archaeological Association Conference, Cambridge New Zealand. General information: http://www.nzarchaeology.org/cms/index.php

14-18 July. 4th Congress of the Pan African Archaeological Association for Prehistory and Related Studies and the 22nd Biennial Meeting of the Society of Africanist Archaeologists. Johannesburg, South Africa. General information: http://www.paa2014.co.za/index.php/en/

22-25 July. HERITAGE 2014 4th International Conference on Heritage and Sustainable Development, Guimarães Portugal. General information: http://heritage2014.greenlines-institute.org/h2014website/

10-14 August. 248th National Meeting and Exposition, American Chemical Society. San Francisco, CA USA. General information: http://www.acs.org

24-28 August. 8th International Conference on Isotopes and Expo, Chicago, IL USA. Session on isotopes and archaeometry. General information: http://www.8ici.org

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

15-19 September. International Council of Museums, Committee for Conservation (ICOM-CC) 17th Triennial Meeting. Melbourne, VIC, Australia. General information: http://www.icom-cc.org/254/triennial-conferences/17th-triennial-conference,-melbourne,-australia/#.Ut4ShqWZ7v0

19-22 October. The Geological Society of America National Meeting. Vancouver, BC, Canada. General information: http://www.geosociety.org/meetings/

19-22 November. American Schools of Oriental Research Annual Meeting. San Diego, CA USA. General information: http://www.asor.org/am/index.html

3-7 December. American Anthropological Association 113th Annual Meeting. "Producing Anthropology" Washington DC USA. General information: http://www.aaanet.org/meetings/

15-19 December. American Geophysical Union Fall Meeting, San Francisco, CA USA. General information: http://www.agu.org/meetings/

7-12 December. Royal Australian Chemical Institute National Congress, Adelaide, SA Australia. Session on Chemical Analysis and Sensing in Conservation. General information: http://www.racicongress.com/program.htm

December. Australian Archaeological Association Annual Conference, Australia. General information: http://www.australianarchaeologicalassociation.com.au/conference

2015

January. Society for Historical Archaeology Conference Montreal, Canada. General information: http://www.sha.org/meetings/annual_meetings.cfm

18-22 May. ASMOSIA (Association for the Study of Marble & Other Stones in Antiquity). XI International Conference, Split (Croatia). Abstracts due Dec. 15, 2014. asmosiaxi.org

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