

SAS BULLETIN

NEWSLETTER OF THE SOCIETY FOR ARCHAEOLOGICAL SCIENCES

VOLUME 40 NUMBER 1

SPRING 2017

FROM THE EDITOR

Spring Has Sprung!!

With spring comes the Society for American Archaeology (SAA) annual meeting, this year held from March 28 to April 2, in Vancouver, British Columbia, Canada. As is usually the case at the SAAs (except during ISA years), the Society for Archaeological Sciences has its annual business meeting. Links to the various officer reports and financial documents can be found at the following link: <http://www.socarchsci.org/govern.html>. Also determined at the SAA meeting was the R.E. Taylor Student Poster Award Recipient.

The **2017 R.E. Taylor Award Recipient: 82nd Society for American Archaeology Annual Meetings, March 29-April 2, 2017 Vancouver, BC, Canada**, was a team effort by Sean W. Hixon (Department of Anthropology, Pennsylvania State University), Emma A. Elliott Smith (Department of Biology, University of New Mexico), Brooke Crowley (Departments of Geology and Anthropology, University of Cincinnati), George Perry (Department of Anthropology, Pennsylvania State University), Richard Bankoff (Department of Anthropology, Pennsylvania State University), Douglas Kennett (Department of Anthropology, Pennsylvania State University), and Seth D. Newsome (Department of Biology, University of New Mexico), entitled: “Patterns

in Amino Acid $\delta^{15}\text{N}$ Values of Lemurs Are Inconsistent with Aridity Driving Megafaunal Extinction in Southwestern Madagascar”.

Honorable Mention for the R.E. Taylor Award goes to the team of S. Goldstein (Washington University in St Louis), M. Storozum, (Washington University in St Louis), F. Marshall (Washington University in St Louis), R. Reid (Washington University in St Louis), A. Wreshnig (Washington University in St Louis), P. Kiura (National Museums of Kenya), and S. Ambrose (University of Illinois at Urbana-Champaign), for the poster entitled: “Herder land-use in southern Kenya: geochemical analysis of soil enrichment”.

Abstracts for the two posters and links to PDF version of the posters can be found at the SAS website: <http://www.socarchsci.org/awards.html>.

Thomas R. Fenn
SAS Bulletin Editor

ANNOUNCEMENTS

Student Research International Travel Award

The Society for Archaeological Sciences is pleased to announce the creation of the SAS Student Research International Travel Award. Up to \$1000 is now available to help with costs of international travel for laboratory or field research to students who have been SAS members for more than one consecutive year. Applications will be accepted from undergraduates in their final year of study who are planning to attend graduate school as well as Master’s degree and PhD students. Research must be undertaken in a different country than that of their home institution. Funds may not be used to attend at conferences, field schools, classes and/or training courses. Application deadlines are February 1 and September 1 each year. Details on how to apply are available through the following link: <http://www.socarchsci.org/Student%20Research%20Award.pdf>

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The National Park Service's 2017 Workshop on Archaeological Propection techniques entitled *Current Archeological Propection Advances for Non-destructive Investigations of the Pea Ridge Civil War Battlefield* will be held May 15--19, 2017, at the Pea Ridge National Military Park in Benton County, Arkansas. Lodging will be in Roger, Arkansas, at a motel to be determined. The lectures will be at a meeting room in Rogers, Arkansas, at a place to be determined. The field exercises will take place at the Pea Ridge National Military Park. The park commemorates the March 7-8, 1862 Civil War battle between Federal and Confederate troops in northwestern Arkansas. The resulting Federal victory kept the State of Missouri in the Union. Co-sponsors for the workshop include the National Park Service's Midwest Archeological Center, Pea Ridge National Military Park, and the National Center for Preservation Technology and Training, as well as the Arkansas Archaeological Survey. This will be the twenty-seventh year of the workshop dedicated to the use of geophysical, aerial photography, and other remote sensing methods as they apply to the identification, evaluation, conservation, and protection of archaeological resources across this Nation. The workshop will present lectures on the theory of operation, methodology, processing, and interpretation with on-hands use of the equipment in the field. There is a registration charge of \$475.00. Application forms are available on the Midwest Archeological Center's web page at <http://www.nps.gov/mwac/>. Payment may be made by credit card through the Friends of NCPTT for non-government employees. Federal employees may pay through a training form (SF-182) sent to the Midwest Archeological Center or by credit card through the Friends of NCPTT (NCPTT webpage announcement). For further information, please contact Steven L. DeVore, Archeologist, National Park Service, Midwest Archeological Center, Federal Building, Room 474, 100 Centennial Mall North, Lincoln, Nebraska 68508-3873; tel: (402) 437-5392, ext. 141; fax: (402) 437-5098; email: steve_de_vore@nps.gov.

AGING ARCHEOLOGICAL SUBADULTS FROM FEMUR
LENGTH – WHICH METHOD IS ADVISABLE?

Charlotte Primeau (Division of Cancer, University of
Dundee, United Kingdom), and Samantha Tipper
(Department of Archaeology, University of Durham, United
Kingdom)

Abstract

The aim of this study is to investigate which method would provide results closest to dental age, when estimating bone age from the length of femur of archeological subadults, when teeth are not available for

aging. Seventeen Anglo Saxon subadults were aged by dental development using the method of AlQahtani et al. (2010). Length of femur was measured and aged according to Maresh (1970), Rissech et al. (2008) and Primeau et al. (2016). Dental age and skeletal age was then compared. Estimated skeletal ages using the method of Maresh (1970), showed the largest discrepancy to dental age, with a mean difference of -2.3 years. For Rissech et al. (2008) there was a mean difference of 0.3 years. For Primeau et al. (2016) there was a mean difference of -0.4 years. It is concluded that Maresh (1970) is the least accurate method for estimating subadult age from femur length. Rather, using Rissech et al. (2008) or Primeau et al. (2016), will give a skeletal age closer to dental age. Rissech et al. (2008) has a skeletal age closer to dental age, however, it is only available for the femur, whereas Primeau et al. (2016) is available for all long bones, and therefore, may be a more consistent method for a fragmented subadult skeletal population.

Introduction

Age estimation is the first key step in the study of archeological subadults. When estimating age of archeological subadults it is the biological age that is estimated, rather than the chronological (actual age). The aim is to reach an estimated age as close as possible to the chronological age. Biological age of archeological subadults can be estimated either from dental development or skeletal development. Dental age is the preferred method, as dental development is less influenced by adverse conditions, such as periods of disease, malnutrition or starvation (Hilson 2000, Scheuer and Black 2000, Cardoso 2007) and as such, is closer correlated to the chronological age. However, when working with archeological material, there is often no dental information available. In such cases skeletal age can then be estimated from appearance and maturation of the skeletal elements, timing of fusion of epiphysis or length of long bones (diaphyseal lengths). Frequently with archeological material the fragile epiphyseal union or incomplete fusion of skeletal elements may be damaged, eroded or absent due to incomplete recovery, related to taphonomic processes or excavation methods (Guy et al. 1997, Lewis 2007). The remaining method is to estimate age from length of long bones.

When estimating skeletal age from long bone lengths, it requires the measured length to be compared to a known standard or an established method such as table data or prediction equations. Several well-known methods of table data have been published in the book by Scheuer and Black (2000). Of these, the best-known and most used table data for archeological material is that of

Maresh (1970). The data was longitudinal data derived from radiographic images from white middle-class children from USA living in the mid-20th century. This method has been criticized when applied to archeological material due to substantial growth differences between modern and archeological populations (Marklein 2016), as well as differences from methodology, i.e. dry bones versus radiographic images (Primeau et al. 2016).

More recently, methods for estimating age from long bones have been developed on archeological material and generally comes in two forms: from archeological material of documented age (i.e. known age from coffin plates) and from archeological material of estimated age. The skeletal material of documented age and sex dates to the 18th, 19th or 20th century and as such, may not be applicable to subadult material from older periods. Methods derived from estimated ages on archeological material have the potential of being more contemporaneous to the skeletal material to which they are applied.

It is the aim of this paper to investigate which method, when estimating skeletal age from the length of long bones, using the femur of archeological subadults, correlates closest to dental age using three methods: 1) the method of Maresh (1970) developed from modern children, 2) the method of Rissesh et al. (2008) developed on archeological material of known age, and 3) the method of Primeau et al. (2016) developed on archeological material of unknown age. It is suggested that the closer a skeletal age correlates to dental age, the more applicable the method is for estimation of age of archeological subadult material.

Material and Methods

Skeletal Material

The skeletal material is curated at the Sedgeford Historical and Archaeological Research Project (SHARP) which is a multi-period research project, aiming to examine the land use and human settlement of a rural Norfolk settlement (Faulkner 1996) the site is located at Sedgeford in Norfolk, UK (Figure 1), and has been excavating every summer since 1996, although earlier excavations took place at the site in 1957, 1958 and 1960 by Peter Jewell and Don Brothwell (SHARP 2014). It was during these earlier excavations that a middle Anglo Saxon cemetery was discovered and a total of 126 individuals recovered which are currently curated at the Duckworth Laboratory in Cambridge. Between 1996 and 2007 further excavations of the cemetery took place by SHARP and an additional 291 individuals were recovered and were dated between circa AD 650/700 to circa AD 975/1025 (SHARP 2014). The adult skeletal remains

from Sedgeford display good bone density and low levels of malnutrition or infectious diseases (SHARP 2014). Considering adult stature rates, which is a good indicator of health (Arcini et al. 2014), it can be determined that the Sedgeford population had average height measurements for both male (177cm) and females (162cm) similar to modern British males (176cm) and females (162cm) (Molleson et al. 1993).



Figure 1: Map of the UK, showing location of Sedgeford.

This project focuses on these latter 291 individuals; comprising of 244 adults and 47 subadults. Unfortunately, not all subadults are fully preserved and only 27 had preserved femurs. Out of these only 17 also had teeth available for dental aging.

Subadult sex cannot be determined accurately from morphological or metrical analysis so was not attempted in this study (Scheuer and Black 2000). Long bone measurements were made in millimeters using an osteometric board. The average value of left and right femur was used unless only one was available in which case the single measurement was used.

Dental Methods

Two main dental methods were chosen to estimate dental age, namely Ubelaker (1989) and AlQahtani et al. (2010). These two methods are the recommended methods for aging sub-adult material (Senn and Weems 2013) and are both in the form of dental charts of formation and eruption and neither differentiate between the sexes which is appropriate when working with subadults of archeological origin where the sex is generally unknown (Scheuer and Black 2000).

The dental method of Ubelaker (1989) is the most utilized method for archeological material. Ubelaker (1989) developed his dental chart from several published data sets to be utilized on archeological material of American Indian origin. When constructing the dental chart, he used the early end of the published variables to reflect a suggested earlier eruption among Indians (Ubelaker 1989).

The dental method of AlQahtani (2010) was developed from 704 radiographs of modern individuals of known age from European and Bangladeshi origin. Initially it was published in 2008 (AlQahtani et al. 2008) and then revised in 2010 (AlQahtani et al. 2010).

Dental age was estimated from the two separate dental charts (Ubelaker 1989 and AlQahtani et al. 2010) from visual inspection of dental material. Each individual was assigned a final dental age, one for each of the two methods by calculating the mean of the estimated age range.

Skeletal Methods

The method of Maresh (1970) was developed on longitudinal data from white middle-class children from Denver, Colorado and consisted of about 175 individuals, ranging from about one year to 18 years old. Data was collected longitudinally, with six-month intervals, from radiographic images of the long bones in all extremities. Length of long bones was then tabulated, excluding the epiphysis, until the age of 12, where after the length is given including the epiphysis. This table data has values for boys and females separately (Maresh 1970). No correction factor for radiographic magnification was used to reflect how the method is generally used within bioarcheology.

The method of Rissech et al. (2008) was developed on cross-sectional archeological data from a population of subadults of known age and sex consisting of 77 individuals ranging from less than a year up to 17 years of age. The material dates from the 18th to 20th centuries and is combined from five different locations (The Sct. Brides

collection, London, UK; the Coimbra and the Lisbon collection, Portugal; the UAB collection, Barcelona, Spain, and the Scheuer collection curated in Scotland, UK). The method is in the form of regression equations for separate and combined sexes (Rissech et al. 2008).

The method of Primeau et al. (2016) was developed from cross-sectional data from a population of archeological sub-adults of estimated ages using the dental method of Ubelaker (1989) and of unknown sex. The material is combined from five skeletal collections from Denmark dating to the medieval period (circa AD 1050-1536) with ages ranging from birth to late adolescent. This method is in the form of linear and quadratic regression equations (Primeau et al. 2016).

Skeletal age was assigned from Maresh (1970) by estimating the best fit from femur length from the table between the two sexes (Scheuer and Black 2000:394) and calculating the mean of the estimated age range. Skeletal age was calculated from Rissech et al. (2008:6) using the regression equation for “unisex series, diaphyseal length”, in table 4. Skeletal age was then calculated from Primeau et al. (2016:140) using the quadratic regression equation in table 6.

Data Analysis

A scatter plot was constructed showing the midpoint of estimated age ranges for both dental ages (Ubelaker 1989 and AlQahtani 2010) plotted against each other. Results of the two dental ages were then evaluated using Bland-Altman analysis for the difference in age against the mean age and statistical difference between the two dental ages was then calculated. Linear regression analysis was then performed for the three methods for calculating skeletal age, to test the predictability of the methods. Midpoint for skeletal ages for the three methods was then plotted against midpoint for dental age and the difference in estimated skeletal age was then subtracted from the dental age.

Results

Figure 2 shows the scatter plot of estimated dental ages calculated from Ubelaker (1989) and AlQahtani et al. (2010) plotted against each other. The estimated dental ages are very similar with Ubelaker (1989) giving a mean age for all 17 individuals of 10.0 years and AlQahtani et al. (2010) giving a mean age for all 17 individuals of 10.2 years.

Figure 3, shows the Bland-Altman plot of the difference between the two estimated dental ages against the mean age. The mean difference between the two dental methods was 0.2 years with a 2 SD of ± 2 years. The difference between the ages is non-significant ($p=0.455$).

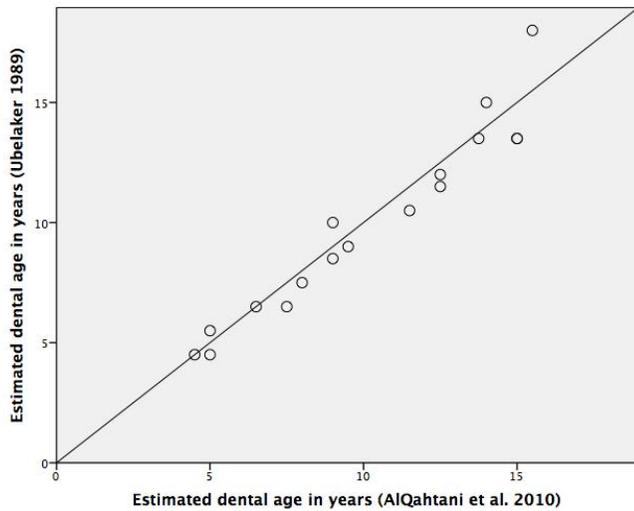


Figure 2: Scatter plot of estimated dental ages (Ubelaker 1989 and AlQahtani et al. 2010) plotted against each other.

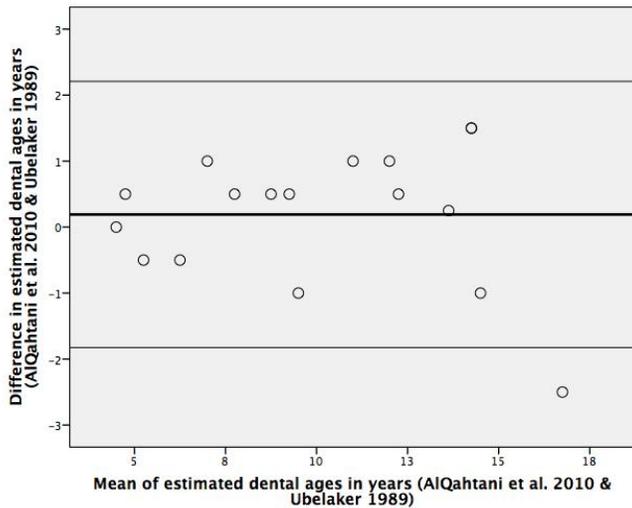


Figure 3: Bland-Altman plot of mean age against difference between estimated ages of the two dental methods. Horizontal lines indicate mean difference (black line) and ± 2 SD (grey lines).

Linear regression analysis was performed to calculate the functional relationship between the two variables (dental age and skeletal age) to estimate how one variable (age) can be predicted from another variable (length of femur).

All three methods were statistically significant ($p < 0.05$). The coefficient of determination r^2 , was as follows: Maresh 0.799, Rissech 0.793 and Primeau 0.785. Therefore, all three methods for estimating skeletal age have a predictability of about 80%.

Figure 4, shows estimated skeletal ages from the three methods (Maresh (1970) in green, Rissech et al. (2008) in red and Primeau et al. (2016) in blue plotted against

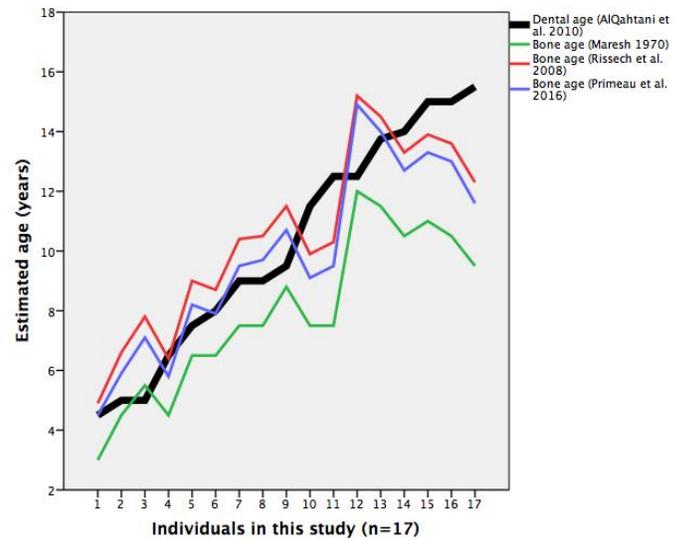


Figure 4: Line diagram showing the estimated dental age (AlQahtani et al. 2010) with the estimated skeletal ages calculated from the three different methods (Maresh, Rissech et al. and Primeau et al.).

dental age calculated from Ubelaker (1989), which is shown in black. Difference in skeletal ages show that Rissech et al. (2008) and Primeau et al. (2016) are closer to each other (mean difference -0.7 years, min -0.3, max -0.9 years), compared to Rissech et al. (2008) and Maresh (1970) (mean difference -2.6 years, min. -1.9, max. -3.2 years) or Primeau et al. (2016) and Maresh (1970) (mean difference 1.9 years, min. -1.3, max. -2.9 years).

Maresh (1970) shows the largest difference to dental age with a mean difference of -2.3 years (min. 0.5, max -6.0 years). Following this, the difference between dental age and Primeau et al. (2016) is a mean difference of -0.4 years (min 0.0, max -3.9 years) and the difference between dental age and Rissech et al. (2008) is a mean difference of 0.3 years (min. -0.1, max -3.2 years). Therefore, Maresh (1970) is the least advisable aging method to use, whereas; Rissech et al. (2008) shows the best result, tightly followed by Primeau et al. (2016).

Discussion

Dental age was estimated from the two methods of (Ubelaker (1989) and AlQahtani et al. (2010)). The method of Ubelaker (1989) is by far, the most utilized method within bioarcheology, but for this study we wanted to evaluate if the more recent method of AlQahtani et al. (2010) could equally be used for archeological material. Therefore, the method of AlQahtani et al. (2010) was included to see if it would yield substantially different age estimates. This appeared not to be the case (Figure 2 and 3), as the mean difference between the two methods was only 0.2 years. AlQahtani et al. (2010) has shown to out-perform the method of

Ubelaker (AlQahtani et al. 2014) although the opposite was also found when tested on material of known age (Goltz 2016). From this study, it therefore seems that AlQahtani et al. (2010) can also be applied to archeological material with comparable results to that of Ubelaker (1989).

Although all three methods for estimating skeletal ages have a predictability of about 80%, which means that about 80% of the variability can be explained by the model from where the ages are estimated (table data or regression equations), they do not produce comparable ages (Figure 3). The reason that the method of Maresh (1970) produced a larger difference to dental age compared to Rissech et al. (2008) and Primeau et al. (2016) may be for several reasons; the table data from Maresh (1970) was derived from radiographic images, from white middle-class children from USA, living in the mid-20th century. There are three main issues with applying such data to archeological subadult material: firstly, the individuals included in the study by Maresh (1970) were generally healthy, whereas, deceased archeological subadults may have already experienced compromised growth. Using table data from modern children such as Maresh (1970) on archeological material, therefore, raises the issue of 'biological mortality bias' where growth data from living healthy subadults (survivors) is unlike to represent the growth of subadults that died prematurely and who potentially had a compromised growth due to malnutrition and disease (Saunders and Hoppa 1993). Therefore, methods developed from a modern population of subadults (survivors) would be not be appropriate to use on an archeological population of deceased subadults.

Secondly, it is acknowledged that a bias arises from differences in methodology when applying measurements from radiographic images to other data such as archeological dry bone due to image magnification (Feldesman 1992, Ousley et al. 2013) and shrinkage of dry bone (Huxley 1998). Maresh (1955) herself acknowledge the effect of magnification and suggested this to be around 1.5%. Feldesman (1992) later estimated the magnification effect from the radiographic images from the study of Maresh to be more in the order of 4.2-6% depending on the length of femur. Huxley (1998) examined shrinkage when bones dried out and found this to be more prevalent the younger the individual. When the table data of Maresh (1970) is used for age estimation in bioarcheology, it appears that there is rarely used any correction factor to address magnification with a few exceptions (Mays 1999, Pinhasi et al. 2011).

Lastly, it is recognized that there is a difference in growth pattern between a modern population and that of an archeological population, both in regards to growth during development and final adult stature. A study examining final adult stature in medieval Denmark compared to modern Denmark, showed significant difference in final adult stature (Boldsen and Søgaaard 1998). This has also been shown to be the case in a study on Portuguese material (Cardoso and Garcia 2009) as well as between different time periods in the UK (Roberts, 2009). The same is true for the growth pattern for archeological subadults, which have shown to be different to that of modern populations when compared to the data of Maresh (Mays 1999, Schillaci et al. 2012). Despite these issues, the table data of Maresh (1970) is recommended for aging archeological material from length of long bones (Powers 2012) and remains the most utilized method within archeology material (Schillaci et al. 2012).

The methods from Rissech et al. (2008) and Primeau et al. (2016) gives comparable results with a mean difference of 0.7 years, where Rissech et al. (2008) was slightly closer to dental age. The equation used in this study was the quadratic equation from Primeau et al. (2016). However, the same study also showed that if using the linear equation developed in Primeau et al. (2016), table 4, rather than table 6, the equation was almost identical to that of Rissech et al. (2008) for the femur. This is despite the fact that Primeau et al. (2016) used five different populations of estimated ages from Denmark dating to circa AD 1050-1536, whereas Rissech et al. (2008) used five population from different locations dating to the 18th, 19th and 20th centuries of known age and sex. The quadratic equation from Primeau et al. (2016) was chosen as a method, rather than the linear, as the study showed that the quadratic model was a better fit for most long bones (Primeau et al. 2016). This is expected, as human growth is not strictly linear, but has several stages consisting of deceleration, acceleration and stunting throughout development causing different growth velocities at different age intervals (Maresh 1955, Pinhasi 2008). However, using the linear equation from Rissech et al. (2008) did show a slightly better fit for the population used in this study, so it is possible that the age estimation using the method of Primeau et al. (2016) could be improved if using the linear equation, rather than the quadratic equation.

There are some limitations to this study. First and foremost, this is a small collection of only 17 individuals. However, results from this study are in concordance with previous studies that also showed that applying modern data to archeological material is not advisable (Marklein

2016, Primeau et al. 2016). Also, the aging methods were only examined from the femur and not the remaining long bones. Further, this collection is from the UK, dating to the Anglo-Saxon period (circa AD 650/700 to circa AD 975/1025), so conclusions may not be readily transferable to other time periods or geographical regions.

Generally, estimating skeletal age of subadult skeletons using long bone lengths is less accurate than using dental age, as long bone growth is more influenced by adverse conditions such as, periods of disease, malnutrition, or starvation. In addition, nutrition and infection act in synergy, where children with suboptimal nutrition are more prone to contract infections, while infectious disease may lessen nutritional uptake (Scrimshaw 2003). Additionally, skeletal age estimation from long bone lengths will be less accurate the older the subadult, especially when approaching puberty. During puberty sexual dimorphism increases due to differential hormone secretion and this results in dissimilar adolescent growth spurts between the sexes, with girls completing their growth (fusion of epiphyses) up to two years earlier than boys (Scheuer and Black 2000). Therefore, estimating skeletal age from long bone lengths is less precise than dental age and carries a larger error range, especially for older subadults (i.e. in the pubertal years). Despite the above issues, estimating age from long bone lengths is still useful when working with archeological subadult remains, as there will always be cases where there is no dental information available due to taphonomy or fragmented remains.

Conclusion

Using table data from modern children such as Maresh (1970) raises the issue of 'biological mortality bias' where growth data from living healthy subadults (survivors) is unlikely to represent growth of subadults that died prematurely, with the addition of potentially a compromised growth, due to malnutrition and disease. Therefore, methods developed from a modern population of surviving subadults would be not be appropriate to use on an archaeological population of deceased subadults. Hence, when choosing a method for archaeological material it should reflect the population under investigation in environmental conditions, time period and geography as best as possible. Therefore, methods from archaeological subadults of either known or unknown age, depending on the history of the population being examined, should be used.

This study has examined three methods, which can be used to estimate skeletal age when dental information is not available. All three methods predict age well (about 80% of the variation can be predicted by the regression

line), however, where the correlation of estimated skeletal ages to dental age is concerned it is not advisable to use Maresh (1970), for age estimation when aging from femur length. Rather, our results indicate that either Rissech et al. (2008) or Primeau et al. (2016) would be a better choice.

The difference in age estimation between applying these two methods (Rissech et al. 2008 and Primeau et al. 2016) to femur lengths gives a mean difference of 0.7 years. Rissech et al. (2008) yields a slightly smaller difference to dental age (0.3 years) compared to Primeau et al. (2016) with a difference to dental age of -0.4 years. The disadvantage of using Rissech et al. (2008) is that this method is only available for the femur. The advantage of using Primeau et al. (2016) is that this method is available for all long bones and therefore, may be a more consistent method for fragmented or larger skeletal collections, where a variation of long bones may be available for the estimation of age, rather than just the femur.

Acknowledgements

The authors would like to thank Sedgford Historical and Archaeological Research Project (SHARP) for access to the skeletal collection and in particular Martin Hatton and Ray Baldry for the help and support with this project.

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MARITIME ARCHAEOLOGY
Nicolás Ciarlo, Associate Editor

In this column, a very interesting note concerning the usefulness of applying an acoustic method to the mapping of lithic remains in Stone Age sites is presented (Grøn et al.). As in previous issues, it also contains an account on recent papers, books, and past conferences.

Current Research

Acoustic mapping of submerged Stone Age sites

A hitherto overlooked acoustic phenomenon associated with flint knapped by humans, seems to facilitate efficient acoustic mapping of Stone Age sites with flint debitage located on, or embedded within, the sea floor.

The basis for the mapping method under development is that: i) flint 'blades' and 'flakes' respond when excited by an appropriate acoustic signal within the range 3-23 kHz; and ii) when damped by surrounding sediments, the flint blades and flakes still respond to the same frequencies so that their response can be recorded. The working hypothesis being tested is that it is possible to register responses from debitage from all human-knapped silicate minerals.

In 2015, a field experiment was carried out to test whether the large quantities of human-knapped flint at the

well-documented Stone Age settlement of Atlit-Yam, located off Israel's Carmel coast at a depth of approximately 10 m, would provide a recognisable response to an acoustic source sweeping the frequency interval 2-20 kHz. The remains at Atlit-Yam include walls, wells, megaliths etc. and date from 8500-9200 before present. The site is generally covered by up to 1.5 m of sand. In the 86 profiles recorded a clear acoustic response was recorded for the settlement area.

The survey at Atlit-Yam (IAA permit S-688/2016) was supported by the Israel Science Foundation (grant No. 1899/12).

Grøn, O.*, L. O. Boldreel, J.-P. Hermand, H. Rasmussen, D. Cvikel, E. Galili, B. Madsen & E. Nørmark

* Department of Geosciences and Natural Resource Management, University of Copenhagen
olegtron111@gmail.com

Recent Publications

International Journal of Nautical Archaeology. From *IJNA* 2016, Vol. 45, No. 2: "A Portuguese East Indiaman from the 1502–1503 Fleet of Vasco da Gama off Al Hallaniyah Island, Oman: an interim report" (D. L. Mearns et al.).

Journal of Archaeological Sciences: Reports. From *JAS: Reports* 2016 (up to December), Vol. 8: " $\delta^{18}\text{O}$ analysis of *Donax denticulatus*: Evaluating a proxy for sea surface temperature and nearshore paleoenvironmental reconstructions for the northern Caribbean" (N. P. Jew et al.); "Tripod cauldrons produced at Olympia give evidence for trade with copper from Faynan (Jordan) to South West Greece, c. 950–750 BCE" (M. Kiderlen et al.); "Estimation of fish size from archaeological bones of hardhead catfishes (*Ariopsis felis*): Assessing pre-Hispanic fish acquisition of two Mayan sites" (N. G. Jiménez-Cano & M. A. Masson); furthermore, the articles published as part of a special section on "Ichthyoarchaeology in the Americas: Methodological approaches and case studies" are worth reading; Vol. 9: "Characterization of archaeological waterlogged wooden objects exposed on the hyper-saline Dead Sea shore" (A. Oron et al.); "Both introduced and extinct: The fallow deer of Roman Mallorca" (A. Valenzuela et al.); "Investigation of biodegradation in three different sediment cores from a shellmound (*sambaqui*) of Brazil, using *Ascaris lumbricoides* eggs as a model" (M. Camacho et al.); "Paleoenvironmental reconstruction of the ancient harbors of King Louis IX (Aigues-Mortes, Rhone Delta, France)" (T. Rey et al.); "To put a cedar ship in a bottle: Dendroprovenancing three ancient East Mediterranean watercraft with the $^{87}\text{Sr}/^{86}\text{Sr}$ isotope ratio"

(S. Rich et al.); "Provenance determination of silver artefacts from the 1629 VOC wreck *Batavia* using LA-ICP-MS" (L. Gentelli); "Geostatistical approach to spatial, multi-elemental dataset from an archaeological site in Vatnsfjörður, Iceland" (Ł. Mikołajczyk & K. Milek); "Chemical signatures of ancient activities at Chan b'i - A submerged Maya salt works, Belize" (E. Cory Sills et al.); "Petrographic analysis of Pre-Columbian pottery from four islands in the Lesser Antilles and implications for inter-island transport and interactions" (J. A. Lawrence et al.); and "Thule whaling at Point Barrow, Alaska: The Nuvuk cemetery stable isotope and radiocarbon record" (J. Brenner Coltrain et al.); and Vol. 10: "Experimental abrasion of water submerged bone: The influence of bombardment by different sediment classes on microabrasion rate" (S. J. Griffith et al.); and "Carbon and nitrogen isotopic ratios in archaeological and modern Swiss fish as possible markers for diachronic anthropogenic activity in freshwater ecosystems" (S. Häberle et al.).

Quaternary International. From Vol. 407, Part B (Special issue: 'Time for the tide: New perspectives on hunter-fisher-gatherer exploitation on intertidal resources in Atlantic Europe and Mediterranean regions'): "Food and ornaments: Diachronic changes in the exploitation of littoral resources at Franchthi Cave (Argolid, Greece) during the Upper Palaeolithic and the Mesolithic (39,000–7000 cal BC)" (C. Perlès); "Changing patterns of eastern Mediterranean shellfish exploitation in the Late Glacial and Early Holocene: Oxygen isotope evidence from gastropod in Epipaleolithic to Neolithic human occupation layers at the Haua Fteah cave, Libya" (A. L. Prendergast et al.); and "Could occupation duration be related to the diversity of faunal remains in Mesolithic shell middens along the European Atlantic seaboard?" (C. Dupont); among others; Vol. 413, Part A: "Initial insights into Aterian hunter-gatherer settlements on coastal landscapes: The example of Unit 8 of El Mnasra Cave (Témara, Morocco)" (E. Campmas et al.); Vol. 419 (Special issue: Holocene Hunter-Gatherer Archaeology of Northern Eurasia): "Toward an alternative perspective on the foraging and low-level food production on the coast of China" (T. Jiao); "Social consequences of increased reliance on fishing in middle Holocene Cis-Baikal: Relating fishing gear, axes, and social status at the Shamanka II cemetery, Lake Baikal, Siberia" (I. Scharlotta et al.); and "Understanding prehistoric maritime adaptations in northern Japan: Indirect evidence from ancient DNA and histological observations of albatross (Aves: Diomedidae) bones" (M. Eda et al.); Vol. 425: "Geomorphological features of the archaeological marine area of Sinuessa in Campania, southern Italy" (M. Pennetta et al.); finally, available

online: “Seaward dispersals to the NE Mediterranean islands in the Pleistocene. The lithic evidence in retrospect” (Ch. Papoulia); “The production and use of cordage at the early Neolithic site of La Draga (Banyoles, Spain)” (R. Piqué et al.); “Sea level changes and past vegetation in the Punic period (5th–4th century BC): Archaeological, geomorphological and palaeobotanical indicators (South Sardinia – West Mediterranean Sea)” (C. Buosi et al.); “A submerged Mesolithic lagoonal landscape in the Baltic Sea, south-eastern Sweden – Early Holocene environmental reconstruction and shore-level displacement based on a multiproxy approach” (A. Hansson et al.); and “Reconstructing drowned terrestrial landscapes. Isotopic paleoecology of a late Pleistocene extinct faunal assemblage: Site GNL Quintero 1 (GNLQ1) (32° S, Central Chile)” (P. López Mendoza et al.).

Geoarchaeology. From Vol. 31, No. 4: “Lost Foraging Opportunities for East Asian Hunter-Gatherers Due to Rising Sea Level Since the Last Glacial Maximum” (J. d’Alpoim Guedes et al.); Vol. 31, No. 5: “Coastal Dynamics and Pre-Columbian Human Occupation in Horseshoe Cove on the Northern Gulf Coast of Florida, USA” (P. F. McFadden); “Archaeological Evidence for Modern Coastal Uplift at Diu, Saurashtra Peninsula, India” (M. Kázmér et al.); and “Soil Paleocatenas, Prehistoric Land Use, and Coastal Landscape Dynamics at Druridge Bay, Northeast England” (R. W. Payton & C. Bonsall); Vol. 31, No. 6: “Evolution of a Shallow Water Wave-Dominated Shipwreck Site: Fougues (1805), Gulf of Cadiz” (T. Fernández-Montblanc et al.); and “Embedded Behavior: Human Activities and the Construction of the Mesolithic Shellmound of Cabeço da Amoreira, Muge, Portugal” (V. Aldeias & N. Bicho); finally, available online: “A Geochemical Signal from a Mesolithic Intertidal Archaeological Site: A Proof-of-Concept Study from Clachan Harbor, Scotland” (L. Mikołajczyk & J. E. Schofield); and “Long-Term Interactions between the Roman City of Ostia and Its Paleomeander, Tiber Delta, Italy” (F. Salomon et al.).

The following articles published in journals on Archaeology-related topics in 2016 (the vast majority during the second semester) are worth mentioning: *Antiquity*, Vol. 90, No. 351: “The provenance of export porcelain from the Nan’ao One shipwreck in the South China Sea” (J. Zhu et al.); and Vol. 90, No. 352: “Of mammoths and other monsters: historic approaches to the submerged Palaeolithic” (R. Bynoe et al.); “Ancient whale exploitation in the Mediterranean: the archaeological record” (D. Bernal-Casasola et al.); “Ancient whale exploitation in the Mediterranean: species matters” (A. S. L. Rodrigues et al.); and “Isotopic

provenancing of the Salme ship burials in Pre-Viking Age Estonia” (T. Douglas Price et al.); *Archaeological and Anthropological Sciences*, Vol. 8, No. 2: “Sclerochronological analysis of archaeological mollusc assemblages: methods, applications and future prospects” (R. W. Twaddle et al.); *Archaeometry*, Vol. 58, No. 4: “Sherds on the Edge: Characterization of 16th Century Colonial Spanish Pottery Recovered from the Solomon Islands” (S. J. Kelloway et al.); and “Characterization of a Historical Cannonball from the Fortress of San Juan De Ulúa Exposed to a Marine Environment” (M. Hernandez et al.); and Vol. 58, Issue Supplement S1: “Lead Isotope Analysis of Pewter Mounts from the Viking Ship Burial at Gokstad: on the Origin and Use of Raw Materials” (U. Pedersen et al.); *Environmental Archaeology*, Vol. 21, No. 3: “Oxygen isotopes in Molluscan shell: Applications in environmental archaeology” (M. J. Leng & J. P. Lewis); and papers published in Vol. 21, No. 4 (A Fish Story or History? Evidence from the Past), which compiles the presentations of the 17th biennial meeting of the Fish Remains Working Group (FRWG) held at Tallinn University, Estonia, September 2013 (Part 2); *INA Quarterly*, Vol. 43, No. 1/2: “Salvaging USS Westfield: Exhibiting Remnants of a Civil War Gunboat in the Texas City Museum” (J. Parkoff); *Journal of African Archaeology*, Vol. 14, No. 2: “The shipwreck of Bom Jesus, AD 1533: Fugger copper in Namibia” (A. Hauptmann et al.); *Journal of Anthropological Archaeology*, Vol. 44 (Part A): “Nets and canoes: A network approach to the pre-Hispanic settlement system in the Upper Delta of the Paraná River (Argentina)” (E. Apolinaire & L. Bastourre); and available online: “Reconceptualising Last Glacial Maximum discontinuities: A case study from the maritime deserts of north-western Australia” (P. Veth et al.); *Journal of Archaeological Method and Theory*, Vol. 23, No. 2: “Charting a Future Course for Organic Residue Analysis in Archaeology” (P. E. McGovern & G. R. Hall); and available online: “Multi-Image Photogrammetry to Record and Reconstruct Underwater Shipwreck Sites” (K. Yamafune et al.); *Journal of Archaeological Sciences*, Vol. 74: “Evidence of Eurasian metal alloys on the Alaskan coast in prehistory” (H. Kory Cooper et al.); Vol. 75: “Tropical ancient DNA from bulk archaeological fish bone reveals the subsistence practices of a historic coastal community in southwest Madagascar” (A. Grealy et al.); and Vol. 76: “Late Pleistocene/early Holocene maritime interaction in Southeastern Indonesia – Timor Leste” (Ch. Reepmeyer et al.); *Journal of Cultural Heritage*, Vol. 21: “Climate change and underwater cultural heritage: Impacts and challenges” (E. Perez-Alvaro); Vol. 22: “The Sardinian coastal towers in the Mediterranean (16th–17th century): An archaeometrical approach for the study of masonry” (C. Giannattasio et al.); and available online:

“Seafloor analysis and understanding for underwater archeology” (M. Reggiannini & O. Salvetti); *Mediterranean Archaeology and Archaeometry*, Vol. 16, No. 1: “Stable carbon and nitrogen isotope evidence for dietary variability at ancient Pompeii” (F. D. Pate et al.); and Vol. 16, No. 2: “Authentication and conservation of marine archaeological coins excavated from underwater of the Red Sea, Saudi Arabia” (O. Abdel-Kareem et al.); *North American Archaeologist*, Vol. 37, No. 3: “Portable x-ray fluorescence in sourcing prehistoric whelk shell artifacts. A pilot study from Eastern North America” (T. G. Bissett & Ch. P. Claassen); *Oxford Journal of Archaeology*, Vol. 35, No. 3: “The Roman Ship ‘punta Scifo d’ and its Marble Cargo (Crotone, Italy)” (C. Beltrame et al.); *Radiocarbon*, Vol. 58, No. 2: “A Revised Radiocarbon Chronology of the Aceramic Shell Midden of Ra’s Al-Hamra 6 (Muscat, Sultanate of Oman): Implication For Occupational Sequence, Marine Reservoir Age, and Human Mobility” (A. Zazzo et al.); and “High-Resolution AMS 14C Dates for the Par-Tee Site (35CLT20) and Prehistoric Whale Hunting on the Oregon Coast” (G. M. Sanchez et al.); and Vol. 58, No. 4: “Marine Reservoir Effects Deduced from 14C Dates on Pottery Residues, Bones, and Molluskan Shells from the Hamanaka 2 Archaeological Site, Rebun Island, Hokkaido, Japan” (Y. Miyata et al.); “Marine Reservoir Correction for American Samoa Using U-series and AMS Dated Corals” (J. T. Clark et al.); and “Marine Radiocarbon Reservoir Effect in Late Pleistocene and Early Holocene Coastal Waters off Northern Iberia” (A. M. Monge Soares et al.); finally, *STAR: Science & Technology of Archaeological Research*, Vol. 2, No. 1: “Recognizing Geomagnetic Storms in Marine Magnetometer Data: Toward Improved Archaeological Resource Identification Practices” (B. M. Carrier et al.).

Other non-archaeological periodical publications also display some interesting papers on archaeometric applications in Maritime archaeology: *Analytical and Bioanalytical Chemistry*, Vol. 408, No. 28: “An alternative analytical method based on ultrasound micro bath hydrolysis and GC-MS analysis for the characterization of organic biomarkers in archaeological ceramics” (L. Blanco-Zubiaguirre et al.); *Annual Reviews in Control*, Vol. 42: “Reflections on a decade of autonomous underwater vehicles operations for marine survey at the Australian Centre for Field Robotics” (S. B. William et al.); *Boreas: An international journal of Quaternary research*, Vol. 45, No. 3: “High-resolution stratigraphy of Scandinavian coastal archaeological settlements: the case of Håkonshella, W Norway” (A. Puy et al.); and Vol. 45, No. 4: “Reconstruction of the environmental history of a coastal insular system using shallow marine records: the last three millennia of the

Cíes Islands (Ría de Vigo, NW Iberia)” (C. Muñoz Sobrino et al.); *Ceramics International*, Vol. 42, No. 15: “Study on the microstructure of the multilayer glaze of the 16th-17th century export blue-and-white porcelain excavated from Nan’ao-I Shipwreck” (Y. Zhou et al.); *Environmental Science and Pollution Research* (available online): “Archaeometric researches on the provenance of Mediterranean Archaic Phoenician and Punic pottery” (M. L. Amadori et al.); *Geomorphology*, Vol. 270, No. 1: “A new GIS approach for reconstructing and mapping dynamic late Holocene coastal plain palaeogeography” (H. J. Pierik et al.); *Hyperfine Interactions*, Vol. 237, No. 1: “Mössbauer and XRD studies of Roman amphorae buried in the sea for two millennia” (F. E. Wagner et al.); *IFAC-PapersOnLine*, Vol. 49, No. 23 (for the 10th IFAC Conference on Control Applications in Marine Systems (CAMS), Trondheim, Norway, 13th to 16th September 2016): “The use of underwater hyperspectral imaging deployed on remotely operated vehicles – methods and applications” (G. Johnsen et al.); and “A new method for underwater archaeological surveying using sensors and unmanned platforms” (Ø. Ødegård et al.); among others; *International Journal of Conservation Science*, Vol. 7, No. 2: “Evaluating the use of laser in analysis and cleaning of the Islamic marine archaeological coins excavated from the Red Sea” (O. Abdel-Kareem et al.); *Journal of Volcanology and Geothermal Research*, Vol. 328: “Petro-chemical features and source areas of volcanic aggregates used in ancient Roman maritime concretes” (F. Marra et al.); *Organic Geochemistry*, Vol. 100: “Identification of alkyl guaiacyl dehydroabietates as novel markers of wood tar from Pinaceae in archaeological samples” (L. Bailly); *Philosophical Transactions of the Royal Society A*, Vol. 374, No. 2082: “Raman spectroscopic analysis of archaeological specimens from the wreck of HMS *Swift*, 1770” (H. G. M. Edwards et al.); *Quaternary Science Reviews*, Vol. 146: “Luminescence dating of interglacial coastal depositional systems: Recent developments and future avenues of research” (M. Lamothe); and Vol. 150: “A geochemical and sedimentological perspective of the life cycle of *Neapolis* harbor (Naples, southern Italy)” (H. Delile et al.); *Remote Sensing*, Vol. 8, No. 11: “Shallow Off-Shore Archaeological Prospection with 3-D Electrical Resistivity Tomography: The Case of Olous (Modern Elounda), Greece” (K. Simyrdanis et al.); *Rendiconti Online della Società Geologica Italiana*, Vol. 38: “UV Fluorescence as tool to evaluate the biotic encrustation pervasiveness on under water amphorae near Crotone (Calabria-Italy)” (A. M. De Francesco et al.); and “Diagnostic analysis of bricks from the underwater archaeological site of Baia (Naples, Italy): preliminary results” (M. Ricca et al.); finally, *Tetrahedron Letters*,

Vol. 57, No. 6: “Utilising phytanic acid diastereomers for the characterisation of archaeological lipid residues in pottery samples” (A. Lucquin et al.).

British Archaeological Reports (BAR). The following book published late in 2016 by Archaeopress is of particular interest: *Health and Disease in the Prehistoric Pacific Islands* (H. Buckley), BAR No. S2792, ISBN 9781407314433. This doctoral work is focused on the study of the effects of malaria on Melanesian people’s overall health, and the comparison with the panorama in Polynesia, where this disease has always been absent. It includes analyses of samples from the Solomon Islands (Melanesia) and from two burial mounds in Tonga (Polynesia). The outcome of this research helps to understand human adaptation to insular environments during and after colonization, as well as their responses to disease.

Analyzing Maritime Archaeological Archives (J. Satchell et al.), BAR No. 628, ISBN 9781407315669. This book may be of interest for conservators, archaeologists, and other researchers. This monograph series of The Maritime Archaeology Trust deals with the problems currently faced by maritime archaeological archives in coastal museums within the UK, as well as the legal and practical issues that need to be addressed to guarantee the preservation of the national cultural heritage for future generations.

Roman and Late Antique Mediterranean Pottery. The Series No. 10: *Lusitanian Amphorae: Production and Distribution*, edited by I. Vaz Pinto, R. Roberto de Almeida & A. Martin, Archaeopress, ISBN 9781784914271, discusses the production and distribution of Lusitanian amphorae. Those chapters related with archaeometric analysis and the amphorae recovered from Mediterranean shipwrecks can be highlighted: “Lusitanian Amphorae from the Dump Layer above the Arles-Rhône 3 Shipwreck” (D. Djaoui & J. C. Quaresma); “Lusitanian Amphorae found on the Punta Sardegna A Shipwreck (Palau, Sardinia). A Preliminary Report on Typologies and Fabrics” (A. Porqueddu et al.); and “Lusitanian Amphorae on Western Mediterranean Shipwrecks: Fragments of Economic History” (S. Bombico et al.).

Pharos. Studien zur griechisch-römischen Antike. The Series No. 38: *Connecting the Ancient World. Mediterranean Shipping, Maritime Networks and their Impact / Vernetzungen in der Antike. Mittelmeerschiffahrt, maritime Netzwerke und deren Auswirkungen*, edited by Ch. Schäfer, ISBN 978-3-86757-266-8, compiles a series of papers on navigation

and maritime trade in the ancient Mediterranean, with focus on the Roman Empire period.

Vertebrate Paleobiology and Paleoanthropology. The Series book: *Africa from MIS 6-2. Population Dynamics and Paleoenvironments*, edited by S. C. Jones & B. A. Stewart, ISBN 978-94-017-7519-9, includes some interesting works on human adaptations in different environments of Africa. In relation to the analysis of coastal occupations during the Middle Stone Age, the chapter “Mid to Late Quaternary Landscape and Environmental Dynamics in the Middle Stone Age of Southern South Africa” (A. S. Carr et al.) can be highlighted.

The *Proceedings of the Seminar for Arabian Studies (PSAS)*, Vol. 46 (papers from the 47th meeting of the Seminar for Arabian Studies held at the British Museum, London, 24th to 26th July 2015), edited by J. Starkey & O. Elmaz, ISBN 9781784913632, contains several investigations concerning coastal populations. The following book chapter is worth mentioning: “Ubaid-related sites of the southern Gulf revisited: the Abu Dhabi Coastal Heritage Initiative” (M. Jonathan Beech et al.). It summarizes the maritime archaeological research project conducted by the Abu Dhabi Tourism and Culture Authority, which included the systematic mapping of sites, as well as geophysical surveys and excavations at key sites. This allowed shedding new light on the structure of Ubaid-related coastal settlements between the mid-sixth and early fifth millennium BC.

Digital in Underwater Cultural Heritage (G. Varinlioglu, Cambridge Scholars Publishing, ISBN 9781443890847. In this book, the author discusses several digital means to record, analyze, and spread information on materials from underwater sites, which can be of special interest for maritime archaeologists dealing with large quantity of data. A special chapter is dedicated to the application of computational techniques for drawing and modeling sites and artifacts.

Previous Meetings and Conferences

41st International Symposium on Archaeometry (ISA). This meeting was held from 15th to 21th May 2016 in Kalamata, Greece. The following presentations related to past maritime and coastal activities are of special interest: “Obsidian access along the Adriatic: Sourcing studies and maritime trade in Croatia” (R. H. Tykot et al.); “Timing the migration of the “Sea Peoples” in the 2nd millennium BC in the Southern Levant: A radiocarbon based chronology” (Y. Asscher & E. Boaretto); “Lambayanna: An Early Bronze Age coastal settlement in the Southern Argolid” (J. Beck et al.); “Pewter from the wreck of HMS

Stirling Castle” (D. Dungworth); “Deciphering the urban topography of the harbour-city of ancient Corfu. Archaeological and Geoarchaeological investigations” (K. Baika et al.); “Interdisciplinary assessment of an unknown substance, found inside the wood cells of the waterlogged piles from the foundation substructure of the Byzantine sea fortification of Thessaloniki” (D. Tsiotas); and “Combining pXRF and Stable Isotope Analysis in assessing Ancient coastal Peruvian diets” (T. J. Gilbertson & R. H. Tykot).

21st International Conference on Cultural Heritage and NEW Technologies (CHNT 21, 2016). *Urban Archaeology and Data.* This meeting was organized by the Program of Urban Archaeology of Vienna and their partners, and took place from November 16th to 18th 2016 at the City Hall of Vienna, Austria. Presentations were focused on the application of digital technologies to the recording and analysis in archaeological and historical research. The following papers are worth mentioning: “Resin Analysis and Characterization in the Yenikapı Byzantine-Era Shipwrecks” (R. Karadağ); “JEnhancer: Automatic Enhancement Toolkit for Underwater Images” (D. Hettmanczyk et al.); “Geo-referencing from Photo-based Documentation in Freshwater and Marine Archaeology” (R. Scholz et al.); “Systematic SfM and MVS-based documentation and interpretation: The underwater excavation of the Mondsee culture settlement Seewalchen/Attersee, Upper Austria” (H. Pohl & R. Wessling); “Archaeonautic: Low-cost and efficient 3D Videogrammetry meets Palafittes at Mondsee/Austria” (M. Block-Berlitz et al.); and “Pairing fossil oyster shells” (A. Djuricic et al.).

Among other noteworthy international meetings held during the second semester of 2016, the following can be mentioned: **8 World Archaeological Congress** (Kyoto, Japan, 28th August to 2nd September); **V Convegno Nazionale di Archeologia Subacquea** (Udine, Italy, 8th to 10th September); **International Meeting on the Protection of the Underwater Cultural Heritage Sites** (Paris, France, 22nd and 23rd September); **NAS and SCAPE Trust Conference** (Glasgow, Scotland, 5th and 6th November); **International Congress on Underwater Archaeology – IKUWA 6** (Fremantle, Australia, 28th November to 2nd December); and **10th International Symposium on Underwater Research** (Samsun, Turkey, 16th to 18th December).

ARCHAEOLOGICAL CERAMICS

Charles C. Kolb, Associate Editor

This issue contains two topics: 1) Previous Professional Meetings; and 2) Forthcoming Professional Meetings.

Previous Professional Meetings

The 2016 Annual Meeting of the American Schools of Oriental Research (ASOR) was held in San Antonio, Texas, USA, 16-19 November 2016. See <http://www.asor.org/am/2016/documents/paper-abstracts-10-25.pdf>. Member-Organized Workshops: Levantine Ceramics Project Workshop. Chair: Andrea Berlin, Boston University. The Levantine Ceramics Project (LCP; www.levantineceramics.org) is a crowd-sourced web site designed to communicate, link, and expand the use of archaeological data in order to advance research. The project web site is devoted to information on ceramic wares, petro-fabrics, individual vessels, petrographic analyses, and kiln sites from anywhere in the Levant, meaning the modern countries of Turkey, Syria, Cyprus, Lebanon, Israel, Jordan, and Egypt, anytime from the Neolithic era (c. 5500 B.C.E.) through the time of Ottoman rule (c. 1920 C.E.). I propose a series of LCP workshop sessions, focused on specific regions and periods, such as Bronze Age Cyprus, Iron Age Jordan, early Islamic/Medieval Syria, etc. in which specialists can present data they have submitted to the site, and address points of overlap and disagreement. The site's architecture allows entries to be edited, thus preserving and communicating new conclusions and understandings. Together the LCP web site and workshops function as an ongoing research collaborative, dynamic archive, and flexible scholarly forum, connecting scholars with scholarship old and new. The initial workshop was devoted to defining, describing, and comparing petro-fabrics of the southernmost Levant, meaning southern Lebanon and Israel. **Session 3B. The Levantine Ceramics Project: Petro-Fabrics of the Southern Levant.** CHAIR: Andrea M. Berlin (Boston University), Presiding. Kamal Badreshany (Durham University), “Petro-Fabrics of Southern Lebanon”; Anastasia Shapiro (Israel Antiquities Authority), “Petro-Fabrics of the Galilee and Northern Coastal Plain, Israel”; Paula Waiman-Barak (Haifa University), “Petro-Fabrics of the Carmel Coast, Israel”; Barak Monnickendam-Givon (The Hebrew University of Jerusalem), “Southern Phoenician Wares: A Ceramicist’s Perspective”; Anat Cohen-Weinberger (Israel Antiquities Authority), “PetroFabrics of the Judaeon-Samaritan Mountains, Israel”; David Ben-Shlomo (Ariel University), and “Petro-Fabrics of the Shephelah and Southern Coastal Plain, Israel.”

Other contributions included: Erin D. Darby (University of Tennessee), “Manipulating Identities: What Figurines Actually Reveal about Identity Formation in the Ancient Near East”; Petra Creamer (The University of Pennsylvania), “The Apotropism of Old Babylonian Terracotta Plaques”; Linda Meiberg (The University of Pennsylvania), “Decorative Motifs on Philistine Pottery and Their Cretan Connections”; Christian Frevel (Ruhr-University Bochum), “Clay Messengers: Understanding Iron Age Cult Stands as Media”; Christina Olson (East Carolina University), “Lost Among Treasures: An Analysis of Forgotten Pots in the Albright Attic”; Matthew Jameson (Bryn Mawr College), “Ubaid Interaction in the Arabian Gulf in the Light of New Research on the Origin and Technology of Ubaid and ‘Local’ Pottery from Dosariyah (Saudi Arabia)”; Daniel Schindler (University of North Carolina at Chapel Hill), “The Late Roman and Byzantine Pottery from Huqq”; Sarah Wenner (University of Cincinnati), “The Ceramic Corpora of Petra North Ridge’s Nonelite Tombs”; Charlotte Maxwell-Jones (The Asia Foundation), “Greek Material Culture at Ai Khanoum and Bactra”; Melissa Cradic (University of California, Berkeley), “Scents and Sensibility: The Sensorial Roles of Lamps in Funerary Rituals during the Second Millennium B.C.E.”; Noa Shatil (Tel Aviv University), “The Persian and Early Hellenistic Pottery from Tel Azekah (Israel)”; Philip Johnston (Independent Scholar), “Fragments of Identity: Ceramic Analysis, Production, and the Phoenician-Iberian Colonial Encounter”; and Dennis Braekmans (Leiden University/Delft University of Technology), Joseph Greene (Harvard University, Semitic Museum), Brien Garnand (Howard University), Lawrence Stager (Harvard University, Semitic Museum), and Patrick Degryse (KU Leuven), “Ubiquitous Ceramics in Unique Museum Collections: The Integration of Past and Present Archaeometric Analyses.”

First Amphoras in the Phoenician-Punic World Congress: The State of the Art was hosted by the Department Archaeology of Ghent University, Belgium, 15-17 December 2016. Topics addressed in the meeting included typological and stylistic analyses, epigraphical analyses and studies of amphora stamps, capacity studies, network analyses, GIS applications, petrography, chemical composition analyses, residue analyses. For additional information and abstracts of the 31 oral presentations and 14 posters, see <http://www.appwc.eu/>
Keynote Lecture: “Amphores phéniciennes puniques: deux décades de recherche” by Joan Ramon Torres.
“First Session. Punic Stamps” Chair: Patrick Monsieur: “¿Marcas comerciales? Estampillas púnicas sobre ánforas” by Luis Alberto Ruiz Cabrero; “Punic biliteral stamps with repeated graphemes: new data about

a particular series of marks on Carthaginian amphorae (4th-2nd centuries BC” by José Ángel Zamora and Antonio Sáez Romero.
“Second Session. Eastern Mediterranean” Chair: Joan Ramon Torres: “Phoenician Amphorae at Tel Akko and Environs” by Ann E. Killebrew, Jolanta Młynarczyk, and Jacek Michniewicz; “Phoenician amphorae from the late Iron Age settlement at Tell el-Burak: typology, petrography, content analyses” by Kamal Badreshany, Aaron Schmitt, and Evgenia Tachatou; “New Evidence on Phoenician amphora types and amphoric inscriptions” by Eric Gubel; “Torpedo Jars between Levant and Egypt: prototypes and imitations” by Luisa Bonadies and Sylvie Marchand; “Phoenician-Punic amphorae from Tebtynis (Egypt), between Mediterranean imports and local imitation” by Sylvie Marchand and Max Luaces; and “Levantine-type transport amphorae in Cyprus during the Bronze and Iron Ages: Issues and Perspectives” by Adriano Orsinger.

“Third Session. North Africa” Chair: Eric Gubel: “Nouvelles données sur les fabriques des amphores puniques provenant de Carthage” by Hadrumète et Utique and Boutheina Maraoui Telmini; “36 shekels of wine to New Carthage. The relationship between Amphora capacity and monetary standards during the Second Punic War” by Víctor Martínez Hahn Müller: “Wine consumption in the Little Syrte between the 5th and 3rd century BCE: the archaeological evidence” by Sami ben Tahar; “The analysis of amphoras from Carthaginian settlement assemblages” by Roald F. Docter; and “Les amphores d’Utique et sa région aux époques phénicienne et punique” by Imed ben Jerbania.
“Fourth Session. Sardinia” Chair: Andrea Perugini: “Punic Amphoras from Pani Loriga (Area A)” by Tatiana Pedrazzi; “Ricerche archeologiche subacquee nella Sardegna centro-meridionale: anfore fenicie e puniche, contesti, forme, contenuti e produzioni by Ignazio Sanna and Carla del Vais; “The Mediterranean exchanges of Neapolis (end of 6th and 4th centuries BC)” by Elisabetta Garau; “Amphorae from Sant’Imbenia (Alghero-Sardinia)” by Marco Rendeli and Beatrice de Rosa; “Phoenician and Punic amphoras from the water of Nora (Sardinia): The recoveries of Michel Cassien (1978-1984)” by Emanuele Madrigali; and “Jars, burials and rituals. Ceramic caskets and funerary boxes in Phoenician mortuary traditions: new evidence from the excavations on Motya, West Sicily” by Paola Cavaliere, Rubens D’Oriano, and Giuseppe Pisanu.

“Fifth Session. Iberian Peninsula and Balearic Islands” Chair: Wim Broekart: “Punic amphorae in the Northwest coast of the Iberian Peninsula: Origins, distribution and commercial dynamics” by Eduardo Ferrer Albelda, Josefa Rey Castiñeira, Javier Rodríguez

Corral, Antonio Sáez Romero, and Francisco J. García Fernández; “The dissemination of the so-called “Late Punic” amphorae from the Circle of the Strait to ancient Gaul: a trade route which underneath Late Republican phenomena?” by Max Luaces; “The amphoras from Baria (Villaricos, Spain)” by José Luis López Castro, Carmen Ana Pardo Barrionuevo, and Laura Moya Cobos; “Punic amphorae in the interior of the Guadalquivir valley: Origin, distribution and contents” by Francisco J. García Fernández, Eduardo Ferrer Albelda, and Violeta Moreno Megías; “Amphorae production and trade in the Western Iberia: an overview” by Elisa de Sousa and Ana Margarida Arruda; “Ánforas púnicas en contextos menorquines de época postalayótica” by Helena Jiménez Vialás, Fernando Prados Martínez, Joan Carles de Nicolás Mascaró, and Andrés M. Adroher Auroux; “Local production of amphorae in Turdetania during the II Iron Age: A typological, compositional and commercial study of production and distribution” by Violeta Moreno Megías, Francisco J. García Fernández, and Eduardo Ferrer Albelda; and “Amphorae production in Gadir: an update” by Antonio Sáez Romero. **“Sixth Session. Sicily” Chair: Víctor Martínez Hahn Müller:** “From potter's kiln to seafaring: Punic amphorae from underwater western Sicily” by Francesca Oliveri and Maria Pamela Toti; “Transport amphorae and the historical space - city - chora – hinterland” by Rebecca Diana Klug; “La circolazione anfórica nella Palermo punica (fine del VI-metà del III sec. a.C.): nuovi dati emersi da recenti scavi in area urbana e di necropoli” by Babette Bechtold; and “Jars, burials and rituals. Ceramic caskets and funerary boxes in Phoenician mortuary traditions: new evidence from the excavations on Motya, West Sicily” by Gioacchino Falsone and Paola Sconzo. **“Seventh Session. Concluding remarks.”**

Posters: “The characterization and origin of the Carthage Tophet funerary urns” by Dennis Braekmans, Brien K. Garnand, Joseph A. Greene, Lawrence E. Stager & Patrick Degryse; “Between Carthage and Rome: the island of Proratora in Sardinia” by Paola Cavaliere, Jeremy Hayne & Giuseppe Pisanu; “Amphorae production in Punic and Late Punic Malaca (Málaga, Spain). New evidence from the Carranque workshop” by Cristina Chacón, Ana Arancibia, Bartolomé Mora Serrano & Antonio Sáez Romero; “Punic amphorae at Euesperides, Cyrenaica” by Kristian Göransson; “Punic amphoras in the Pla del Rey (Valldemossa, Mallorca)” by Guy de Mulder, Mark van Strydonck & Johan Deschieter; “Punic amphorae lids. Evidence of a particular class of pottery from central-west Sardinia” by Jeremy Hayne & Peter van Dommelen; “On some aspects of Iron Age Storage and Transport Jars from the Northern Levant” by Lione du Piéd; “NAA, Petrography, and the first

Phoenician Amphorae in the Bay of Cadiz” by Philip Johnston; “Western Mediterranean Phoenician Amphorae Imports in the Northeastern Iberian Peninsula during the Early Iron Age” by Eva Miguel Gascón, Jaume Buxeda i Garrigós & Peter M. Day; “Amphorae from the 1st millenium BC at Quinta do Almaraz (Almada, Portugal)” by Ana Olaio; “Archaic Phoenician and imported amphorae from Gadir: the Teatro Cómico site (Cádiz)” by Juan Miguel Pajuelo, José María Gener, María de los Ángeles Navarro, Ester López Rosendo, and Mariano Torres; “Another kind of salting, the salt-cured meat in the Phoenician Amphoras” by Carmen Ana Pardo Barrionuevo; “Phoenician and Punic Amphorae from S’Urachi (San Vero Milis, Sardinia)” by Andrea Roppa, Emanuele Madrigali, Alfonso Stiglitz, and Peter van Dommelen; and “Anfore puniche, macine e vetro egiziano dal relitto di Su Pallosu (San Vero Milis-OR)” by Ignazio Sanna & Carla del Vais.

The 2017 Annual Meeting of the Society for Historical Archaeology was held in Fort Worth Texas, USA, 4-8 January 2017. This was the SHA’s 50th anniversary year. See <https://www.ncptt.nps.gov/events/society-for-historical-archaeology-2017/> and <https://www.conftool.com/sha2017/sessions.php>.

Ceramics were well-represented in three symposia and other scattered papers. General Session: Ceramic Studies: “Hybrid Objects, Mixed Assemblages, and the Centrality of Context: Colonoware and Creolization in Early New Orleans” by Lauren Zych (University of Chicago). Following the discovery of unusual handmade chamber pots at Colonial Williamsburg last century, archaeologists began to identify colonoware in contexts throughout North America, the Caribbean, and beyond. Traditionally defined as the product of two or more disparate cultures, colonoware remains the most thoroughly studied category of “hybrid” objects in archaeology today. However, scholars now agree that a myopic emphasis on production – or, more accurately, on the racial identities of producers– severely limited the scope of earlier research. Drawing upon a more holistic approach that considers production and consumption in a single study, this paper presents new data on colonoware and other handbuilt vessels from eighteenth-century New Orleans. The evidence, derived from neutron activation analysis, ceramic petrography, and close contextual analysis, moves us beyond overly-romanticized tales of Indian wives and African mistresses towards a more accurate understanding of the complex relationships that led to creolization in Louisiana during the colonial era. “‘The Ware is in Perfect Order’: Reassessing the Transferprint Color Chronology using Period Newspaper Advertisements” by David M Markus (University of Florida). As an artifact category, ceramics, especially

those decorated with transferprints, represent one of the most ubiquitous pieces of material culture in historical archaeology. While a substantial amount research has been conducted on the origins and development of the transferprint technology, there is still considerable confusion regarding the introduction and popularity of specific transferprint colors, especially in the North American market. Despite recent refinements to the chronology, the availability of digitized 18th and 19th Century newspapers allows for a reassessment of both the chronology and the terminology employed in the analysis of historic ceramics. This paper will present a modified chronology of the introduction and popularity of transferprint technologies and colors. This alteration to the existing chronology is based on a dataset of over 600 unique newspaper advertisements spanning from 1778–1859 from 20 different states and over 100 different cities, making this chronology applicable to most North American archaeological sites. “What Lies Beneath: An Analysis of Historic Ceramics Found at 23SC2101, a Multi-Component Historic Site” by Grace I. Smith and Steve J. Dasovich (Lindenwood University). 23SC2101 is a multi-component site with French Colonial through 20th century domestic occupations. Multiple projects located ceramics from all time periods and all levels of excavation. The site is in an urban area and many of the upper levels have suffered from severe disturbance. Besides the normal analysis of socio-economic status and site function, the analysis of ceramic date ranges by level may help to determine how severe the disturbance has been. Information on disturbance is often overlooked, but it can be a valuable tool in analyzing site formation processes. “Refining’ Coarse Earthenware Types from the British Coal Measures” by Lindsay C. Bloch (Digital Archaeological Archive of Comparative Slavery). Ceramics analysis, particularly the identification and dating of ware types on historic sites, structures our inferences in critical ways. However, our ware types and production date ranges are sometimes built on incomplete information about the origins of these wares. The Coal Measures region of Great Britain, encompassing production centers such as Staffordshire and the major port of Liverpool, was the source for a variety of earthenware products, both coarse and refined during the colonial era. While many coarse earthenwares have been attributed to discrete locations within the region, with names like “Buckley” or “Staffordshire,” geological, historical, and elemental evidence demonstrates that these ware types conflate products of numerous production centers within the broader Coal Measures. I define the visible and elemental attributes of coarse earthenwares from throughout the Coal Measures, offering enhanced geographic and temporal resolution for wares recovered archaeologically in the British Atlantic. “Working Title:

Saenger Pottery Works: Preliminary Report, Unlocking a Town’s History through Their Pottery” by Elizabeth A. Long (Texas State University). This investigation of historical ceramics is conducted on a collection that dates from 1886 to 1915. Saenger Pottery Works was in operation from c.a.1885 through c.a. 1915. The size, form, and function variability of the ceramics inform about production techniques used and what forms are preferred over others. The issues in provenience and provenance are discussed because the pottery, while attributable to the site, do not have records of surface collection. Background research is a joint effort with the president of the town Historical Society. A dark history is revealing itself with the discovery of a long forgotten criminal with familial ties to current residents. The investigation seeks to find the historical significance Elmendorf. Research is currently on going, and an excavation of the Saenger site is in the formation process. “Xenia, IN: A Comparison Study Based on the Carolina Artifact Pattern” by Andrew D Earle and Christopher R Moore (University of Indianapolis). During the early to mid-19th century, Xenia, Indiana was an occupied town in Carroll County. As the region grew, Xenia did not and the town was abandoned. During the summer of 2011, the University of Indianapolis performed a siteless survey of a 60+ acre agricultural field that included portions of the abandoned town. We used Stanley South’s Carolina Artifact Pattern to categorize data from the site. Additionally, we used South’s mean ceramic date formula to confirm the mean dates of habitation for Xenia to be between 1840 and 1860.

SYM-013: Manila Galleon Archaeology in the American Continent: “The Stoneware from the Baja California Manila Galleon” by John P Schlagheck (Holman & Associates). Stoneware has long been held by archaeologists as a problematic artifact category. Stoneware is troublesome to date with any precision, difficult to source, and decidedly less flashy than even the most pedestrian porcelains. However, a study of the stonewares from the Manila galleon wreck site Baja California, in the form of sherds from large utilitarian storage jars, is an opportunity for gaining additional knowledge about the contents of a ship that, in the late sixteenth century, was in the vanguard of the Manila galleon trade at the very brink of a revolution in global commerce. This presentation provides a description of the main types of stoneware jar fragments found at the wreck site and comparisons with other stoneware jar assemblages of known provenience. “Smuggling and Distribution Routes of the Manila Galleon. The case of some XVI century Chinese porcelains and majolica in the Pacific coast of Mexico” by Roberto E Junco (Instituto Nacional de Antropología e Historia, Mexico). In 2006 a

survey was carried out in the north coast of Guerrero, Mexico that pointed to possible smuggling activities related to the route of the Manila Galleon. Several dozen shards of Chinese porcelain were recorded. Analysis of the Chinese porcelain determined that the collection was part of one depositional event and can be attributed to the late XVI century. In the collection are several common types such as phoenix plates, bowls and cups. Related to the porcelain was a ceramic type known as Romita Sgrafitto, which at the moment, its origin was unknown. Analysis of this ceramic with Instrumental Neutron Activation Analysis, made it possible to reconstruct distribution routes of the galleon trade previously unknown, as well as hypothesize about smuggling activity in the coast, something that is known from historical accounts but not from the archaeological record. "Spanish Shippers Marks on Wax, Pottery and Silver Bars" by Mitch Marken (ESA). This paper discusses the purpose and meaning of markings found impressed into pottery vessels, beeswax blocks, or carved into silver bars and possibly other trade goods shipped aboard Spanish galleons between 1500-and 1800. The paper will discuss examples recovered from shipwrecks from the trans-Atlantic and trans-Pacific trade, archival evidence and modern correlations.

SYM-032: British Ceramics in Indigenous, Colonial, and Post-Independence Latin America: "British Ceramics at the Empire's Edge: Economy and Identity Among Subaltern Groups in Late 19th-Century British Honduras" by Brooke Bonorden and Brett A. Houk (both Texas Tech University). Following the outbreak of the Caste War in the Yucatán (1847-1901), a group of approximately 1,000 Maya migrated into northwestern British Honduras (Belize) and settled 20 small villages. Far from the principal population centers of the Yucatán, the Petén, and Belize City, the only other inhabitants in this region were logging gangs predominantly composed of descendants of African slaves who seasonally inhabited the mahogany camps of the Belize Estate and Produce Company's (BEC) vast land concessions. Recent archaeological investigations at Qualm Hill, a BEC logging camp, and Kaxil Uinic village, a San Pedro Maya settlement, examined the ways in which these two marginalized groups navigated the cultural landscape of late 19th-century British Honduras. This paper focuses on the ceramic assemblages of the two sites to examine differences in access to colonial imports and how the two groups may have selectively participated in the colonial cash economy of British Honduras. "British Ceramics, Indigenous Miners, and the Commercialization of Daily Practice in Late Colonial Huancavelica" by Douglas Smit (University of Illinois-Chicago). Throughout the 18th century, indigenous Andean miners at the Huancavelica

mercury mine increasingly entered into wage labor agreements with Spanish mine owners in order to avoid the harsher conditions of the *mita* labor draft. This shift from forced to free labor increased the circulation of specie within the mining community, and as a result, the miners began increasingly participating in local, regional, and global markets. Drawing upon recent excavations at the indigenous mining settlement of Santa Barbara, this paper examines the role of British material culture in household consumption among the indigenous miners. Our analysis indicates that British ceramics complemented, rather than replaced Spanish and Andean vessels. However, the introduction of these new vessel forms coincided with the development of new dining practices, reflecting the increasing commercialization of daily life in Late Colonial Peru. "Ceramics, Foodways, and Identity in Bocas del Toro, Panama" by Jerry Howard (University of Massachusetts Boston). The Island of Isla Colon in the western Caribbean archipelago of Bocas del Toro, Panama has long been a place of trade and exchange. In the period shortly before Old World contact, different native groups visited the region producing an array of material evidence. Regionally diverse ceramics found on the island demonstrate a plethora of styles and traditions from both northern and southern regions during this ancient period. The practice of ceramic diversity on Isla Colon continued well into the historic period, as Afro-Caribbeans who migrated to the island established extensive trade networks with native and English merchants, introducing English made ceramics to the culture. The historic ceramics recovered from Sitio Drago reveal signs of continuity and change present in foodways. Through a specific selection process these ceramics also offer another glimpse into the identity of Bocas' historic inhabitants. I suggest that such contributions are the foundations for a Bocatoreno identity. "Mahogany and Sugar for Tobacco, Booze, and Salt-Pork: Consumerism and Consumption at 19th-Century Lamanai, Belize" by Adam F. W. Rigby and Tracie Mayfield (University College London). This presentation outlines archaeological research focused on the nineteenth-century, British sugar plantation settlement at Lamanai, northwestern Belize. Little is known about the eighteenth- and nineteenth- centuries at Lamanai, and this ongoing project aims to answer questions regarding how life (residential, industrial, and administrative) was structured. Archaeological data presented here includes the results of recent archaeological excavations (2014) and a study of previously excavated archaeological materials recovered at the site over the past 30 years (2009), conducted by the authors. Much of the diagnostic archaeological evidence has taken the form of ceramic remains, but glass, bone and metal objects are also present. Archival research has also shed greater light on

the operational history of the site and the composition of its labour force. The project's core theoretical and methodological foundations will also be discussed, which framed the most recent studies at Lamanai and will continue to inform future research endeavours. "Refined earthenware ceramics among enslaved Afro-Andeans at the post-Jesuit haciendas of San Joseph and San Xavier in Nasca, Peru" by Brendan J. M. Weaver (Berea College). In excavated contexts at the vinicultural haciendas of San Joseph and San Francisco Xavier de la Nasca, refined earthenwares of British manufacture first begin to appear in post-1767 strata. This period marks the Jesuit expulsion and the expropriation of the estates by the Spanish Crown. Administrators for the Crown likely found it difficult to replicate the material conditions on the haciendas under their Jesuit predecessors and turned to other exchange networks for provisioning the newly appropriated Crown estates. Although technically contraband in the late 18th-century Spanish Empire, British refined earthenwares replaced the supply of fine majolica tablewares, which had been provided to the enslaved laborers at both estates by the former Jesuit administration. After Peruvian independence and the transmittal of the estates into private hands, the increasing presence of diverse refined earthenware ceramics indexes transformations in the political economy of the estates, as well as the markets which supplied them. "The preferences for British earthenwares among 18th and 19th-century Limeños: A perspective from the historical archaeology of the Casa Bodega y Quadra, Lima, Peru" by Miguel Angel Fhon Bazan (Municipalidad de Lima, Peru). Archaeological research at the Casa Bodega y Quadra, located in the historic city-center of Lima, Peru, has recovered of a large number of colonial and republican-era artifacts, including pottery sherds of a variety of types and origins. A percentage of these ceramics correspond to British earthenwares. This material evidence reflects the intense and sustained trade between England and Peru that developed at the close of the 18th century and the 19th century. This study examines the characteristics of the British pottery found at the Bodega y Quadra site, analyzing the forms, decorative designs, and iconographic themes, among other features, with the goal of reconstructing the preferences for these imported wares required by Limeña society during this period. The project also seeks to identify the respective maker's marks, signaling which brands of British earthenware were most sought-after in this part of South America. "To the ends of the Earth: European Tablewares in El Progreso, Galápagos (1880-1904)" by Fernando Astudillo and Ross Jamieson (both Simon Fraser University, Canada). In 1878 Manuel J. Cobos founded a large-scale agricultural operation on the island of San Cristóbal, Galápagos. A merchant from the

Ecuadorian coast, Cobos' El Progreso operation, with 300 labourers at its peak, produced sugar, cane alcohol, leather, and a variety of other agricultural products exported to the city of Guayaquil on the Ecuadorian mainland. His home was several days sailing from Guayaquil to San Cristóbal, and 8 km uphill by oxcart or on horseback to the interior of the island. Despite being in one of the more remote locations from Europe on the planet, excavation of Cobos' 1880s or 1890s household midden revealed a wide variety of luxury goods from Europe and the United States. His reputation as a brutal *hacendado*, living in a house of little architectural distinction, seemingly contradicts his ceramic tablewares, in the latest fashions from France, Belgium, and England. "Tools of Royalization: British Ceramics at a Military Outpost on Roatán Island, Honduras" by Lorena D Mihok (Eckerd College). During the seventeenth and eighteenth centuries, the British Crown viewed the Caribbean as the geographical hub within which it would be able to obtain key resources and to challenge the growing power of the Spanish Empire. In 1742, Augusta was established as a British military outpost on Roatán Island, Honduras, because of its strategic location across the Bay of Honduras from the Spanish settlement of Trujillo. In this paper, I use the term "royalization" to refer to the strategies employed by monarchies to bring about loyalty to a state. While the royalization process was intended to instill a sense of loyalty and British identity among colonists, enforcement of the use of only imported materials such as British ceramics may have proved difficult or impractical. Documentary and archaeological data suggest that multifaceted relationships emerged among British and Miskitu populations around the Bay of Honduras at settlements such as Augusta. "Venezuela between Spanish and English: an identity formed through images" by Ana C Rodriguez and George Amaiz (Independiente, Venezuela and Bolivarian Republic). Previous analysis of ceramics from the historic center of Barcelona in Venezuela demonstrated that the decorative motifs of English ceramics and other European countries influenced the shaping of the identity of Barcelona during the 19th century. In this paper, we compare the Barcelona study with collections with the Historical Center of Caracas, in order to establish whether this change and unification of patterns and customs in everyday life was also reflected in the capital of Venezuela. This will help us examine the similarities in the development of Venezuelan identity through elements such as language and urban organization from European countries, while differences are reflected in the distinct indigenous components of each region. "You Don't Have to Live Like a Refugee; Consumer Goods at the 19th Century Maya Refugee Site at Tikal, Guatemala" by James W Meierhoff (Field Museum of Natural History / University

of Illinois at Chicago). In the mid-nineteenth century Maya refugees fleeing the violence of the Caste War of Yucatan (1857-1901) briefly reoccupied the ancient Maya ruins of Tikal. These Yucatec speaking refugees combined with Lacandon Maya, and later Ladinos from Lake Petén Itza to form a small, multi-ethnic village in the sparsely occupied Petén jungle of northern Guatemala. The following paper will discuss the recent archaeological investigation of the historic refugee village at Tikal, with a focus on the recent analysis of commercially made British ceramics and copious metal artifact assemblages; and includes a discussion on what the villagers may have been trading to obtain such goods. As will be demonstrated, despite its remoteness from urban centers, the Tikal Village was well connected to trade networks of surrounding societies, demonstrated by the quantity and diversity of foreign items found in their homes and in vast midden deposits around this short lived community.

Miscellaneous Presentations: “A pXRF Analysis on 18th-Century Colonial Redware” by Cheryl A Frankum (Indiana University of Pennsylvania). This portable X-ray fluorescence (pXRF) research addresses questions concerning economic status and procurement strategies through the study of redware ceramics. The use of pXRF is a high-tech, newly emerging analytical technique for archaeologists that provides quantitative data concerning the chemical composition of ceramics. The ceramics were produced by local or regional manufacturers, and this research is a comparative compositional study with collections from several archaeological sites in Westmoreland County and southwestern Pennsylvania. Previous studies using pXRF for ceramic analysis have shown that there is great potential for positive outcomes of reliable data when examining ceramics. Redware was the first pottery produced in Colonial America, and an examination of how it traveled and how consumers chose pieces allow us to better understand human behavior during early frontier development. “Comparative Ceramics Analysis of Enslaved Contexts at Thomas Jefferson’s Poplar Forest” by Caitlyn C Johnson (University of Florida). Ceramics and socioeconomic analyses are useful tools for comparing market access, choice, and economic status between sites associated with enslaved people. Located in Bedford County, Virginia, Poplar Forest plantation was home to enslaved peoples beginning with its establishment in the mid-18th century and continuing through multiple owners until emancipation. Archaeology conducted since the 1990s has yielded substantial datasets for several different slave quarters on the property, which have provided insight into their occupants’ daily lives. This poster presents a broad comparison of the ceramic

assemblages from multiple quarter sites, with periods of occupation ranging from the late 18th century through the end of the antebellum period. Ceramic analysis, including CC index values for each site are used in order to help elucidate differences and similarities between these sites to offer some initial interpretations of the temporal and social factors that may have shaped these assemblages. “Saenger Pottery Works: Preliminary Report, Unlocking a Town’s History through Their Pottery” by Elizabeth A. Long (Texas State University). This investigation of historical ceramics is conducted on a collection that dates from 1886 to 1915. Saenger Pottery Works was in operation from c.a.1885 through c.a. 1915. The size, form, and function variability of the ceramics inform about production techniques used and what forms are preferred over others. The issues in provenience and provenance are discussed because the pottery, while attributable to the site, do not have records of surface collection. Background research is a joint effort with the president of the town Historical Society. A dark history is revealing itself with the discovery of a long forgotten criminal with familial ties to current residents. The investigation seeks to find the historical significance Elmendorf. Research is currently on going, and an excavation of the Saenger site is in the formation process. “Household Ceramics across communities of Labor, a study from central Appalachia” by Tyler Dean Allen¹, R. Carl DeMuth², Heather Scott³, and Kelly MacCluen⁴ (1Michigan Tech University; 2Indiana University; 3Unaffiliated Scholar; 4Roanoke College). Excavations during the summers of 2015 and 2016 by the Coal Heritage Archaeology Project focused on the residential communities that once lived in Tams, WV and Wyco, WV. These communities originated as coal company towns, in which all residents worked for and rented their houses from the coal company. Because these communities were somewhat isolated, many of the residents could only shop at the company store. This study examines the ceramic materials recovered from different racial, and ethnic communities across our field sites to develop a better understanding of race and class early 20th century West Virginia.

The 2017 Annual Meeting of the Archaeological Institute of America was held in Toronto, Ontario, Canada, 5-8 January 2017. See <http://www.asor.org/am/2017/approved.html>.

Contributions on ceramics were well-represented at the meeting; there were two sessions totally devoted to ceramic subjects. **4A: Ceramics:** “Did Mycenaean Wash Their Hands? A Functional Analysis of Late Helladic IIIc Kalathoi” Trevor Van Damme, Cotsen Institute of Archaeology, UCLA, and Bartłomiej Lis, Polish Academy of Sciences; “New Pottery Assemblage

from a Late Archaic Fill from Thasos” Martin Perron, Maison de l’Orient et de la Méditerranée, Lyon, and Anne Tichit, Université Paris Sorbonne; “Ceramic Types and Wealth Distributions in the Classical Greek House” Grace Erny, Stanford University; “The Hellenistic “koine” as a Linguistic, Cultural, and Ceramic Concept” Alexandros Laftsidis, University of Cincinnati; “Understanding Ancient Trade, Agency, and Social Change: An Examination of Thracian Encounters with ‘Greek Colonists’” Ashlee Hart, University at Buffalo; and “Portuguese Coarseware in North Atlantic (16th-18th centuries)” Tania Manuel Casimiro, NOVA University of Lisbon, and Sarah Newstead, University of Leicester.

6E: Pottery from Sanctuaries: What Can it Tell Us? (Colloquium): “Ritual Drinking in Archaic Samothrace: Evidence from the Figure-Decorated Pottery” An Jiang, Emory University; “Votive Inscriptions and Figural Pottery on the Athenian Acropolis: A Contextual Approach” Kiki Karoglou, Metropolitan Museum of Art; “Ex-Voto: Reconsidering a Votive Deposit from the area of the Hephaisteion in Athens” Kathleen M. Lynch, University of Cincinnati; “The Attic Pottery from the Persephoneion of Locri Epizefiri between Ritual Practices and Worship” Elvia Giudice, University of Catania, and Giada Giudice, Archivio ceramografico dell’Università di Catania; “Hera, Heads, and Hope: South Italian Vases in Paestan Sanctuaries” Keely Heuer, State University of New York at New Paltz; and “Women and Drinking Cups in North Etruria: Evidence from Poggio Colla” Ann Steiner, Franklin and Marshall College.

The other presentations included: “The Toronto 495 Group Reconsidered: Early Hellenistic Pottery Production at Tarquinia” Bice Peruzzi, Grand Valley State University; “Soup’s on! Expanding the Picture of Minoan Meals through Functional Analysis of Cooking Pots and Tablewares” Micaela Carignano, Cornell University; “Ceramics and the Socioeconomic Significance of La Biagiola through Etruscan, Roman, and Lombard, and Modern Settlement” (poster) Letitia C. Mumford, St. Olaf College; “Potters of the Nile?: Meroitic Ceramic Culture, Typological Analysis, and the Nubian Ceramic Collection at the Royal Ontario Museum” Anissa Malvoisin, University of Toronto; “Pottery from the Mediaeval Middle East: Collections Research at the Royal Ontario Museum” Robert Mason, Royal Ontario Museum; “Theoretical Approaches to the Terra Sigillata at Gabii: Evidence of the Augustan Period” Matthew Harder, University of Missouri; “Roman Brickstamps in the Carthage National Museum, Tunisia” Jeremy Rossiter, University of Alberta; “The Early Hellenistic Ceramic Deposits from Temple B” Babette Bechtold, University of Vienna; “Seals from the Hellenistic Archives of Kedesh, Seleucia, Uruk, and Delos” Sharon

Herbert, University of Michigan; “Comparing Third Millennium Material Use: Siliceous Paste (Faience) in the Indus Valley, Mesopotamia, and Egypt” Heather M.-L. Miller, University of Toronto; “The Imported Greek ceramics from the Regia” Carlo Regoli, Università di Roma La Sapienza; “Ceramic Production and the Roman Regia” Mattia D’Acri, Università della Basilicata; “Competing in Clay: Sacred and Private Uses of Architectural Terracotta at Fregellae” Sophie Crawford Waters, University of Pennsylvania; “Making Sense of Changes in the Ceramic Assemblage at Phylakopi on Melos during the Late Bronze Age” Jason Earle, The Institute for Aegean Prehistory; “Cooking up a New Model: Using Cooking Ware Vessels from Kalamianos to Identify Production and Exchange” Debra A. Trusty, Florida State University; and “The Late Helladic Roofing Tiles from Eleon, Greece: Construction and Form” Kyle A. Jazwa, Monmouth College.

The 82nd Annual Meeting of the Society for American Archaeology was held in Vancouver, BC, Canada, from 29 March 29-2 April 2017. The Preliminary Program lists five sessions on ceramics. **Poster Session Current Ceramics Research in the American Southwest** Participants: Emily Case and Emma Britton; Suzanne Eckert, David Hill and Judith Habicht-Mauche; Robert Bischoff; Leszek Pawlowicz, Christopher Downum and Michael Terlep; David Lewandowski and Theodore Tsouras; Rebecca Simon; Sachiko Sakai; Christina Stewart; Kelsey Reese, Molly Iott, Katherine Portman, Donna Glowacki and James Potter; Brenton Willhite, Andrew Fernandez, Andrew Krug and Christine VanPool; William Willis; Andrew Duff, Judith Habicht-Mauche and Rob Franks. **Symposium Beyond Typology: Current Trends in Ceramic Analysis in China** Chairs: Anke Hein; Andrew Womack Participants: Andrew Womack; Zhao Yichao; Patania Ilaria, Susan Mentzer, Ofer Bar-Yosef and Paul Goldberg; Camilla Sturm; Kueichen Lin; Qiaowei Wei; Eric Carlucci, Jianfeng Cui and Ling-Yu Hung; Lingyi Zeng; Matthew Chastain, Jianli Chen and Xingshan Lei. **Symposium Wheel of Fortune: Ceramic Analysis and the Study of Technology, Exchange, and Sociopolitical Change in the Mediterranean and Greater Near East** Chair: Christine Johnston Participants: Susannah Fishman; Trevor Van Damme; Sonali Gupta-Agarwal; Megan Daniels, Justin Leidwanger, Elizabeth Greene and Numan Tuna; Dennis Braekmans, Brett Kaufman, Hans Barnand and Ali Drine; Christine Johnston; Jacob Damm; Mara Horowitz. **Symposium Recent Developments in East and Southeast Asian Archaeology I: Material Culture Studies** Chair: Alison Carter Participants: Joyce White and Elizabeth Hamilton; Vincent Pigott; Andrew Weiss and Vince Pigott; Kazuo Miyamoto; Lauren Glover;

Carmen Sarjeant; Miriam Stark, Peter Grave, Lisa Kealhofer and Darith Ea; Li Fei; Damien Huffer, Duncan Chappell, Lâm Thị Mỹ Dung and Hoàng Long Nguyễn. And **Symposium Ceramics in Southwestern Archaeology** Chair: Patrick Lyons Participants: Evan Giomi, Leslie Aragon, Ben Bellorado, Barbara Mills and Matt Peeples; Heather Seltzer; Maxwell Forton; Leon Natker; Dylan Person; Samantha Linford; Jaelyn Eckersley; Garrett Leitermann; Caroline Gabe; Krystal Britt; Patrick Lyons, Don Burgess, Marilyn Marshall and Jaye Smith; Elizabeth Long. The authors and titles of oral presentations and posters listed above and individual presentations on ceramic materials in other sessions will be posted in the next issue of the *SAS Bulletin*.

Forthcoming Professional Meetings

International Congress of Eurasian Archaeology (ICEA) 2017 Buca will be held in Izmir Turkey, 18-21 April 2017. The meeting is sponsored by Dokuz Eylül University (DEÜ) Center for Studies on Caucasus and Central Asian Archaeology, KAM (DEÜ), and the Municipality of Buca and will focus on Eurasian Prehistory (mainly the Paleolithic to Eneolithic Periods). The official languages will be Turkish, Russian, English, and Chinese; abstracts and full texts will be submitted in English. Topical sessions include: Material Culture, Anthropology, Human Migrations, Relations between Early Cultures of Baikal and Northern China, Genetics Research, Early Pottery Production, Jade in Prehistoric Asian Cultures, and Petroglyphs. Applications can be made online via the congress's email address icea.official.kam@gmail.com. See also <http://kam.deu.edu.tr/icea2017.html>

Terracottas in the Mediterranean through Time II is scheduled for 12-15 March 2018 at the University of Haifa, Israel and organized by Dr. Adi Erlich and Dr. Sonia Klinger. The Zinman Institute of Archaeology, the Department of Art History and the Department of Archaeology of the University of Haifa is sponsoring this conference dedicated to the study of terracotta figurines and related objects in the Mediterranean region from the early periods to late antiquity. The conference aims to bring together scholars and students who often tackle the same issues as they study clay figurines and related objects from different periods and parts of the Mediterranean region. Scholars who research terracottas of illiterate societies often use anthropological and ethnographical methods, while those studying terracottas of historical periods refer to historical sources and artistic analogies. The various viewpoints and attitudes may enrich and deepen our understanding of terracotta figurines and their role in society. The scope of issues to be discussed at the conference will be wide, and will

follow the different stages of the terracottas' lives: First stage - the artisans or coroplasts: aspects of manufacture; typology and iconography; production of large- and small-scale terracottas; organization of workshops; questions of specialization; new technologies employed in identifying workshops. Second stage - patterns of distribution: interaction between production centers and markets; trade; imitations. Third stage - the users: Who used terracottas and who did not; how they were used; usage through space and time; themes and types in specific contexts (sacred, funereal and domestic); choice of types; symbolic meaning conveyed by terracottas; terracottas and gender. Fourth stage - phasing out: How, why and when terracottas went out of use; patterns of deposition or obliteration; archaeological context of terracottas and its meaning. A special issue to be discussed in the conference will address terracottas not just as a separate category, but to examine what accompanies them in different contexts, and how did terracottas act beside other objects and materials in all four categories mentioned above. This viewpoint may provide a better understanding of the role terracottas played in ancient societies. The official language of the conference is English. Presentations should not exceed 20 minutes. We invite proposals for panels and individual papers on these and related topics. Proposals for panels and individual papers on these and related topics are invited. Abstracts of 200-300 words should be submitted by 30 September 2017 to Dr. Adi Erlich; for additional information contact her at aerlich@research.haifa.ac.il.

11th ICAANE: International Congress on the Archaeology of the Ancient Near East is scheduled to be held 3-7 April 2018 at LMU Munich (Ludwig-Maximilians-Universität München), Germany. The Organizing Committee invites all scholars working on subjects related to Near Eastern Archaeology to participate. The sessions will cover all aspects of the archaeology of the Near East, from prehistoric to Islamic times, from archaeological fieldwork to art historical, historical and philological studies, as well as Cultural Heritage. Registration and submission of papers is possible from 1 April 2017 onwards and the deadline for submission of proposals for papers, workshops and posters is 30 June 2017. For additional information contact: icaane2018@lmu.de.

ARCHAEOMETALLURGY

Thomas R. Fenn, Associate Editor

The column in this issue includes the following categories of information on archaeometallurgy: 1) New Books; 2)

New Book Chapters/Articles; 3) Doctoral and Master Theses; 4) Forthcoming Meetings; 5) Previous Meetings; and 6) Web-based Resources.

New Books

The Technology of Large-Scale Zinc Production in Chongqing in Ming and Qing China, by Wenliu Zhou, 2016, BAR International Series S2835, BAR Publishing, Oxford, UK, xvi+162 pages, 43 tables, 122 figures (62 in color), 3 maps (1 in color); illustrated throughout in color and black & white, ISBN 9781407315515, £32.00.

This book presents the analyses, technical interpretation and socio-economic contextualization of the production remains of zinc distillation from three Ming sites in Fengdu and one Qing site in Shizhu, Chongqing, southwest China. Zinc ore, zinc metal, retorts and slag from these sites were analyzed by OM, SEM-EDS, EPMA-WDS and XRD. Following on from a detailed technological reconstruction, some differences were found between the zinc distillation technologies in Fengdu and Shizhu, not only in technical efficiency but also in the organization of production, which can be explained as adaptation of the zinc production for coinage to the different social, political and economic constraints affecting each group of sites. This book then contextualizes and discusses the significance of Chinese zinc production with reference to coinage in Ming and Qing China, but also by comparing it to other brass- and zinc-making technologies in China, India and Europe, and by assessing the influence of Chinese zinc in the international maritime trade.

The main sections of the volume consist of: Introduction (p. 1); Chapter 1. Limits of subject, chronology and chorology (p. 4); Chapter 2. Historical and Technological Background to Zinc Production in China (p. 9); Chapter 3. Theoretical Framework and Methodology (p. 23); Chapter 4. Analyses of Zinc Smelting Remains in Fengdu (p. 31); Chapter 5. Analyses of Zinc Smelting Remains in Shizhu (p. 79); Chapter 6. Zinc Production in Chongqing and Beyond (p. 103); Chapter 7. The Significance of Zinc Production in Ming and Qing China (p. 117); Chapter 8. Conclusions and Future Work (p. 129); References (p. 133); and four appendices (p. 143). More information and how to purchase the publication can be found at the publisher's website: <http://www.barpublishing.com/the-technology-of-large-scale-zinc-production-in-chongqing-in-ming-and-qing-china.html>.

India's Legendary Wootz Steel: An Advanced Material of the Ancient World, edited by Sharada Srinivasan and Srinivasa Ranganathan, 2014, *Series in Metallurgy and Materials Science*, National Institute of Advanced

Studies, Bangalore, and the Indian Institute of Sciences, Bangalore, University Press, Hyderabad, x+149 pages, illustrations (black and white, and color), map (black and white), ISBN 9788173717215.

The book is reissued under the Universities Press' IIM series in Metallurgy and Materials Science. A fascinating history of India's legendary high-grade steel 'wootz steel' which was highly prized and much sought after across the world for over two millennia. Wootz steel was used to make the fabled Damascus blades. Although Indian wootz steel was such an important material in the metallurgical history of mankind, there are no books devoted to Indian contributions. First brought out by Tata Steel in November 2004 as a celebration of the twin centenaries of J N Tata and J R D Tata, the book has been widely acclaimed. It is both scholarly as well as highly readable at the level of popular archaeo-science.

Contents: Foreword (of the 2004 edition); Acknowledgements; Chapter 1: Wootz Steel as the Acme of Mankind's Metallurgical Heritage; Chapter 2: The Three Ages of Civilisation: The Stone, Bronze and Iron Ages; Chapter 3: Steel and the Sword; Chapter 4: The Romance of Wootz Steel and the Damascus Sword; Chapter 5: Crucible Steel and Indian Armoury: Sixteenth to Nineteenth Century Accounts; Chapter 6: European Excitement: Sixteenth to Twentieth Century Experiments; Chapter 7: Replication of Wootz: Twentieth Century American Adventures; Chapter 8: On Pattern-welded Damascus Swords: Imitation as the Best Form of Flattery; Chapter 9: Archaeometallurgy of Wootz: A Beginning without an End; Chapter 10: Ancient Steel Meets Modern Science: Twenty First Century Advances; Suggestions for Further Reading.

Les Scorries de forge du Pays dogon (Mali): Entre ethnoarchéologie, archéologie expérimentale et archéométrie, Raphaëlle Soullignac, 2017, LIBRUM Publishers, Basel, Switzerland, 209 pages, 119 color figures, 29 tables, 4 appendices [+175 pages in the separate PDF database appendix], Language: French, ISBN: 9783952454299, free as a PDF (open access).

This is to alert you to a very significant open-access publication on the forging of iron in West Africa. This is a revised version of Raphaëlle's PhD thesis, which was completed at the Université de Fribourg, Switzerland, in 2015 under the direction of Vincent Serneels. They arranged for many village blacksmiths in the (very isolated) Dogon region of Mali to forge several samples of iron that they supplied. Each blacksmith was asked to forge tools of standard dimensions from several samples of ingot stock. Two of these samples were standard

European mild steel; the third was African bloomery iron, from a large stock of African iron ingots obtained by Vincent. The blacksmiths in the sample used varying designs of forge pits and air supply. Each forge was swept clean before use. Raphaëlle kept timed logs of each forging cycle, and weights of charcoal consumed. After completion, all products (forged iron, forge slags) were weighed and removed to the laboratory, where a variety of analytical methods were applied (thin-section petrography, metallography, chemical analysis, x-ray diffraction). This is by far the most scientifically exacting study yet attempted, to my knowledge, of variation in iron-smithing residues. Any archaeometallurgist who has to decide whether a given prehistoric slag sample derived from smelting or forging should have a copy of it in his or her laboratory. [David Killick, School of Anthropology, University of Arizona]. The text and database appendix both are available in full color for free (i.e., open access) online at: <http://librumopen.com>.

Abstract: Numerous archeological sites have produced slags originating from iron smithing workshops. These slags have been shown to exhibit great variability which is generally interpreted as reflecting different iron smithing techniques, but this interpretation remains tentative. This work is based on an ethno-archaeological approach in the field and archaeometrical laboratory studies and contributes to a better understanding of the factors influencing the formation of smithing slags.

The first step of the work took place at four different villages (Fiko, Kakoli, Kobo, Doundé) within Dogon Country, Mali, that reflect two different technical traditions (i.e., Mombo, Tomo). About a hundred smithing works of hoe blades, were recorded according to a defined protocol. Raw materials, waste (e.g., slags and hammerscale) and final products were sampled as well.

During the second step of the work, these specimens were studied at the Department of the Geosciences of the University of Fribourg. The methods include a morphometric study and characterization of the sample using a selection of physical and chemical methods, in particular, chemical analyses by X-ray fluorescence, X-ray diffraction, optical microscopy, and scanning electron microscopy.

In the Mombo area, the workshop is a large shed containing several working areas with mobile structures. In the Tomo area, the workshop is a shelter containing a single working area with fixed structures.

The observation of the work of the smiths helped us to understand the chaîne opératoire of hoe blades, from the

raw material to the production of the finished blade. Preforming is a highly variable step in the production of hoes as it depends on the raw materials being utilized, in particular the size and number of bars (one or two) being used. This step is followed by the forming and the finishing steps, which show little variability. In the preforming step, temperatures are high and heating is important. There are several ways to weld two iron bars. The use of siliceous additions is restricted to the Tomo workshops. Quenching increases the formation of defects in the metal. During the forming step, temperatures are intermediate to high and heating therefore remains important. During the finishing step, temperatures are low to average and hammering is important.

Slag is formed at the bottom of the hearth by the accumulation of several materials : raw material (iron), fuel (coal), hearth (lining, tuyere, soil), and siliceous additions. Iron is lost from the raw material into the hearth forge during smithing work in the form of iron oxides crusts, hammerscale, and particles of metallic iron. Loss of iron is a complex and variable process (8-53%) that depends on various work conditions (temperature, duration of the work, shape of the bar, number of welds, etc).

Fast smithing of a single bar of iron generates sandy-clayey slags (SAS) and shapeless slags (SI). SAS slags contain 80 to 100 % of siliceous materials, such as rocks and glass, and they are poor in iron. They contain less than 2 % of the mass of the initial iron bar.

SI slags from Doundé are small (< 4 cm) and contain a lot of non-ferrous minerals, such as augite, leucite, åkermanite, or hedenbergite. They reflect the difficult conditions of formation within the hearth.

Smithing works based on of two iron bars are longer and generate dense grey slags (SGD) and ferrous rusty slags (SFR). In this case, approximately 5–15 % of the mass of the initial iron is lost in the slag.

SGD slags contains between 50 and 100 % fayalite (or kirschsteinite, the Ca rich equivalent) and an average of 10% ferrous particles. Slags from Kakoli contain iron oxides and a large amount of calcium originating from cement used to coat the hearth.

SFR slags results especially from failed smithing works or from quenchings. They contain up to 90% iron and iron oxides. In some cases, cast iron is observed. [Translation: Walter Joyce]

New Book Chapters/Articles

Several recent editions of *The Crucible*, newsletter of *The Historical Metallurgy Society (HMS)*, are available as PDFs from the HMS website. Issue 93 (Winter 2016) comprises 16 pages including a Letter from the Chairman (Tim Young), News (articles include: “Helping to Fund Historical Metallurgy into the Future” by Jonathan Prus & Eddie Birch; “Iran; the land of Archaeometallurgical surprises” by Mohammadamin Emami; “X-Ray Fluorescence: The Basics” by Mike Dobby; “Wealdon Iron: A summary of the 2016 volume” by Jeremy Hodgkinson; and “A Small Cast Pig” by Peter Crew & Jack Procter), A One Minute Interview with Jianjun Mei, Meet your Council segment on Peter Halkon, Event Reviews (including IAMS Summer Archaeometallurgy School 2016, HMS Research in Progress Meetings Abroad, and MeTools Conference), In Memoriam (for Amina Chatwin & Ursula Franklin), What are you up to? (brief blurbs on archaeometallurgy activity), and Forthcoming Events. A PDF version of the issue is available at: http://hist-met.org/images/HMS_News_93.pdf.

The Crucible, Issue 92 (Summer 2016) comprises 16 pages including a Letter from the Chairman (Tim Young), News (articles include: “New Analyses of Roman Copper Alloys” by Pablo Antonio Fernández Reyes; “A Possible Explanation for the Presence of Calcium and Phosphorus in Melting Crucibles” by Paul Eklöv Pettersson & Mats Lönnberg; “The ‘WhoCares’? Project” by Shane Kelleher; “Stories of Metal Forming: A request for help” by Julian Allwood; and “An Opportunity to Help Your Society – Volunteer Now!” by Aurélie Cuénod), A One Minute Interview with Sharada Srinivasan, Meet your Council segment on Mike Cowell, Event Reviews (Metals at Awrana 2015, Metalwork Use-Wear Analysis: The Loss of Innocence, and HMS Research in Progress 2015), What are you up to? (brief blurbs on archaeometallurgy activity), and Forthcoming Events. A PDF version of the issue is at: http://hist-met.org/images/HMS_Crucible_92.Summer.pdf.

The Crucible, Issue 91 (Spring 2016) comprises 16 pages including a Letter from the Chairman (Tim Young), News (articles include: “Ancient Iron Metal Tracing by Iron Isotopes Analysis” by Jean Milot, Franck Poitrasson, Sandrine Baron, Marie-Pierre Coustures, & Caroline Robion-Brunner; “The Staffordshire Hoard” by Eleanor Blakelock; “Gold and Silver in San Pedro de Atacama, Northern Chile” by María Teresa Plaza; “CAST:ING, Copper Alloy Sculpture Techniques and history: International iNterdisciplinary Group (2015-2019)” by David Bourgarit; and “Investigating an Enigmatic Iron Age Metallurgical Site in Southeastern Arabia” by Lloyd

Weeks, Kristina A. Franke, & Charlotte M. Cable), A Letter from... Sudan (Jane Humphris), A One Minute Interview with María Filomena Guerra, Meet your Council segment on Jonathan Prius, Event Reviews (41st International Symposium on Archaeometry), and Forthcoming Events. A PDF version of the issue is at: http://hist-met.org/images/HMS_Crucible_Spring_2016_.pdf.

The Crucible, Issue 90 (Winter 2015) comprises 20 pages including News (articles include: “The Earliest Zinc Artifacts” by P.Craddock, J.Cribb, N.Gale, & S.La Niece; “Silver Production in the Southern Andes of Bolivia during the 15th to 17th Centuries” by P.Cruz and F.Téreygeol; “Wealdon Iron Research Group” by J.Hodgkinson; and, The Case of Pre-Columbian Bronze Objects in Northwestern Argentina: Metallurgy, Archaeological Contexts and Chronology” by Geraldine Gluzman), A Letter From... Basque Country (David Larreina-Garcia & Juan Antonio Quirós-Castillo), A One-Minute Interview with Zofia Stos-Gale, Meet your Council segment on Andrea Dolfini, Event Reviews (IAMS Summer School 2015, and HMS Street Furniture Conference and AGM), What are you up to? (brief blurbs on archaeometallurgy activity), and Forthcoming Events. A PDF version of the issue is at: http://hist-met.org/images/HMS_Crucible_90_Winter.pdf.

From the *Journal of Archaeological Science* (2017, Vol 80) comes “Origins of inhabitants from the 16th century Sala (Sweden) silver mine cemetery – A lead isotope perspective” (T. Douglas Price, Robert Frei, Ylva Bäckström, Karin Margarita Frei, Anne Ingvarsson-Sundstrom; pp. 1-13), and “Copper for the Pharaoh: Identifying multiple metal sources for Ramesses' workshops from bronze and crucible remains” (Frederik W. Rademakers, Thilo Rehren, Ernst Pernicka; pp. 50-73).

From *Journal of Archaeological Science: Reports* (2017, Vol. 12) comes “Copper-ore mining in Sweden since the pre-Roman Iron Age: lake-sediment evidence of human activities at the Garpenberg ore field since 375 BCE” (Richard Bindler, Jon Karlsson, Johan Rydberg, Björn Karlsson, Lena Berg Nilsson, Harald Biester, Ulf Segerström; pp. 99-108), “Extraction of archaeological information from metallic artefacts—A neutron diffraction study on Viking swords” (Anna Fedrigo, Francesco Grazi, Alan R. Williams, Tobias Panzner, Kim Lefmann, Poul Erik Lindelof, Lars Jørgensen, Peter Pentz, Antonella Scherillo, Florence Porcher, Markus Strobl; pp. 425-436), and “Typological and technological attributes of metallurgical crucibles from Great Zimbabwe (1000–1700 CE)'s legacy collections”

(Foreman Bandama, Abigail Joy Moffett, Shadreck Chirikure; pp. 646-657), and from (2017, Vol. 11) comes “Bronze production in the Iron Age of the Iberian Peninsula: The case of *El Castro*, Vigaña (Asturias, NW Spain)” (Carlotta Farci, Marcos Martín-Torres, David González Álvarez; pp. 338-351), “Beyond smelting: New insights on Iron Age (10th c. BCE) metalworkers community from excavations at a gatehouse and associated livestock pens in Timna, Israel” (Erez Ben-Yosef, Dafna Langgut, Lidar Sapir-Hen, pp. 411-426), “Did prehistoric and Roman mining and metallurgy have a significant impact on vegetation?” (T Mighall, S. Timberlake, Antonio Martínez-Cortizas, Noemí Silva-Sánchez, I.D.L. Foster; pp. 613-625).

From *Archaeometry* (2017, Vol. 59, No. 2) comes “Microstructural and Componential Characterization of the Plating Technology on Chinese Han Dynasty Bronze Fragments” (P.J. Jin, F.H. Ruan, X.G. Yang, H.X. Zou, J. Yi, Y. Zhang and Y. Zhao; 274-286), and from (2017, Vol. 59, No. 1) comes “The Phenomenon of the Influence of Gold Melt on Microinclusions of Platinum Group Minerals in Ancient Gold Objects” (V.V. Zaykov, V.A. Kotlyarov, E.V. Zaykova and I.YU. Melekestseva; pp. 96-104).

From *Archaeological and Anthropological Sciences* (2017, Vol. 9, No. 3) comes “Colonial iron in context: the Trianon slave shackle from Mauritius” (Krish Seetah, Thomas Birch, Diego Calaon, Saša Čaval; pp. 419-430), and “The Dor C shipwreck, Israel: metallurgical analysis and its contribution to the ship characterization” (D. Ashkenazi, D. Cvikel, M. Holtzman, D. Bershadski, A. Stern, S. Klein, Y. Kahanov; pp. 431-445), and from (2017, Vol. 9, No. 2) comes “Iron Age tin bronze metallurgy at Marlik, Northern Iran: an analytical investigation” (Omid Oudbashi, Morteza Hessari; pp. 233-249).

From the *Mediterranean Archaeology and Archaeometry* (2017, Vol 17, No. 1) comes “Archaeometric Contribution to the Interpretation of the Late Bronze Age “Hoard” from Porto do Concelho (Macao, Central Portugal)” (C. Bottaini, R. Vilaca, I. Montero-Ruiz, J. Mirao, A. Candeias; pp. 217-231), and from (2016, Vol. 16, No. 3) comes “An Overview of the Economic Status of the Safavid Era on the Basis of Silver Coins, Case Study: Shah Abbas II and Sultan Hussein” (H. Kohansal Vajargah; pp.73-78), “PIXE Analysis of Silver Coins from Ilkhanid and Safavid Dynasties in Iran: A Case Study” (B. Sodaei; pp. 207-211), and from (2016, Vol. 16, No. 1) comes “Evaluating Laser Cleaning of Corroded Archaeological Silver Coins” (O. Abdel-Kareem, A. Al-Zahrani, A. Khedr, M. A. Harith; pp. 135-

143), and “Archaeometallurgical Studies of Spear Heads and Arrow Heads of the Middle Bronze Age Sites of Azerbaijan” (A. Hasanova; pp.221-226).

From *STAR: Science & Technology of Archaeological Research* (2016, Vol. 2) comes “Preliminary Investigation of Sri Lankan Copper-alloy Statues” (K. A. Anusha Kasthuri; pp. 159-176). From the *Journal of Conservation Science* [Korean, English Abstracts] (2016, Vol. 32, No. 3) comes “A Study of the Microstructure and Impurity Characteristics of Cast Bronze in Koryo Period” (Jung Eun Choi; pp. 313-320), and from (2016, Vol. 32, No. 2) comes “Scientific Analysis and Provenance Study of Bronze Artifacts Excavated from Dongchon Site in Sunchang, Jeollabuk-do, Korea” (Go Woon Bae, Kwang Yong Chung; pp. 101-108), and “Metallurgical Analysis for Non-ferrous Smelting Slag Collected from Seosan Area” (Hye Jin Lee, Hye Youn Lee, So Dam Lee, Nam Chul Cho; pp. 189-202).

Doctoral & Master Theses

Egypt's Unusual Iron Age: From the Time of Hammering Prestige Goods in the Predynastic Era and Late Bronze Age to Forging the Weapons and Tools of the “Age of Iron”, by Maria R. Carlenius, (Doctor of Philosophy in History, Department of History, University of Tennessee, Memphis, Tennessee), May 2016, xiv+321 pages, 14 figures, 9 tables, 5 appendices, bibliographical references.

Thus far determining when the Iron Age occurred in Egypt has been an imprecise process with most overviews simply stating when iron first appeared, highlights of iron discoveries or when smelting began in earnest which was the 6th Century BCE in the Delta. In this dissertation I employ Anthony Snodgrass’s methodology to determine when it occurred. The results indicate that the height of Egypt’s iron use peaked in the Roman era; by the Late Roman era they reverted to using iron for ornamental purposes in much smaller quantities. In addition, iron production may never have exceeded that of bronze which may be a hallmark of a true Iron Age.

Egypt’s Iron Age was clearly atypical. After possibly engaging in the earliest known experimentation with iron in the world (around 3300 BCE) they took three millennia before producing a significant number of practical iron goods. Then for some reason they drastically reduced much iron production. Through cross-cultural comparison and an in depth look at three time periods: the Predynastic when iron first appears in Egypt, the Late Bronze Age and Greco-Roman eras, I argue that the fact that iron was never deeply integrated into the fabric of indigenous ancient Egyptian society and crises that occurred

throughout the Roman Empire were the causes of the short peak use of iron. [Abstract from thesis]

Reconstructing Past Craft Networks: A Case Study using 3D scans of Late Bronze Age Swords to reconstruct Specialized Craft Networks, by Kristina Golubiewski-Davis (Doctor of Philosophy in Anthropology, Department of Anthropology, University of Minnesota, Minneapolis, Minnesota), May 2016, xvi+458 pages, 147 figures, 17 tables, 6 appendices, and bibliographical references.

As the collection of 3D data proliferates in the archaeological community, new methods integrating analysis of those data must also be developed. This dissertation project approaches the problem of observing social networks by examining decisions made by specialized craft workers: specifically, Late Bronze Age smiths (~1200-800BC). The data examined include shape data collected from 3D scans of bronze swords. These data were used to group the blades using cluster analysis based on different aspects of the swords including blade profile, hilt profile, and various decorative shape data. Those clusters create links between the swords which were then used to examine the network of bronze smiths. This project is a case study of how one might go about studying the way individuals with specialized knowledge were connected in the past by studying the results of that knowledge expressed through tangible differences between artifacts. [Abstract from thesis]

Indigenous Gold from St. John, U.S. Virgin Islands: A Materials-Based Analysis, by Stephen E. Jankiewicz (Master of Arts in Anthropology, Department of Anthropology, Northern Illinois University, DeKalb, Illinois), May 2016, x+102 pages, 31 figures, 7 tables, 3 appendices, and bibliographical references.

The purpose of this research is to examine the origin, manufacturing technique, function, and meaning of metals used during the twelfth and thirteenth centuries on the island of St. John, United States Virgin Islands. This project focuses on two metal artifacts recovered during National Park Service excavations conducted between 1998 and 2001 at a shoreline indigenous site located on Cinnamon Bay. These objects currently represent two of only three metal artifacts reported from the entire ancient Lesser Antilles. Chemical and physical analyses of the objects were completed with nondestructive techniques including binocular stereomicroscopy, scanning electron microscopy, portable X-ray fluorescence spectrometry, and particle-induced X-ray emission spectrometry with assistance from laboratories located at Northern Illinois University, Beloit College, Hope College and The Field

Museum. This data will be combined with contextual site data and compared to other metal objects recovered throughout the ancient Caribbean. [Abstract from thesis]

Early Copper Smelting in the Lake Superior Region: A Case Study of the Isle Royale and Ohio Mining Company, 1846-1852, by Adrian Paul Blake (Master of Science in Industrial Archaeology, Department of Social Sciences, Michigan Technological University, Houghton, Michigan), 2016, viii+125 pages, 50 figures, 3 tables, 3 appendices, and bibliographical references.

The lodes of native copper found in the Lake Superior region presented new opportunities for investors and miners alike. Making these opportunities pay required the unique challenges presented by the region's remoteness and unique geological formations to be overcome. A primary way in which these newly emerging companies overcame these challenges was through successful vertical integration of the copper refining industries. Smelting came to the region early, but met with little success as the workers first needed to retool their skills and experiences to the demands of the region's mineral deposits. In 1848 the Isle Royale and Ohio Mining Company commenced their short-lived copper furnace operation near the settlement of Ransom on Isle Royale. The archaeology and history of this furnace provides insights on a newly emerging industry, technological adaptation, and social and labor relations within this remote but rapidly emerging industrial frontier. [Abstract from thesis]

The Sickles' Edge: An Experimental Use-Wear Approach to Investigating Sickle Deposition in Bronze Age Europe, by Barbara Ellen McClendon (Master of Science in Anthropology, Department of Anthropology, The University of Wisconsin-Milwaukee, Milwaukee, Wisconsin), December 2015, xi+135 pages, 50 figures, 6 tables, 2 appendices, and bibliographical references.

Prehistoric hoards – containing items such as precious metals, tools, ornaments, and weapons – have long fascinated archaeologists and the general public alike. The practice of intentional wealth deposition in hoards was particularly prolific during the European Bronze Age; however, the motivations behind this practice remain unclear. Comparisons of the contents of hoards through space and time can yield valuable data regarding the purpose and process of deposition, but one of the most common items found in Bronze Age hoards – bronze sickles – remains understudied. In order to generate a standardized approach to the comparative analysis of prehistoric sickles in a variety of contexts, I propose a protocol for measuring indications of use-wear, based on

the results of experimental trials. Four bronze sickles were cast, hafted, and used in harvesting vegetation. After two harvesting trials, microscopic images were taken of the back and front of each cutting edge; use-wear maps were created identifying bluntness, abrasion, striations, and blade deformation. Similar use-wear maps were created for seven prehistoric bronze sickles in the collections of the Field Museum of Natural History, the Logan Museum of Anthropology, and the Milwaukee Public Museum. The data generated by comparing wear patterns on the experimental sickles with the working edges of the prehistoric sickles suggest that indications of use can be identified through specific patterns of abrasion and bluntness along a sickle's cutting edge. These sickle-specific usewear patterns and the process of producing and using the experimental sickles are described in detail to serve as a foundation for further systematic analysis of prehistoric bronze sickles and their depositional contexts. [Abstract from thesis]

Forthcoming Meetings

Iron in Archaeology: Bloomery Smelters and Blacksmiths in Europe and Beyond is an international conference in honor of Radomír Pleiner in the 50th year of the CPSA, to be held from May 30 – June 1, 2017, at the National Technical Museum in Prague, Czech Republic. The aim of the conference is to bring together scholars involved in research on early ironworking and to share the newest results and experiences achieved in this field. Very welcome contributions are those informing about recently excavated bloomeries and smithies, about results of analyses of slags and iron artefacts, about new analytical methods developed, new trends and achieved results in experimental archaeometallurgy of iron, etc.

The event will be held at Prague in the spring of 2017, thus 30 years after R. Pleiner himself organized a similar CPSA conference at Liblice near Prague. Conferences organized under the auspice of the CPSA have already a long tradition, which will be, by the forthcoming event, revived and continued. The first meeting was held at Schaffhausen in 1970, the others at Eisenstadt in 1975, Schaffhausen in 1979, Sankelmark in 1980, Vordernberg in 1981, Populonia in 1983, Belfast in 1984, Norberg in 1985, Mainz in 1986, Liblice in 1987 (the 20th anniversary of CPSA), Val Camonica in 1988, Kielce-Ameliówka in 1989, Sévenans-Belfort in 1990, Budal in 1991, Ripoll in 1993, Besançon in 1993, Plas Tan y Bwlch in 1997 (the 30th anniversary of CPSA), Bienno in 1998, Sopron-Somogyfajs in 1999, Sandbjerg in 1999 and Uppsala in 2001. All these conferences were the most enjoyable and friendly of occasions, which helped to bond together a family of scholars of European early ironworking. The organizers believe that the forthcoming

conference in Prague will also be such an event.

Additional information can be found at the following link: <http://www.arup.cas.cz/iaa2017/index.html>.

The *Historical Metallurgy Society (HMS)* will hold its 2017 Annual General Meeting “*The Metallurgy of Our Portable Heritage*” on Saturday, June 17, 2017, at the Institute of Archaeology, University College London (UCL), London, United Kingdom. The Historical Metallurgy Society (HMS), in conjunction with the Portable Antiquities Scheme (PAS) <<https://finds.org.uk/>>, would like to invite submissions for papers for a study day on the metallurgy of our portable heritage. This meeting is aimed at a wide variety of contributors, from archaeological metallurgists, excavators, post-excavation specialists and PAS officers. The meeting is for open to anyone interested in finding out more about metal objects; be they gold, silver, copper alloy or iron.

The day will also include some invited speakers, but proposals for oral papers related to metallurgical aspects of the following topics are welcome:

- Using the PAS data for the analysis and/or interpretation of metal objects or assemblages
- Manufacture and use of small metal objects
- Recent work on small find assemblages from excavations
- New metal finds both from excavations and the PAS
- Metal conservation of our portable heritage

Abstracts of no more than 250 words are due by 31st of January, with the intention of revealing a program in the middle of February. A color abstract book will be produced so speakers are invited to also send one color photo (maximum of 9MB) for inclusion with their abstract. The call for papers information can be found at: http://hist-met.org/images/events_files/2017_AGM/AGM_2017_cal_forpapers.pdf, while more information can also be found at the HMS website: <http://hist-met.org/meetings/11-meetings.html?layout=blog>. For more information please contact Eleanor Blakelock at events@hist-met.org.

The *Ninth International Conference on the Beginnings of the Use of Metals and Alloys (BUMA IX)* will be held from October 16-19, 2017, at the International Center, Bumin Campus, Dong—A University, Busan, Korea.

About the Conference

The international conference on “the Beginnings of the Use of Metals and Alloys” (BUMA) is the interdisciplinary gathering of scientists, engineers,

archaeologists and historians with a focus on production and use of metals, and an emphasis on cultural interactions and evolutions over time and space especially between the West and the Asian region.

BUMA was founded in 1981 by two eminent archaeometallurgists Prof. Robert Maddin in Philadelphia USA and Prof Tsun Ko in Beijing, China, with the strong support of late Professors Cyril Stanley Smith (MIT) and Yunoshin Imai (Tohoku University) from the second Conference on. From Beijing in 1981 BUMA has traveled to Zhengzhou, China (1986), Sanmenxia, China (1992), Matsue, Japan (1998), Gyeongju, Korea (2002), Beijing, China (2006), Bangalore, India (2009). Nara, Japan (2013).

BUMA IX will be held in Busan, Korea in 2017. As the largest harbor of Korea, there are many historical and cultural attractions in Busan.

Scope of the Conference

The main theme at the Busan Conference is “Cultural Interaction and the Use of Metals”. The Conference will provide a forum for discussion on the effects of metals on the culture and history with a special focus on Asian materials. Comparative studies and case studies on ancient and traditional metallurgy from other regions can illuminate the interactions between the Far East and the West through South Asia as well as Eurasia.

The Conference covers the following theme:

- (1) Iron and Steel Technology
- (2) Copper and Bronze Technology
- (3) Precious Metals and Coinage
- (4) Casting Technology of Bronze and Iron
- (5) Swords and Iron Artifacts
- (6) History of Alloys (Brass, Paktong and Shiromé)
- (7) Ores and Metal Production
- (8) Illustrated Technology of Mining and Metallurgy
- (9) Experimental Metallurgy, Survey Methods and Conservation

Important Dates/Deadlines

Abstract (1 page) submission Deadline:	Mar. 31, 2017
Abstract Acceptance:	Apr. 30, 2017
Advance registration Deadline:	May 31, 2017
Final Program:	July 31, 2017
Conference:	Oct. 16-19, 2017
Full paper (within 8 pages) submission Deadline:	Oct. 18, 2017

Additional information can be found in the 1st conference circular PDF file at: <http://kim.or.kr/UploadData/Editor/EmBody/201604/96EBA3E68BA446B2B935206E0DF47D24.pdf>, and at the conference website: <http://buma9.org/>.

Previous Meetings

The *Society for American Archaeology (SAA) 82nd Annual Meeting* was held in Vancouver, British Columbia, Canada, from March 29 – April 2, 2017. Four sessions dedicated to metals and archaeometallurgy were held at the conference and a number of other metal and metallurgical related papers were scattered through other sessions. The session *Ancient Metallurgy in Mesoamerica: Local Expression and Interregional Connections* included “Precolumbian Huastec Metallurgy” (Diana Zaragoza and Kim Richter), “Proto-Tarascan Uacusecha Metallurgy: Issues about Technological Transition and Lost Techniques” (Isabel Medina-González, Manuel Espinosa-Pesqueira and Grégory Pereira), “Ancient Metal Routs in the Tarascan Señorío: Mining, Smelting, Smiting” (José Luis Punzo, Cesar Valentín Hernández, Lissandra Gonzalez and Mijaely Castañón), “Noninvasive Analyses of Metal Artifacts from the Milpillas Site, Zacapu, Michoacán” (Manuel Espinosa-Pesqueira, Blanca Maldonado, Isabel Medina-González and Gérald Migeon), “Mixtec Goldworking: New Evidence for Lost-Wax Casting from Late Postclassic Tututepec, Oaxaca” (Marc Levine), “The Periphery Gold Production Areas of Oaxaca: Tradition and Distinctiveness” (Edith Ortiz-Díaz), “Metallurgical Production at Mayapán, Yucatán, Mexico: New Discoveries from the R-183 Group” (Elizabeth H. Paris, Elizabeth Baquedano and Carlos Peraza Lope), “Maya Metals: A Comparative Analysis from Tipu and Lamanai, Belize” (Scott Simmons and Bryan Cockrell), and “Indigenous Copper Production in Colonial Mexico (1533–1630)” (Johan Garcia), while Dorothy Hosler and Aaron Shugar were discussants.

The session *Archaeometallurgy of the New World: Current Research, Approaches, and Methods* included “Early Metallurgy from Waywaka in the South-Central Highlands of Andahuaylas, Apurimac, Peru: New AMS Dates and XRF Analysis” (Joel W. Grossman and Timothy C. Kenna), “Lung-Powered Copper Smelting on the Pampa de Chaparri, Lambayeque Department, Peru” (David Killick and Frances Hayashida), “The Origins and Development of Arsenic Bronze Technologies on the North Coast of Peru: Preliminary Results from Archaeometric and Experimental Investigations” (Branden Rizzuto), “Variations in Mochica Metalwork” (Alicia Boswell, Ellen Howe, Joanne Pillsbury and Deborah Schorsch), “Imperial Authority and Local Agency: Investigating the Interplay of Disruptive

Technology, Indirect Authority, and Changing Ritual Practice at Dos Cruces” (Colin Thomas), “Silver Production and Inka Expansion in the South-Central Andes” (Carol Schultze and Colleen Zori), “The Environmental Effects of Indigenous Smelting in the Southern Andes: A Look at the Source” (Mary Van Buren), “María Scattolin and Leticia Cortés—The Contribution of Northwestern Argentina to the Metallurgical Andean Tradition” (María Scattolin and Leticia Cortés), “Primary Copper Smelting in Mesoamerica: A Case Study from Central Michoacán” (Blanca Maldonado, José Luis Punzo, Thilo Rehren, Juan Julio Morales and Avto Gogichaishvili), “An Evaluation of Stingless Bee Wax as a Pattern Material in Mesoamerican Investment Casting” (Michael Tarkanian and Elizabeth H. Paris), and “Metallurgy in America: What Do We Know About Its Development and Diffusion?” (Niklas Schulze), while Izumi Shimada was the discussant.

The session *Developing Approaches in the Study of Prehistoric Copper in North American Archaeology* included “Direct Comparison of LA-ICP-MS and Handheld XRF Elemental Analysis of Copper Artifacts: A Methodological Case Study in the Exploration of Hopewell Valuables Exchange Systems” (Kevin Nolan), “External Standards for the LA-ICP-MS Analysis of North American Copper Artifacts: Looking at Different Approaches” (Laure Dussubieux), “Getting to the Source: Copper Characterization, Prehistory, and the Question of Interpretation” (Gregory Lattanzi), “Elemental Analysis of Late Archaic Copper from the McQueen Shell Ring, St. Catherines Island, Georgia” (Mark Hill), “Shifting the Interpretation of Ohio Hopewell Copper Use” (Mark Seeman), “Native Copper Innovation in the North” (H. Kory Cooper), “Biographies of Northwest Coast Copper: A Material Investigation” (Lenore Thompson), “Cultivating Methods for New Conclusions: An Analysis of Oneota Copper Artifacts of the Lake Koshkonong Region in Southeastern Wisconsin” (Jacqueline Pozza), “Current Approaches to the Study of Late Prehistoric North American Copper Materials: Contributions from the Hoxie Farm Site, Cook County, Illinois” (Kathleen Ehrhardt), “Toward a Deep History of Southern Appalachian Copper Mining: New Agendas and Approaches” (Colin Quinn), “Collecting Copper and Systematic Archaeological Analysis” (Robert Ahlrichs), and “Metal Sensing and Indigenous Copper from Isle Royale National Park and Gila National Forest” (Casey Campetti).

The session *Casting Empire: Metal Production in Early Imperial China* included “Casting Metals for the Qin First Emperor and His Underground Empire” (Xiuzhen Li,

Marcos Martín-Torres, Andrew Bevan and Thilo Rehren), “How the Han Empire Managed Large-Scale Iron Production: A Study Report of Iron Smelting Sites in Shandong Province and Henan Province” (Zhouyu Zhang and Jianli Chen), “The Management of Techniques and Labor in Copper Production: Based on the New Materials in Tonglushan Sifangtang Cemetery” (Shuxiang Chen and Qifeng Xi), “Resources, Technology, and Distribution: A Discussion on Models of Early Bronze Production in China” (Huaiying Chang), and “Archaeology of Iron in the Lingnan Region and the Imperial Strategy of the Han Dynasty in Its Southern Peripheries” (WengCheong Lam, Liangbo Lv and Qianglu Zhang), while Jianli Chen was the discussant.

Additional papers of archaeometallurgical interest found in other sessions include “pXRF Examination of Shang-Dynasty Bronzes from the Daxinhuang Site, Shandong (Qingzhu Wang, Thomas Fenn, Hui Fang, Xuexiang Chen and Jianfeng Lang), “Transcultural Interaction in China’s Shang Period: An Archaeo-Metallurgical Perspective” (Kunlong Chen, Jianjun Mei, Thilo Rehren and Congcang Zhao), “Incipient Metallurgy in Western Yunnan: Current Study and Issues” (TzeHuey Chiou-Peng and Jianfeng Cui), “The Beginning Use of Iron in Ancient China and the Early Silk Road” (Jianli Chen), “Pursuing the Mineral Sources of Yinxu Bronze Objects (13th–11th BC): Study on the Lead Ingots from Anyang, China” (Yu Liu, Jigen Tang and Jianyu Liu), “The Spread of Iron Metallurgy: The African Continent” (Louise Iles), “Using Ethnoarchaeology to Interpret Archaeological Blacksmithing Sites in Togo, West Africa” (Philip de Barros), “Cross-Craft Overlaps in Materials and Symbolism: Insights from Legacy Crucibles from the Great Zimbabwe Archive” (Shadreck Chirikure), “Early Iron Production in Sudan” (Jane Humphris and Michael Charlton), “Experimental Iron Smelting at Meroe, Sudan” (Michael Charlton and Jane Humphris), “Space and Scale in Reconstructions of the Social Organization of Craft Production” (Nathaniel Erb-Satullo), “The Industry of Empire: Investigating the Spatial and Technological Organization of Angkorian Iron Production around Phnom Dek, Cambodia” (Mitch Hendrickson, Stephanie Leroy, Enrique Vega, Quan Hua and Philippe Dillmann), “Nested-Context Perspective of Craft Production: Middle Sicán Metallurgy” (Izumi Shimada), “Multiscalar Analysis of Copper and Silver Production under the Inka: A Case Study from Northern Chile” (Colleen Zori), “Geophysical and Geochemical Spatial Approaches to Early Copper Metal Production among Bronze Age Communities in the Southern Urals, Russia” (Bryan Hanks, Roger Doonan, Nikolai Vinogradov and Elena Kupriyanova), “Reconstructing Phoenician Iron Production at Tel Akko, Israel”, (Mark Van Horn, Adi

Eliyahu, Naama Yahalom-Mack and Ann E. Killebrew), “Applying a Life History Framework to Analyzing Metal Age Metal Assemblages from Thailand” (Joyce White and Elizabeth Hamilton), “Putting a ‘Human Face’ on Prehistoric Mining/Metallurgical Communities in the Khao Wong Prachan Valley of Central Thailand” (Vincent C. Pigott), “The Spread and Development of Iron Technologies in China” (Kazuo Miyamoto), “Monte Cristo’s Gold: A Case Study of a Hard Rock Gold Mining Town in Washington’s Cascade Range at the Turn of the Twentieth Century” (Aubrey Steingraber), “Use and Symbolism of Copper Axes in Tarascan Society during the Late Postclassic Period in Modern-Day Michoacán, Mexico” (Marcelo Ibarra López), “The Spatial Analysis of Debris from the Mound 34 Copper Workshop” (Emily Coco), “Compositional Analysis of Copper-Base Metal Artifacts from Michigan” (Heather Walder)

Web-based Resources

A website entitled *ArsenicLoss* is devoted to “Chemical and metallurgical aspects of arsenical bronze: the case of arsenic-loss in prehistoric metal production”. The website, a product of the research of archaeometallurgist Marianne Mödlinger, includes a “Home” page with a running Blog (started in spring 2015), an “About” page providing the origins of the research project, a “Project” page providing additional details on the project and institutions and groups involved, a “Research team” page identifying team members and giving a bit of background on those members, a “Literature” page providing a useful list of references on the subject, and “Links” page. The website homepage can be found at: <https://arsenicloss.com/>.

A website entitled *CAST:ING, Copper Alloy Sculpture Techniques and history: International iNterdisciplinary Group* is devoted to creating “a framework that will facilitate advances in the understanding of bronze sculpture through the use of shared protocols and vocabulary for technical studies.” The website includes a “Home” page with subheadings of *Objectives, Outputs, Benefits, Who?, How?, Time frame, and What is novel?*. All of these provide useful information on the origins of the project and research presented on the website and goals, and institutions and people involved. Other pages include “Guidelines”, divided into an Introduction and 8 volumes, “Bibliography” of global research relevant to the project and research, “News” on the research and its outputs as well as other related news, “FAQ” for more details on the project, and “About” with general details on the group and sublinks of “More about the group”, “History of the project”, “The Models we inspire on” and “Details of past and forthcoming meetings”. The website homepage can be found at: <http://www.cast-ing.org/>.

BOOK REVIEWS

David Hill, Associate Editor

Encyclopedia of Geoarchaeology, edited by Allan S. Gilbert. 2017. Encyclopedia of Earth Sciences Series. (Series Editor Charles W. Finkle). Springer Publishing, Dordrecht, Netherlands. xxix + 1046 pages, 158 b/w illustrations, 310 illustrations in color. \$549.00 (Print/eBook). ISBN: 978-94-007-4827-9 (Print), 978-1-4020-4409-0 (eBook).

Reviewed by David Kilby, Department of Anthropology, Texas State University

The *Encyclopedia of Geoarchaeology* is the latest in a series of 35 reference volumes in the Encyclopedia of Earth Sciences Series published periodically since the mid-1970s by Springer. Originally conceived in 1981 by Rhodes Fairbridge, this particular volume in the series stalled under a change in publishers (Gilbert 2017:xxviii). It was resurrected and brought to completion 35 years later by Allan S. Gilbert along with Associate Editors Paul S. Goldberg, Vance T. Holliday, Rolfe D. Mandel, and Robert S. Sternberg. The result is an impressive tome that is international in scope and ranges temporally from paleoanthropology to ethnogeoarchaeology.

The volume consists of 165 individual entries ranging in length from brief summaries (less than a full page for specific sites or localities) to chapter length treatments of foundational topics (e.g., Remote Sensing, Site Formation Processes). Although the entries are organized alphabetically, they can be divided informally into three general categories: geoarchaeological concepts, methods, and significant locations. Not included are biographical entries of pioneers and major figures of geoarchaeological research. I suspect this was considered and eschewed, perhaps to avoid deliberation over whom to include (especially considering that due to the relative youth of the field, many of those very pioneers are still around to enjoy the volume, while others are contributors). It bears mentioning that the contributions of many of these pioneers are reviewed in a thorough historical entry (Geoarchaeology, History).

Just under half of the entries (74) cover general geoarchaeological concepts and foundations. Many subjects might serve as succinct chapters of a general textbook (e.g., Archaeological Stratigraphy, Geomorphology, Paludal Settings, Soils), and are afforded broad treatment. Others address more specific topics and issues (e.g., Burned Rock Features, Metals, Tells) and are appropriately focused. Some physiographic

areas and their characteristic processes are given specific attention (e.g., Arctic, Plains, Shorelines); others are conspicuously absent in comparison (deserts, mountains, and woodlands come to mind), though these are often addressed indirectly under other entries.

Specific field and laboratory methods are the subject of 39 entries. These entries are among the most important in the volume, as they provide authoritative guides to complex and often esoteric knowledge and techniques (e.g., Data Visualization, Isochron Dating, Neutron Activation Analysis). It is worth noting that many of these methodical advances would not yet have been developed when the volume was first conceived, and this highlights the editorial challenge of keeping entries up to date for later editions.

Entries focused on specific sites or archaeological localities comprise the remaining 52 contributions. On the whole, these entries provide brief overviews of classic sites and projects (e.g., Eastern Sahara Combined Prehistoric Expedition, El Mirón Cave, Olduvai) that are associated with fundamental applications and advancements in geoarchaeology. As such they provide useful case studies of the implementation of geoarchaeology in understanding of sites, time periods, and regions.

This volume represents an ambitious undertaking and the result is impressive. The editors and contributors are to be commended for accomplishing their goal of producing a volume that “defines terms, introduces problems, describes techniques, and discusses theory and strategy...in a language...accessible to students and nonspecialists” (Gilbert 2017:xxviii) The price is potentially prohibitive for many individuals, but the depth and breadth of the information it presents make it an authoritative if not essential volume for institutional and academic collections, whether as part of the full series or as a stand-alone reference.

collaborations in its LA-ICP-MS laboratory. Proposal must be received by March 15 and September 15, each year.

The EAF hosts a Thermo ICAP Q inductively coupled plasma-mass spectrometer (ICP-MS) and two laser ablation systems: a New Wave UP213 laser ablation (LA) system with a 5 cm x 6 cm chamber and a New Wave UP266, with an experimental adaptable chamber, dedicated to the study of large objects. Complementing the ICP-MS instrumentation, the EAF also hosts a LEO EVO 60 XVP Scanning Electron Microscope with an environmental chamber equipped with an Oxford Inca Energy Dispersive Spectroscopy system, two portable XRF systems and a digital imaging petrographic microscope.

This NSF funded program aims at facilitating the access of the EAF to researchers and students by offering funding to offset 2/3 of the LA-ICP-MS analytical costs. Researchers should indicate whether they will be in residence at the Museum to run their samples, or whether they are requesting Museum staff to undertake the analysis. In some cases, students from outside the Chicago area are eligible for limited funding for travel and accommodation. Students requesting travel funding should submit a travel budget.

A panel including outside and Field Museum scholars will review proposals. All parties who wish to undertake a collaborative project in the lab should forward a short proposal (4 pages) for consideration. The proposal should address the research problem, the size of the specimens, and the type, number, and contexts of the samples, whether the scholar will be in residence and travel budget if appropriate. Curriculum vitae for the principal collaborator(s) should also be included. You should inquire with Laure Dussubieux, lab manager, before submitting any proposal at ldussubieux@fieldmuseum.org.

RESEARCH OPPORTUNITIES

Call for Proposals: NSF Subsidized Projects At the Elemental Analysis Facility (EAF), The Field Museum, Chicago, IL (2016-2019)

Each March 15 and Sept. 15.

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Department of Geography and Anthropology
California State Polytechnic University, Pomona
3801 West Temple Avenue, Building 5 - 150
Pomona, CA 91768

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

Editor: **Thomas R. Fenn**, Department of Geography and Anthropology, California State Polytechnic University, Pomona, 3801 Temple Avenue, Building 5 - 150, Pomona, CA 91768, USA; tel 909-869-3576; email trfenn@cpp.edu

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Publication and mailing expenses for the SAS Bulletin have generously been donated by the College of Letters, Arts, and Social Sciences (CLASS), California State Polytechnic University, Pomona, California.

Published quarterly by the Society for Archaeological Sciences

Distributed to subscribers: \$20/yr regular membership (electronic); \$25/yr regular membership (paper); \$15/yr student and retired (electronic); \$20/yr student and retired (paper); \$35/yr institutional; \$300 lifetime.

Individuals add \$115/yr for *J. of Archaeological Science*; \$45/yr each for *Archaeometry* and *Archaeological & Anthropological Sciences*.

ISSN 0899-8922.